

中国纤维
流行趋势
CHINA FIBERS
FASHION TRENDS

中国纤维

流 行 趋 势 报 告

CHINA FIBERS

FASHION TRENDS REPORT

2021/2022



国家工业和信息化部消费品工业司

中国化学纤维工业协会

东华大学

中国棉纺织行业协会



桐昆集团股份有限公司
Tongkun Group Co., Ltd.

行纤维之事 利国计民生

T O N G K U N G R O U P



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桐昆·中国纤维

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流行者明 趋势者兴

中国纤维流行趋势 十年志

这十年，精彩纷呈，盛世华章

时光如白驹过隙，中国纤维流行趋势已经和中国纤维产业相伴十年。这十年，是纤维全产业链深度融合的十年，是企业内生动力云程发轫的十年，是纤维科技与时尚流行相辅相成的十年。

这十年，中国纤维流行趋势把技术创新、品牌建设、可持续发展作为活动内涵，引领整个化纤行业乃至整个纺织行业关注纤维品牌、建设纤维品牌，开发品牌产品，提升中国纤维在国际市场上的整体形象和影响力，提升行业发展内涵和长远竞争力。

这十年，中国纤维流行趋势创建了纤维流行趋势的传播与推广平台：通过大视野平台现场展示、专家解读、主题展览与时装秀、微视频、设计大赛、品牌培育、上下游对接等方式有机融合，开创了中国纤维流行趋势全球同步发布、传播与推广模式。

这十年，通过研究中国纤维流行趋势发布对化纤产业的定量、定性贡献，以及对品牌培育、标准化工作的贡献，建立纤维流行趋势发布贡



纤维 新视界 NEW FIBER NEW WORLD

LEAD THE FASHION AND THRIVE WITH THE TREND

Summary of China Fibers Fashion Trends in the Past Decade

A Decade of Brilliance and Flourish

As time flies by, China Fibers Fashion Trends has accompanied China's fiber industry for ten years. The past decade has been a decade of deep integration of the entire fiber industry chain, a decade in which the internal power of the enterprises have budded and thrived, and a decade in which fiber technologies and fashion complement and enhance one another.

In the past decade, China Fibers Fashion Trends has taken the technological innovation, brand building, and sustainable development as the essence of activities, leading the entire chemical fiber industry and even the entire textile industry to focus on fiber brands, establish fiber brands, develop brand products, enhance the overall image and influence of China's fiber in the international market, and ultimately enhance the development level and long-term competitiveness of the industry.

In the past ten years, China Fibers Fashion Trends has created a platform for the spread and promotion of fiber fashion trends: through the organic integration of on-site display at the wide-view platforms, expert interpretations, theme exhibitions and fashion shows, micro-videos, design competitions, brand cultivation, upstream and downstream coordination, etc., it has created a



献评价体系，形成中国纤维整体品牌影响力，不仅引导中国化纤产品的开发方向，而且为中国正由化纤生产大国向化纤生产强国建设提供支撑平台。

这十年，中国纤维流行趋势发布了两百余种纤维产品，参与企业达四百余家。每一次的发布都根植于中国纤维工业的蒸蒸日上，中国纤维科技的精进不休，中国纤维人的和衷共济。这十年，我们乐见纤之魅，我们触摸纤之源，我们品味纤之韵，我们安享纤之盾。这十年，我们见证了纤维科技的创新与融合，守正与鼎新。这十年，我们见证了纤维工业的颠覆与重塑，筑梦与制创。这十年，幸得有你，有每一位中国化纤人，每一家中国纤维企业的参与，我们共同开启了纤维新视界。

这十年，以产品为载体，以科技为支撑，以趋势为纽带，以时尚为舞台，中国纤维流行趋势见证了中国化纤工业的每一次前行的坚定步伐，每一次向上的磅礴伟力。行远自迩，日升月恒，中国纤维以纤维为笔，在祖国的大地上书写盛世虹章。

中国纤维流行趋势成为中国工业体系在高度市场化环境下践行“高质量发展”和“供给侧结构性改革”的代表之作。



method for simultaneously releasing, communicating, and promoting China's fiber fashion trend across the globe.

In the past decade, by studying the quantitative and qualitative contributions of the releasing of China's fiber trend to the chemical fiber industry, as well as the contribution to brand cultivation and standardization work, China Fibers Fashion Trends has established the contribution evaluation system of the publication of the fiber trend and the overall brand influence of Chinese fibers, which have not only guided the direction of product development for China's chemical fiber but also provided a support platform for China to transform from a major chemical fiber manufacture to a more influential chemical fiber producing country.

In the past decade, China Fibers Fashion Trends has released more than 200 fiber products contributed by more than 400 companies. Every release benefits significantly from the prosperity of China's fiber industry, the continuous improvement of China's fiber technology, and the united efforts made by China's fiber industry professionals. In the past ten years, we have been pleased to find the beauty of fiber, explored the developing source of fiber, appreciated the charm of fiber, and enjoy the security of fiber. In the past ten years, we have seen the innovation and integration, as well as the principle adherence and creativity of fiber technologies. In the past ten years, we have witnessed the subversion and reshaping as well as the realizing of dreams and innovation of the fiber industry. Thanks to the participation in the past decade of everyone in China's chemical fiber industry and each of China's fiber companies. We have jointly created a new vision of the fiber industry.

In the past ten years, with products as the embodiment, technologies as the support, trends as the link, and fashion as the stage, China Fibers Fashion Trends has witnessed the firm steps and great endeavors of China's chemical fiber industry. From a small step to the heyday, China's fiber industry uses fiber as a pen to compose the magnificent chapter of the prosperity of the motherland.

China Fibers Fashion Trends has become a typical achievement of China's industrial system in practicing the "high-quality development" and "supply-side structural reform" in a highly market-oriented environment.

Looking back to 2020, China's fiber industry maintained its tenacity and reached its prosperous period

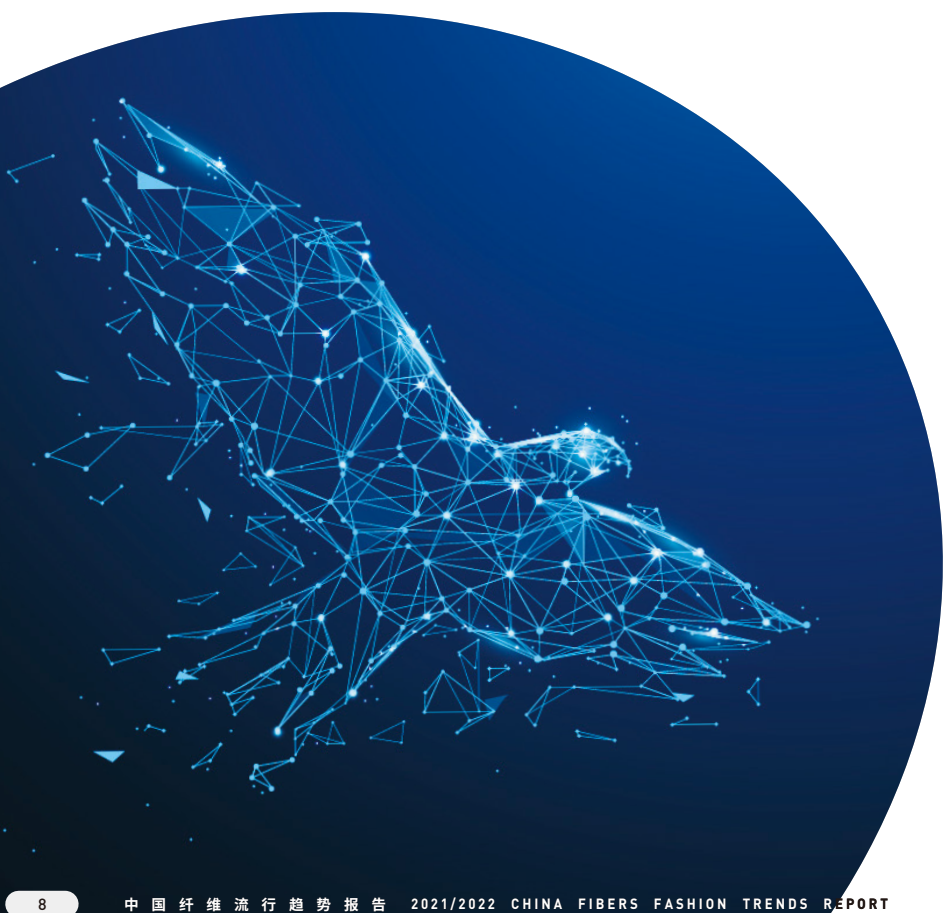
Looking back at the extraordinary 2020, after the sudden and fierce outbreak COVID-19 epidemic, the CPC Central Committee took charge of the overall situation, made decisive decisions, and responded to the extraordinary situation with extraordinary measures. Under the leadership of the CPC Central Committee, China's fiber industry showed the will and quality of "dedicated to serving the country forever". Staying true to the mission and ignoring the gains or losses, the industry used its fiber products as armor to not only help 1.4 billion Chinese people fight the epidemic but also significantly contribute to the world's anti-epidemic cause, further

回望 2020 年，坚韧依旧，风鹏正举

回望不平凡的 2020 年，突如其来的新冠疫情，来势汹汹。党中央统揽全局，果断决策，以非常之举应对非常之事。中国纤维产业在党中央的领导下，以“愿得此身长报国”的意志品质，无问西东，不计得失，以纤维制铠甲，不仅助力了 14 亿人抗疫，也为世界范围内的抗疫做出了巨大贡献，更凸显了纤维产业之于“民生”的不可或缺。

2020 年，中国纤维人助推科技进步，硕果累累。120 头高效率超细氨纶纤维产业化成套技术及装备、高品质熔体直纺 PBT 聚酯纤维成套技术开发、长效环保阻燃聚酯纤维及制品关键技术、聚酯复合弹性纤维产业化关键技术与装备开发、百吨级超高强度碳纤维工程化关键技术等 5 个项目获得 2020 年度纺织之光科技进步奖一等奖。

2020 年在疫情背景下，化纤行业陷入内需不振、出口受阻等困局，但纵观全年，中国纤维在科技创新、绿色发展、智能制造、炼化一体、数字经济、产融合作等方面依然颇有建树，既与“十三五”期间的总体发展特点一脉相承，又有新形势新业态下催生的新发展模式，在“十三五”收官之年，进一步巩固了行业在全球化纤工业和我国纺织工业大体系中的地位。至柔的纤维彰显出至韧的品格，锻造出至强的屏障，淬炼出至刚的力量。



highlighting the indispensability of the fiber industry to people's livelihood.

In 2020, China's practitioners in the fiber industry People promoted technological progress and achieved fruitful results. Five projects, including the industrialized complete technology and equipment for 120-end high-efficiency ultra-fine spandex fiber, the development of complete technologies for high-quality melt direct-spinning PBT polyester fiber, the key technology of long-lasting environmentally-friendly flame-retardant polyester fiber and its products, the key technology and equipment development of polyester composite elastic fiber industrialization, and the key technology of 100-ton ultra-high-strength carbon fiber engineering, won the first prize of the 2020 Textile Vision Science and Technology Progress Award.

In 2020, against the background of the epidemic, the chemical fiber industry was caught in dilemmas such as sluggish domestic demand and blocked exports. However, throughout the year, China's fiber industry had still made impressive achievements in technological innovation, green development, intelligent manufacturing, refinery-chemicals integration, digital economy, and industry-finance integration, keeping in line with the overall development characteristics during the 13th Five-Year Plan period, while also presenting new development model spawned under the new situations and business forms. In the finishing year of the 13th Five-Year Plan, it further consolidated the industry's status in both the global fiber industry and the broad system of China's textile industry. The softest fiber has shown its toughest character, forging the strongest protective barrier, and releasing the mightiest power.

Looking forward to 2021, China fibers fashion trends will implement inclusive and innovative development and create a prosperous future with the support of Tongkun Group.

The year 2021 marks the centenary of the founding of the Chinese Communist Party, the beginning of the 14th Five-Year Plan, and the beginning of the new journey of building a modernized socialist country in all dimensions. In 2021, China's fiber industry plans to—

Integrate the green transformation into high-quality development: General Secretary Xi Jinping announced new measures for China's national independent contributions at the Climate Ambition Summit. The green transformation of China's chemical fiber industry will promote the industry's high-quality development and establish a full-process green manufacturing system. It also aims to grasp the technologies of high-quality diversified bio-based raw material preparation, high-value recycling of waste textiles, degradable chemical fiber production, and green catalyst production and its application, and enhance the construction of the green evaluation system for fiber products and green product certification system. Furthermore, the industry will establish a recycled diversified multi-gradient comprehensive utilization system for chemical fiber, create the life cycle source analysis and reduction system of fiber-based microplastics, and develop the co-processing technology for pollution and carbon emission reduction, which helps to achieve the goals of peak carbon dioxide emissions and carbon neutrality. The concept of green development is deeply rooted in people's hearts and will continue to drive China's future. Looking forward to 2021, China's fiber industry will embrace lucid waters and lush mountains.

遇见 2021, 美美与共, 桐立昆仑

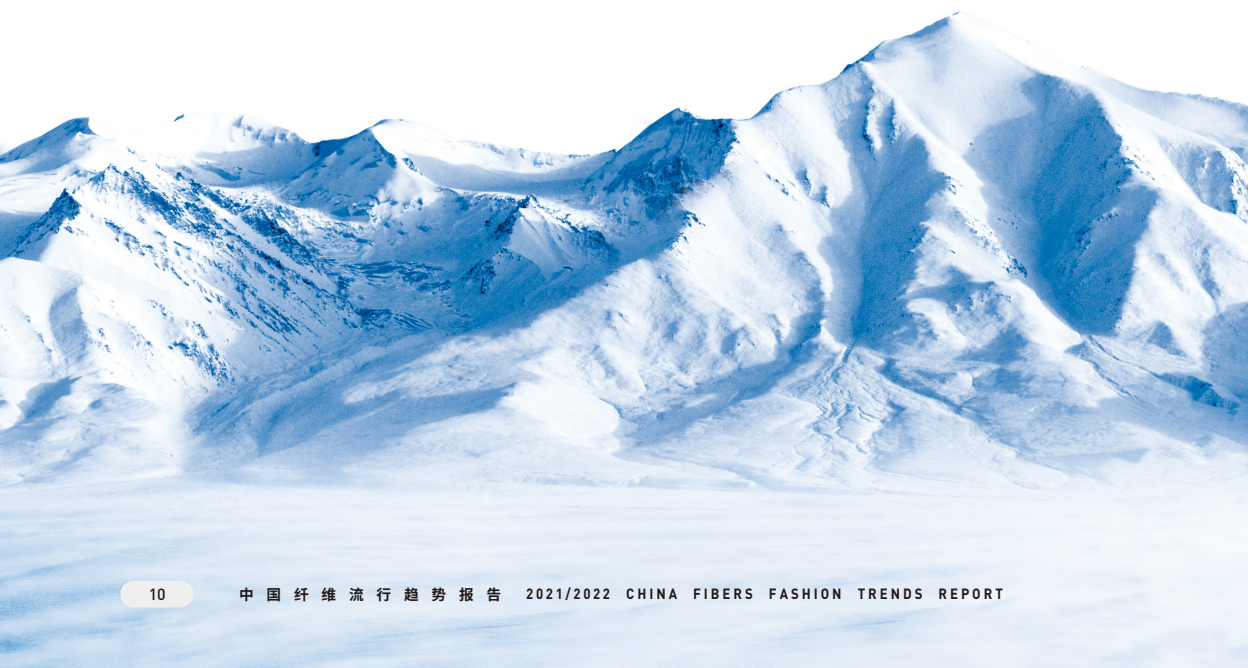
2021 年是建党一百周年、“十四五”开局之年、全面建设社会主义现代化国家新征程开启之年。遇见 2021, 中国纤维将——

绿色转型融入高质量发展：习近平总书记在气候雄心峰会上宣布了中国国家自主贡献新举措。中国化纤工业的绿色转型将助力行业的高质量发展，建立全流程绿色制造体系；攻克高品质多元化生物基原料制备技术、废旧纺织品高值化循环再利用技术、可降解化学纤维生产技术、绿色催化剂生产技术及应用；完善纤维产品绿色评价体系建设和绿色产品认证体系建设；建立化学纤维再生循环多元梯度综合利用体系；建立纤维基微塑料生命周期源解析及减量体系；开发化纤行业减污降碳协同处置技术，助力碳达峰和碳中和目标实现。绿色深入人心，绿色悦动中国，遇见 2021, 中国纤维拥抱绿水青山。

柔性生产推动高质量发展：智能化、阻燃、抗静电、抗紫外、抑菌、相变储能、光致变色等满足功能性纺织品所需的差别化、功能性纤维，各美其美，美美与共。柔性生产、模块化、精准化、快速响应是系统工程也是科技集成。对泱泱中华五千年文明的回望，对盛世中华的文化自信，让国潮回归，让国货自强。超仿真纤维，以纤维沟通传统与现代科技。原液着色纤维，以国色织就天香。遇见 2021, 中国纤维以柔性推动行业高质量发展。

智能制造赋能高质量发展：工业互联网、云计算、大数据、物联网等现代信息技术与纤维制造技术深度融合，构建全产业链智能制造体系。以新凤鸣集团“化纤行业 5G+ 全要素一体化工业互联网平台 - 凤平台”、桐昆集团“化纤行业工业互联网平台”等为试点，引领面向化纤行业的特色工业互联网平台建设。加大机器换人力度，继续提高智能制造水平。企业通过实施智能制造，打通全产业链多环节多链段数据，实现数据流共享。遇见 2021, 中国纤维以“锐意创新的勇气、敢为人先的锐气、蓬勃向上的朝气”，赋能行业高质量发展。

“浩渺行无极，扬帆但信风”，中国纤维履方致远，踵事增华，与每一个化纤人携手“桐”立昆仑。“不负凌云志”，“奋烈正当时”，在这激荡岁月里，中国纤维行而不辍，未来可期。



Promote high-quality development through flexible manufacturing: Functional and differentiated fibers required by functional textiles with intelligent, flame-resistant, anti-static, anti-ultraviolet, antibacterial, phase-change and energy-storage, photochromic and other features show their respective uniqueness and jointly reveal the beauty of fibers. Flexible manufacturing, modularization, precision, and quick response are both systematic engineering and technology integration. Looking back on China's five-thousand-year brilliant civilization, the confidence in the culture of China at its prime recovers the Chinese fashion and boosts the Chinese products. Super-simulated fiber bridges tradition and modern technologies. The original-liquid colored fiber presents fabulous beauty. In 2021, China's fiber industry will promote flexible high-quality development of the industry.

Empower high-quality development with intelligent manufacturing: Through deepening the integration of fiber manufacturing technology with the industrial Internet, cloud computing, big data, Internet of Things and other modern information technologies, the industry aims to build an intelligent manufacturing system for the entire industry chain. With the pilot projects such as "Chemical Fiber Industry 5G+ All-factor Integrated Industrial Internet Platform-Phoenix Platform" by Xinfengming Group, and "Chemical Fiber Industrial Internet Platform" by Tongkun Group, intelligent manufacturing is launched to lead the construction of distinctive industrial Internet platforms for the chemical fiber industry. Meanwhile, the substitution of labor force with machines will increase to continue to improve the level of intelligent manufacturing. Through the implementation of intelligent manufacturing, enterprises can connect the data on various links of the entire industry chains and realize the data flow sharing. In 2021, China's fiber industry will empower the high-quality development of the industry with innovative courage, pioneering spirit and energetic mood.

An ancient Chinese poem goes, "There is no end for sailing and the key is to hoist sails and sail towards the established goal". Each of the practitioners in China's fiber industry is jointly contributing to consolidating the foundation and preparing for a longer but prosperous journey. With great ambitions at such a flourishing and competitive age, the persistent efforts of China's fiber industry are bound to have a bright future.



中国纤维流行趋势 2021/2022
主题解读

THE INTERPRETATION ON
CHINA FIBERS FASHION TRENDS
2021/2022

激荡与领航

AGITATION AND NAVIGATION



激荡

化纤行业 40 年沧海桑田，经历风雨变换，在激荡冲击中发展与壮大。第一次金融危机之时，中国化纤人慧眼识机，聚酯熔体国产化技术快速发展；第二次金融危机，我国涤纶工业丝逆势而行，强势上扬。新冠疫情爆发，中国化纤逆势前行，为战“疫”提供原料保障，为中国人民保驾护航。中国化纤面临着前所未有的复杂局面，产业转型与升级、国内外产业链市场都面临着艰巨挑战。

产业结构，激荡中升级：化纤产业发展进程中，中国化纤工业抓住国际产业梯次转移、国内市场需求释放以及加入世贸组织的发展红利等重大机遇，进入了纤维产业发展的“快车道”，迎来了“黄金期”。随着原材料涨价、劳动力成本上升，下游纺织产业链向东南亚等国家地区转移，中国化纤披荆斩棘，在智能、绿色、互联网科技上融合创新，迎来了纤维产业的高质量内涵式发展。

产业链条，激荡中延伸：随着化纤产能的集聚和利润空间的压缩，化纤龙头企业系统整合资源，向上拓展到炼化，向下延伸至终端消费品，横向拓展要素支撑能力，打造全产业链竞争优势。中小型化纤企业错位竞争，精准对接终端需求，整合上下游客户渠道，在细分领域和市场发挥灵活优势，游刃有余，营造专精特新优势。

市场格局，激荡中相变：中国化纤已成为世界上品类最全，产业链条最完整的产业。伴随经济结构的调整、新中产的崛起、传播方式的改变，新消费形态的诞生，来自国内巨大的消费能力，必将促进化纤产业加速形成以国内大循环为主体、国内国际双循环相互促进的新发展格局。

AGITATION

After 40 years of vicissitudes, the chemical fiber industry has developed and grown with difficulties and opportunities in the turbulence. At the time of the first financial crisis, the practitioners of China's chemical fiber industry captured opportunities to promote the rapid development of polyester melt technology localization; In the second financial crisis, China's polyester industrial yarn obtained strong development despite the adversary trend. With the outbreak of the COVID-19 pandemic, China's chemical fiber bucks the trend and provides raw materials to guarantee the fight against the pandemic and protect the Chinese people. China's chemical fiber industry is facing an unprecedented complex situation where arduous challenges are emerging in the industrial transformation and upgrading, as well as the domestic and international industrial chain markets.

The industrial structure is upgraded in the agitation: In the process of chemical fiber industry development, China's chemical fiber industry seized great opportunities such as the international industrial echelon-transfer, the release of domestic market demand and the development bonus of China's accession to the WTO, and entered a "fast track" of development while embracing the "golden period". With the rising prices of raw materials and labor costs, the downstream textile industry chain has shifted to Southeast Asia and other countries and regions, while China's chemical fiber industry has overcome numerous difficulties to develop the integrated innovation in intelligence, green development and Internet technologies, achieving the high-quality internally-driven development of the fiber industry.

The industrial chains are extended in the agitation: with the concentration of chemical fiber production capacity and the shrinkage of profit margin, the leading chemical fiber enterprises systematically integrate resources, extend development upstream to refining and chemical and downstream to terminal customer goods, and horizontally expand the factor supporting capacity to create the competitive advantage of the whole industrial chain. Small and medium-sized chemical fiber enterprises carry out the staggered competition that accurately meets terminal needs, while integrating upstream and downstream customer channels and giving full play to their flexible advantages in subdivided fields and markets, so as to establish the professional, unique, superior and new advantages.

The market structure is changed accordingly in the agitation: China's chemical fiber industry has become the most comprehensive in the world with the most complete industrial chain. The adjustment of economic structure, the rise of the new middle class, the change of communication mode, the birth of new consumption patterns, and the huge domestic consumption capacity, will accelerate the formation of a new development pattern of the chemical fiber industry, characterized by the dominant status of the domestic great cycle and the reciprocal development of domestic and international exchange cycles.

领航

中国化纤企业以不息为体，日新为道，不停地追求上进、革故鼎新。中国化纤坚守主业，将做大做强与做精做细相结合；中国化纤包容开放，对国内外装备、助剂技术引进吸收再创新，挑战极限；中国化纤不断革新，紧跟时代步伐，与国际接轨，将传统行业打造成优势竞争产业。中国化纤展现中华民族坚忍不拔的特质，在制造模式、资本融合、产品开发等方面不断迭代更新，铸就新一轮领航趋势。

聚焦三品，领航纤维新视界：中国化纤品种百花齐放，涤纶、锦纶、循环再利用化学纤维、生物基纤维、超高分子量聚乙烯纤维等品种规模、品质世界第一；海藻纤维、壳聚糖纤维自主开发，世界首创。中国化纤秉承利国计民生的情怀，打造精湛匠艺、讲好品牌故事，创造多元应用。在战役中为医护人员保驾护航；在环境保护中，默默担当；在土工建筑、国防军工中顶天立地。

责任担当，领航低碳新生活：中国化纤产业积极构建绿色技术创新体系、清洁生产评价体系、安全高效能源体系，加速推广先进节能减排技术和装备，实现制造方式的绿色转型。中国再生循环技术水平及创新能力跻身世界前列、聚酯清洁生产水平居国际领先水平。打造“绿色纤维”品牌，推进化纤行业的绿色发展和绿色生态文明建设。

勇立潮头，领航竞争新优势：中国化纤产业规模和效益增长态势良好，化纤制造向着柔性化、智能化、定制化与服务化转型，资源整合向跨领域、网络化协同转变。大型化纤企业不断与资本融合，向上下游延伸，继续领跑化纤行业，亮相世界排名。2020年，3家化纤相关企业入围世界500强企业榜单，7家化纤相关企业挺进千亿俱乐部，16家化纤相关企业入选中国企业500强榜单。

NAVIGATION

China's chemical fiber enterprises have been continuously striving for excellence by carrying out constant innovation and revolutions. China's chemical fiber industry adheres to its main business and combines the target of larger and stronger development with the goal of sophisticated manufacture; the inclusive and open chemical fiber industry in China introduces, absorbs and innovates domestic and foreign equipment and auxiliary technologies to challenge the limits; the constantly innovative chemical fiber industry in China keeps pace with the times and the global development to turn the traditional industry into the one with competitive advantages. Demonstrating the tenacity of the Chinese nation, China's chemical fiber industry is standing and upgrading in the aspects of manufacturing mode, capital integration, product development, etc., achieving a new round of navigating trend.

The focus on variety increasing, quality improvement and brand establishment navigate the chemical fiber industry into a new development: China's chemical fiber products have wide varieties. The scale and quality of chemical fiber products such as polyester, nylon, recycled chemical fiber, bio-based fiber and ultra-high molecular weight polyethylene fiber rank the first in the world; the independently -innovated alginate fiber and chitosan fiber are pioneers in the world. Committed to benefiting the nation and its people, China's chemical fiber industry develops advanced techniques, performs excellent brand publicity, and achieves diverse applications. The industry navigates and safeguards the medical staff in fighting against the Covid-19 pandemic; it bears its obligations in environment protection; finally, it also plays an important role in civil engineering, national defense and military industry.

The commitment to environment responsibilities navigates the creation of the new low-carbon life: China's chemical fiber industry actively builds the green technology innovation system, the clean production evaluation system and the safe and efficient energy system, accelerates and promotes advanced energy-saving and emission-reduction technologies and equipment, and realizes the green transformation of manufacturing methods. China's recycling technology level and innovation ability rank among the top in the world, and the clean production level of polyester has reached the international leading level. By promoting the green development of the chemical fiber industry and the construction of green ecological civilization, the industry is actively building Green Fiber brands.

The brave leading role navigates the new competitive advantage: The scale and benefit of China's chemical fiber industry have a good growth momentum. Chemical fiber manufacturing is being transformed to achieve flexibility, intelligence, customization and service, and resource integration is being transformed to realize cross-domain and network cooperation. Large chemical fiber enterprises continue to integrate with capital, extend upstream and downstream, and keep the leading role in the chemical fiber industry and world rankings. In 2020, three chemical fiber-related enterprises were listed among the world top 500 enterprises, seven chemical fiber-related enterprises entered the RMB100 billion club, and 16 chemical fiber-related enterprises were selected in the list of the top 500 Chinese enterprises.

性能图标

Performance Icon



弹性持久
Durable Elastic



均匀稳定
Good Stability



吸湿速干
Fast Dying



透气
Breathable



凉感
Cool feeling



吸湿发热
Absorbing Moisture
and Emitting Heat



亲肤
Skin Friendliness



柔软
Soft



蓬松
Fluffy



保暖
Heat Preservation



质量轻
Lightweight



婴儿级纺织品
infant textile products



抗蠕变
Creep Resistance



生物质
Biomass



循环再生
Recycling &
Regeneration



绿色环保
Green & Environmental
Protection



生物降解
Biodegradability



部分替代原生纤维
Virgin Fiber
Replacement



仿棉
Cotton-like



仿真
Imitated



光泽好
Good luster



抗皱
Anti-wrinkle



挺括
Structured



悬垂性好
Good Drapability



易打理
Ease-care



易加工
Easy Processability



易上染
Easy-dyable



色彩持久
Durable Color



原液着色
Dope dyed



色彩丰富
Enriched colors



染色鲜艳
Durable Color



耐磨
Wear Resistance



抗起球
Anti-pill



除臭
Deodorizing function



抑菌
Anti-bacteria



驱蚊
Mosquito repellent



防泼水
Water-repellent



耐洗涤
Washing-resistant



耐污
Stain-resistant



耐高温
Heat-resistant



隔热
Heat Insulation



温度调节
Warmth & Cooling



吸收光源
Absorption from
light source



防紫外线
Anti-UV



耐老化
Anti-aging



耐酸碱
Acid & Alkali Endurance



耐腐蚀
corrosion resistance



低熔点
Low melting-point



抗熔滴
Anti-drip



低烟
Low toxicity



防透视
Anti-perspective



远红外
Far infrared



耐化学药品
Chemical resistance



无重金属析出
No Heavy Metal



电绝缘
Electric insulation



高耐(电)压
High (Electricity)
Pressure Resistant



抗静电
Anti-static



阻燃
Flame Retardant



可塑性好
Plastic



密度小
low-density



单丝纤度
Fineness monofilament



纤度细
Small fineness



异形截面
Specially
Shaped Section



高强度
High-strength



高模量
High Modulus



抗冲击性
Impact-resistance



耐高低温
High and Low
Temperature
Resistant



高伸长
High Stretch



抗拉强度高
High Tensile Strength



低应力
Low Stress



低模量
Low Modulus



分散性好
Dispersion



可追溯性
Traceability



效率高
High productive
efficiency



使用寿命长
Long service life

中国纤维流行趋势
CHINA FIBERS FASHION TRENDS

纤 / 溯绿源

FIBER

Tracing Back to Green Source

溯本清源，山青水碧。随着人们对自然环境、生态健康的关注，纤维制造从消耗资源环境到与环境和谐永续共存。如今，中国纤维采用可再生、可循环利用的原料，利用先进的纤维加工技术、生态绿色的产品理念，从纤维设计、节能工艺反哺环境，全方位为消费者提供优质绿色产品和可持续环保的解决方案，构筑绿色产业链，打造生态时尚新业态。

The most essential and environmental development relies on the green source from nature. With people's growing attention to the natural environment and ecological health, chemical fiber manufacturing has turned from consuming resources to coexisting in harmony with the environment. Nowadays, by implementing renewable and recyclable raw materials and adopting advanced fiber processing technology, as well as ecological and green product concepts, China's fiber industry feeds back the environment via fiber design and energy-saving technology and provides thoroughly consumers with high-quality green products and sustainable environmentally-friendly solutions, thus building a green industrial chain and creating a new form of the ecological trend in the industry.

生物基 化学纤维

BIO-BASED CHEMICAL FIBER

推荐理由

可再生的生物质资源为原料、先进的清洁生产技术，实现纤维的自然再生、品种再造，解决原料供应与环保问题，尽享人与自然的和谐共生。创建高光纯乳酸原料国产化基础，实现高品质聚乳酸纤维的华丽转身；开发以竹为原料的新型莱赛尔品种；拓展莱赛尔在卫材领域的定制化应用。突破生物基聚酰胺 56 纤维细旦化技术，成就高品质生物基锦纶的精致印象。

Recommendation Reasons

Renewable raw materials and advanced clean production technology are adopted to realize the natural regeneration of fibers as well as their varieties, solve the problems of raw material supply and environmental protection, and enjoy the harmonious coexistence between man and nature. Efforts should be made to create the basis for the localization of high-gloss pure lactic acid raw materials, realize the gorgeous transformation of high-quality polylactic acid fibers, develop new varieties of lyocell using bamboo as raw materials and expand the customized application of lyocell in the field of sanitary materials. A breakthrough in the fine-denier technology of the bio-based polyamide 56 fiber will create a refined impression of high-quality bio-based nylon.

推荐品种

- 聚乳酸纤维 | 品牌：丰原绒
- 卫材专用莱赛尔纤维 | 品牌：元丝
- 竹莱赛尔纤维 | 品牌：绿纤
- 细旦生物基聚酰胺 56 纤维 | 品牌：泰纶

Specific Variety

- Polylactic Acid Fiber | Brand: BBKA GROUP
- Lyocell Fiber for Sanitary Materials | Brand: ORICELL
- Bamboo Lyocell Fiber | Brand: GRECELL
- Fine-denier Bio-based Polyamide-56 Fiber | Brand: TERRYLL

聚乳酸纤维

Polylactic Acid Fiber

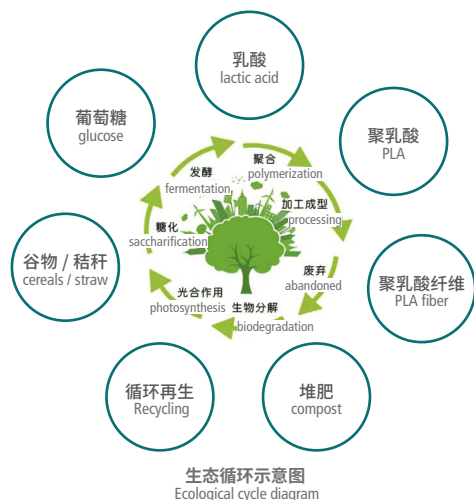
制备技术

Processing Technology

将玉米、木薯、高粱等农作物中提取出淀粉，再经淀粉酶水解制成葡萄糖；或从秸秆中提取纤维素和半纤维素，再通过物理和化学方法转化成葡萄糖。葡萄糖经发酵生成乳酸，乳酸脱水制得丙交酯，再经开环聚合制成聚乳酸，经熔融纺丝工艺制得聚乳酸纤维。

Glucose is produced by hydrolyzing starch extracted from crops such as corn, cassava, sweet potato and sorghum with amylase, or converting cellulose and hemicellulose extracted from straw in physical and chemical methods.

It is then fermented to produce lactic acid, and lactic acid is concentrated to produce lactide, which is used to produce polylactic acid through ring-opening polymerization, and finally polylactic acid is used to produce polylactic acid fiber through the melt spinning process.



丰原绒
BBCA GROUP

推荐理由

基于可再生的生物质原料打造可降解的生物基纤维，打破国外封锁，实现玉米、秸秆等农作物到乳酸、丙交酯再到聚乳酸纤维的生产过程。

Recommendation Reasons

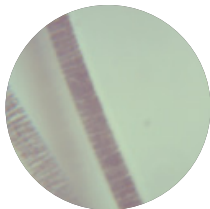
The technology creates degradable bio-based fibers based on renewable raw materials, breaks overseas blockade, and realizes the production process of corn and other crops to lactic acid, lactide and to polylactic acid fibers.

纤维及制品特点

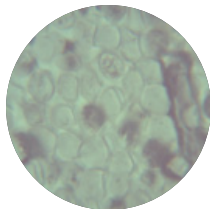
Characteristics of Fiber and Product



纤维原貌图
Fiber original appearance



纤维纵截面图
Fiber longitudinal section



纤维横截面图
Fiber cross section

主要规格

短纤：1.33 ~ 22.22dtex×51mm

中空和实芯，本色和有色。

长丝：83.33 ~ 333.33dtex/72 ~ 144F

本色和有色

Main Specifications

Staple fiber: 1.33~22.22dtex×51

mmhollow and solid core,Uncolored and colored.

Filaments: 83.33~33.33dtex/72~144F

Uncolored and colored

标准及认证

《聚乳酸短纤维》(FZ/T 52041-2015)

《聚乳酸牵伸丝》(FZ/T 54098-2017)

《可水洗聚乳酸纤维 / 棉复合絮片》
(T/CTCA 11-2020)

Standards and Certifications

“Polylactic acid staple fiber”(FZ/T 52041-2015)

“Polylactic acid drawn yarn”(FZ/T 54098-2017)

“Washable polylactic acid fiber/cotton
composite wadding”(T/CTCA 11-2020)

纤维性能与制品特点



- 生物基原料，绿色环保
- 亲肤、保暖、透气、回潮率低
- 具有良好的生物相容性，可生物降解
- 抑菌、抗螨、抗过敏；
- 本质阻燃、燃烧无黑烟

Fiber Performance and Product Features

- bio-based materials,Green and environment-friendly
- Skin-friendly, warm, breathable, low moisture regain
- Good biocompatibility, biodegradable
- Bacteriostatic, anti-mite, anti-allergic; intrinsically flame-resistant, burning without black smoke

产品规格 Specification	干断裂强度 (cN/ dtex) Breaking tenacity in dry state(cN/dtex)	断裂伸长率 (%) Elongation at break(%)	沸水收缩率 (%) Boiling water shrinkage(%)
1.55dtex	3.5 ~ 5.5	25 ~ 40	2 ~ 5

极限氧指数 (%) Limiting oxygen index(%)	回潮率 (%) Moisture regain(%)	抗螨性 (%) Mite resistance(%)	抑菌性 Bacteria restraint
25 ~ 27	0.6	≥ 99	3A 级 AAA level

应用技术

Application Technology

- 纺纱：**可以纯纺，也可与其他纤维进行混纺
- 织造：**可纺成纱线，用于制作针织与梭织面料；也可用于生产水刺、针刺、热轧等无纺布
- 染整：**建议使用分散低温染料，染色温度和热定型温度≤ 115℃

Spinning: Pure spinning or blend spinning with other fibers is available.

Weaving: The fiber can be spun into yarns for making knitted and woven fabrics; it can also be used to produce spun-laced, needle punch, hot rolled and other non-woven fabrics

Dyeing and finishing: It is recommended to use disperse low-temperature dyes, and dyeing temperature and heat setting temperature should be less than or equal to 115℃

纤维应用

Fiber Application

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	运动服 sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
✓	✓		✓	✓				
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
✓		✓						
羽绒服 Down jacket	高端成衣 High-end ready-to-wear	帽子 Cap	专业运动服 Professional sportswear					
	✓							
家用纺织品 Home textiles								
床上用品 Bedding	窗帘 Curtain	地毯 Carpet	沙发布 Sofa fabric	填充物 Filler	毛巾 Towel	玩具 Toys		
✓	✓	✓		✓				
产业用纺织品 Industrial textiles								
汽车内饰 Automotive interior	电池隔膜 Battery separator	体育用品 Sporting goods	医用纺织品 Filtration products	卫生纺织品 Sanitary textiles	军用纺织品 Military textiles	特种纸 Special papers	清洁用品 Cleaning supplies	过滤产品 Filtration products
✓			✓	✓			✓	✓
消防用品 Fire Supplies	航空航天 Aerospace	户外用品 Outdoor products	建筑增强 Building enhancement	面膜 Masks	口罩 Gauze mask	缆绳 Cable	织带 TAPS	发动机壳体 Motor case
无人机 UAV								



Q&A

Q：聚乳酸纤维在医用领域的应用，你了解吗？

A：由于聚乳酸纤维生物相容性良好，可完全生物降解，在医疗领域有着广泛的应用前景。如聚乳酸手术缝合线有较强的抗张强度，能有效控制聚合物的降解速率，随着伤口的愈合，缝合线自动缓慢降解消失。此外，聚乳酸纤维还可应用于牙科材料、眼科植入材料、药用控制系统、人造皮肤、人造组织工程支架材料等医药学领域。

Q: Do you know the application of polylactic acid fiber in the medical field?

A: Because the polylactic acid fiber has good biocompatibility and can be biodegraded and absorbed, it has broad application prospects in the medical field. For example, the polylactic acid surgical suture has strong tensile strength, which can effectively control the degradation rate of the polymer. As the wound heals, the suture will automatically slowly degrade and disappear. In addition, the polylactic acid fiber can also be used for various medical purposes such as making dental materials, ophthalmic implant materials, medicinal control systems, artificial skin and artificial tissue engineering scaffold materials.

Q：聚乳酸纤维在无纺领域的应用，你了解吗？

A：利用单组份纤维或双组份复合纤维（高、低熔点的聚乳酸复合），纯纺或与其他纤维混纺，制作水刺、针刺、热风 and 热轧无纺布，用于纸尿裤、卫生巾、护理垫、医用敷料、面膜、湿巾、干湿巾和过滤材料等产品。

Q: Do you know the application of polylactic acid fiber in the field of non-woven fabrics?

A: The single-component fiber or bicomponent composite fiber (polylactic acid composite material with high or low melting point) are used to perform pure spinning or blend spinning with other fibers to makespun-laced, needle punch, hot air and hot rolled non-woven fabrics for diapers, sanitary napkins, nursing pads, medical dressings, facial masks, wet wipes, dry wipes and filter materials.



元丝
ORICELL

元丝
ORICELL

卫材专用莱赛尔纤维

Lyocell Fiber for Sanitary Materials

制备技术

Processing Technology

将再生纤维素溶解于 NMMO/ 水溶剂体系中，制成再生纤维素溶液，经干喷湿法纺丝制备莱赛尔纤维，短切至特定的长度规格。

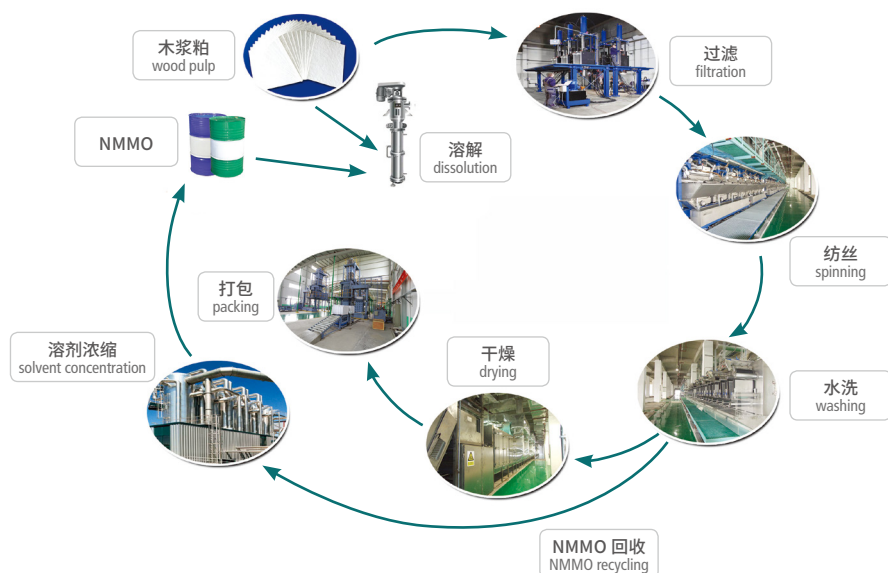
Dissolve regenerated cellulose pulp in the solvent of NMMO/water to make a regenerated cellulose solution, then lyocell fibers are produced through the dry-jet wet-spinning process, and the fibers are chopped to specific length.

推荐理由

绿色原料、绿色溶剂、绿色工艺制备的全绿色生物基纤维，实现在卫材领域的应用拓展。

Recommendation Reasons

100% bio-based fibers prepared with green raw materials, green solvents, and green processes have realized the application expansion in the field of sanitary materials.



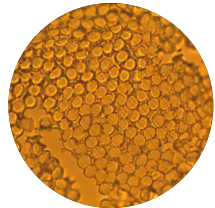
流程示意图
Flow Chart of Preparation

纤维及制品特点

Characteristics of Fiber and Product



纤维原貌图
Fiber original appearance



纤维横截面图
Fiber cross section

主要规格

短纤：1.0 ~ 6.0dtex×12 ~ 20mm

Main Specifications

Staple fiber: 1.0~6.0dtex×12~20mm

标准及认证

《莱赛尔短纤维》(FZ/T 52019-2018)
通过 Oeko-Tex 认证、绿色纤维认证

Standards and Certifications

“Lyocell staple fibers” (FZ/T 52019-2018)
Passed Oeko-Tex certification and green fiber certification

纤维性能与制品特点



- 生物可降解，绿色环保
- 力学性能优异，干、湿强度高、干湿强相差小，后加工适应性强
- 无纺制品吸湿透气，具有良好的可冲散性能
- 织物手感柔软、可染性好、易上色，耐水洗

Fiber Performance and Product Features

- Biodegradable, green and environment-friendly
- Excellent mechanical property, high strength in dry and wet conditions, small difference between strength in dry and wet condition, strong post-processing adaptability
- Non-woven products are moisture-absorbing and breathable, with good flushability
- The fabric feels soft, has good dyeability, and is easy to color and washable

产品规格 Specification	干断裂强度 (cN/dtex) Breaking tenacity in dry state (cN/dtex)	湿断裂强度 (cN/dtex) Breaking tenacity in wet state (cN/dtex)	干态断裂伸长率 (%) Dry elongation(%)	湿模量 (cN/dtex/5%) Wet modulus(cN/dtex/5%)	白度 (%) Whiteness(%)
1.0dtex×12mm	≥ 3.80	≥ 3.50	≥ 14.00	≥ 1.05	≥ 75



应用技术

Application Technology

可冲散制品：可选用线密度 1.0 ～ 3.0dtex 短切纤维

医用辅料：可选用线密度 1.0 ～ 3.0dtex 短切纤维，30% 短切纤维与壳聚糖纤维、海藻纤维混合

填充材料：可选用 30 ～ 50% 比例的短切纤维与其他纤维混纺

软家具基材：可选用 3.0 ～ 6.0dtex 短切纤维

Flushable products: Chopped fibers with a linear density of 1.0 to 3.0dtex can be used.

Medical dressings: Chopped fibers with a linear density of 1.0 to 3.0dtex can be used, 30% chopped fibers are mixed with chitosan fibers and seaweed fibers.

Filling materials: 30-50% chopped fibers can be used to blend with other fibers.

Soft furniture substrates: Chopped fiber with a linear density of 3.0 to 6.0dtex can be used.

纤维应用

Fiber Application

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	运动服 sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
✓			✓			✓		
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
✓						✓		
羽绒服 Down jacket	高端成衣 High-end ready-to-wear	帽子 Cap	专业运动服 Professional sportswear					
✓								
家用纺织品 Home textiles								
床上用品 Bedding	窗帘 Curtain	地毯 Carpet	沙发布 Sofa fabric	填充物 Filler	毛巾 Towel	玩具 Toys		
✓		✓		✓				
产业用纺织品 Industrial textiles								
汽车内饰 Automotive interior	电池隔膜 Battery separator	体育用品 Sporting goods	医用纺织品 Filtration products	卫生纺织品 Sanitary textiles	军用纺织品 Military textiles	特种纸 Special papers	清洁用品 Cleaning supplies	过滤产品 Filtration products
	✓		✓	✓			✓	
消防用品 Fire Supplies	航空航天 Aerospace	户外用品 Outdoor products	建筑增强 Building enhancement	面膜 Masks	口罩 Gauze mask	缆绳 Cable	织带 TAPS	发动机壳体 Motor case
				✓				
无人机 UAV								



Q&A

Q：可冲散制品对纤维有什么要求？有哪些优点？

A：可冲散制品，顾名思义，是指可以直接用水冲散的制品，主要应用包括成人厕用纸巾、婴幼儿卫生用湿巾及女性湿巾等。纤维超过一定规格就会造成堵塞，为了满足可冲散性能，纤维的尺寸要短；其次，可在自然环境中生物降解，不对环境造成压力。采用卫材专用莱赛尔纤维生产的可冲散无纺制品，纤维具有良好的抗拉强度，冲洗废弃时迅速分解，能够为人们的工作、生活带来便利。

Q: What are the requirements for fibers in terms of flushable products? What are the advantages?

A: Flushable products, just as the name implies, refer to products that can be directly flushed with water. Main applications of such products include adult toilet paper wipes, infant sanitary wipes and female wipes. If the fiber is longer than a certain length, it will cause blockage. In order to be flushable, the length of the fiber should be short; secondly, the fiber should be biodegradable in the natural environment without causing pressure on the environment. Flushable non-woven products produced with lyocell fiber special for sanitary materials, whose fiber has good tensile strength and can be quickly decomposes when washed and discarded, can bring convenience to people's work and life.



绿纤
GRECELL

推荐理由

以天然竹材为原料，制备竹材莱赛尔纤维。纤维力学性能优异，生产工艺绿色环保，对环境与人体友好。

Recommendation Reasons

Natural bamboo pulp is used as the raw material to prepare bamboo lyocell fiber. The fiber has excellent mechanical property with green and environment-friendly production process, which is harmless to the environment and the human body.

竹莱赛尔纤维

Bamboo Lyocell Fiber

制备技术

Processing Technology

以天然竹材为原料，以 NMMO 为纺丝溶剂，通过干喷湿法纺丝制备纤维素纤维。

Natural bamboo pulp as the raw material and NMMO as the spinning solvent are used to prepare cellulose fibers through the dry-jet wet-spinning process.



纤维及制品特点

Characteristics of Fiber and Product

主要规格

短纤：1.3dtex×38mm

Main Specifications

Staple fiber: 1.3dtex×38mm



纤维原貌图
Fiber original appearance

产品规格 Specification	干断裂强度 (cN/dtex) Breaking tenacity in dry state (cN/dtex)	湿断裂强度 (cN/dtex) Breaking tenacity in wet state (cN/dtex)	湿断裂伸长率 (%) Wet elongation (%)	回潮率 (%) Moisture regain(%)	抑菌率 (%) bacteriostasis rate(%)
竹浆莱赛尔 Bamboo pulp lyocell	> 40	> 35	14-19	11-15	> 99
普通莱赛尔 Ordinary lyocell	> 36	> 30	14-18	9-13	> 70

标准及认证

《莱赛尔短纤维》(FZ/T 52019-2018)

获得 Oeko-tex standard 100、DIN CERTCO 等认证

Standards and Certifications

"Lyocell staple fibers" (FZ/T 52019-2018)

Obtained Oeko-tex standard 100, DIN CERTCO and other certifications

纤维性能与制品特点



- 生物质、生产过程绿色环保
- 干、湿强度高，吸湿透气，亲和舒适
- 天然抑菌
- 纤维含有微量叶绿素铜钠，具备天然紫外线吸收能力
- 抗纤维化性能较好，在外力作用下不易起毛起球
- 织物抗拉伸和抗压缩性较好，蓬松、柔软、滑爽、服用飘逸性和动态垂悬性好

Fiber Performance and Product Features

- Biomass, green and environment-friendly production process
- High dry strength and wet strength, moisture absorbing and breathable, friendly and comfortable
- Naturally antibacterial
- The fiber contains traces of sodium copper chlorophyllin, which has natural UV absorption capacity
- With good anti-fibrillation, the fabric is not easy to be fuzzing and pilling under external force
- The fabric has good tensile and compression resistance, and is fluffy, soft, smooth, offering products elegant flow and good dynamic drapability

应用技术

Application Technology

纺纱：可以和棉、麻、毛、涤纶等纤维混纺使用

Spinning: The fiber can be blended with cotton, linen, fur, polyester and other fibers.

纤维应用

Fiber Application

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	运动服 sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
✓						✓		
羽绒服 Down jacket	高端成衣 High-end ready-to-wear	帽子 Cap	专业运动服 Professional sportswear					
产业用纺织品 Industrial textiles								
汽车内饰 Automotive interior	电池隔膜 Battery separator	体育用品 Sporting goods	医用纺织品 Filtration products	卫生纺织品 Sanitary textiles	军用纺织品 Military textiles	特种纸 Special papers	清洁用品 Cleaning supplies	过滤产品 Filtration products
					✓			
消防用品 Fire Supplies	航空航天 Aerospace	户外用品 Outdoor products	建筑增强 Building enhancement	面膜 Masks	口罩 Gauze mask	缆绳 Cable	织带 TAPS	发动机壳体 Motor case
				✓				
无人机 UAV								

Q&A

Q：竹莱赛尔与竹再生纤维素纤维的工艺区别是什么？

A：顾名思义，竹再生纤维素纤维是采用传统的粘胶法工艺，而竹莱赛尔纤维是采用NMMO物理溶解，溶剂安全，最大程度保留了纤维素的天然特性，生产过程没有有害物质与废弃物排放，实现了再生纤维素纤维的清洁生产。

Q: What is the difference in process between bamboo lyocell and bamboo viscose fiber?

A: As the name suggests, bamboo viscose fiber uses traditional viscose process, while bamboo lyocell fiber is physically dissolved with NMMO solvent, the natural characteristics of cellulose are retained to the greatest extent, and no harmful substances and waste are discharged during the production process, thereby realizing the clean production of regenerated cellulose fibers.

Q：竹莱赛尔纤维的价格是否要高于木浆莱赛尔纤维？

A：目前竹莱赛尔的定位是更高端的纤维品种。但随着产能的增大，竹莱赛尔纤维的价格也会趋于平稳。

Q: Is the price of bamboo lyocell fiber higher than that of wood pulp lyocell fiber?

A: Currently, bamboo lyocell is positioned as a higher-end fiber. But with the increase in production capacity, the price of bamboo lyocell fiber will also stabilize.



泰纶
TERRYL

推荐理由

关键单体生物基戊二胺为我国自主知识产权产品，主要原料为生物质，不受石油供应影响，缓解国家能源紧缺问题。纤维细旦化，品质稳定性，提升了生物基聚酰胺纤维的精致印象。

Recommendation Reasons

The key monomer, bio-based pentane diamine is a product with independent intellectual property rights in China. Its main raw material is biomass, which is not affected by oil supply and can alleviate China's energy shortage. The fine-denier fiber with stable quality has enhanced the delicate impression of bio-based polyamide fibers.

细旦生物基聚酰胺 56 纤维

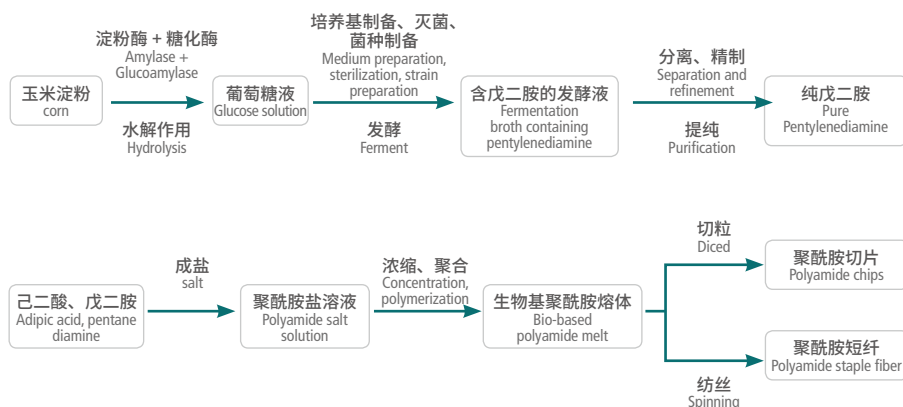
Fine-denier Bio-based Polyamide-56 Fiber

制备技术

Processing Technology

将玉米淀粉经酶水解制成葡萄糖，经生物技术转化成精戊二胺，控制聚合条件制备高品质生物基聚酰胺，经熔融纺丝制备细旦生物基聚酰胺 56 纤维

First, the glucose produced by the hydrolysis of corn with amylase is converted into refined pentamethylene diamine using biotechnology. Next, high-quality bio-based polyamide is prepared by controlling the polymerization conditions. Then, fine-denier bio-based polyamide 56 fibers are prepared through a melt spinning process.



制备流程图
Flow Chart of Preparation

纤维及制品特点

Characteristics of Fiber and Product

主要规格

长丝：44dtex/51F

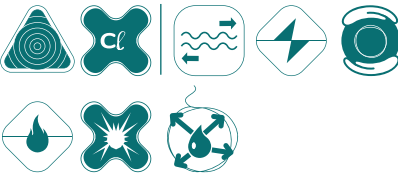
标准及认证

《锦纶工厂设计标准》（GB/T 50639-2019）

通过 ISO 9001、ISO 14001 认证

生物基聚酰胺 56 获得欧盟 DIN-Geprüft 认证

纤维性能与制品特点



- 低温易染，上色速度快，色牢度高，不易褪色
- 耐磨、抗静电、织物手感柔软
- 本质阻燃、抑菌、吸湿排汗

Fiber Performance and Product Features

- Easily dyed at low temperature, fast dyeing speed, high color fastness, not easy to fade
- Wear-resistant, anti-static, soft-feel fabric
- Intrinsically flame retardant, antibacterial, moisture wicking

产品规格 Specification	断裂强度 (cN/dtex) Breaking strength(cN/dtex)	断裂伸长率 (%) Elongation at break(%)	卷曲收缩率 (%) Crimp shrinkage rate(%)	卷曲稳定度 (%) Crimp stability(%)	沸水收缩率 (%) Boiling water shrinkage rate(%)
44dtex/51F	4.2	30.79	36.59	48.46	6.5

初始模量 (cN/dtex) Initial modulus(cN/dtex)	回潮率 (%) Moisture regain(%)	极限氧指数 (%) Limit oxygen index(%)	抑菌率 (%) Antibacterial rate(%)
35	5.0	> 26	99.5

应用技术

Application Technology

定型：定型温度为 80 ～ 130℃

织造：后纺加工速度 150 ～ 300m/min

Setting: The setting temperature should be 80~130℃ .

Weaving: The post-spinning processing speed should be 150~300m/min.



纤维原貌图
Fiber original appearance



纤维截面图
Fiber cross section

Main Specifications

Filaments: 44dtex/51F

Standards and Certifications

“Nylon Factory Design Standard” (GB/T 50639-2019)

Certified by ISO 9001 and ISO 14001

Bio-based polyamide 56 fiber has obtained EU DIN-Geprüft certification



纤维应用

Fiber Application

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	运动服 sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
✓	✓		✓				✓	
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
✓				✓				
羽绒服 Down jacket	高端成衣 High-end ready-to-wear	帽子 Cap	专业运动服 Professional sportswear					
✓	✓							
家用纺织品 Home textiles								
床上寝具 Bedding	窗帘 Curtain	地毯 Carpet	沙发布 Sofa fabric	填充物 Filler	毛巾 Towel	玩具 Toys		
		✓			✓			

Q&A

Q: 细旦生物基聚酰胺 56 纤维相较于传统聚酰胺 6 纤维、聚酰胺 66 纤维而言有什么优点?

A: 在基本性能如耐磨性等相当的情况下, 细旦生物基聚酰胺 56 纤维具有优良的阻燃性、吸湿排汗性、抗静电、低温易染、抑菌等特点。其关键单体生物基戊二胺是我国自主知识产权产品, 主要原料为生物质, 不受石油供应影响。

Q: What are the advantages of fine-denier bio-based polyamide 56 fiber compared with traditional polyamide 6 fiber and polyamide 66 fiber?

A: When the basic properties such as wear-resistance are roughly the same, the fine-denier bio-based polyamide 56 fiber has excellent flame retardance and moisture wicking ability, and it is antistatic, easy to dye at low temperature, and antibacterial. Its key monomer bio-based pentane diamine is a product with independent intellectual property rights in in China and its main raw material is biomass which is not affected by oil supply.

循环再利用 化学纤维

REGENERATED CHEMICAL FIBER

推荐理由

以废旧纺织品、废旧聚酯瓶、废丝为原料，物理法、化学法技术全覆盖，助力再生资源重获新生。循环再利用化学纤维品质媲美原生、品质稳定的同时，更可实现高透气、超高弹等功能，助力纤维高值化发展，创新诠释循环再利用化学纤维无限可能。

Recommendation Reasons

Recycled chemical fiber uses waste textiles, waste polyester bottles and waste yarns as raw materials, and the physical and chemical methods are fully applied to help renewable resources regain a new life. While the recycled chemical fiber has stable quality, which is comparable to that of virgin fiber, it can also achieve high breathability and ultra-high elasticity, thereby facilitating the high-value development of fibers, and innovatively interpreting the unlimited possibilities of recycled chemical fibers.

推荐品种

- 高透气性循环再利用聚酯纤维 | 品牌：桐昆
- 弹性循环再利用聚酯纤维 | 品牌：Green Circle
- 循环再利用聚酰胺 6 纤维 | 品牌：中纤

Specific Variety

- High Permeability Regenerated PET Fiber | Brand: GOODEN COCK
- Elasticity Regenerated PET Fiber | Brand: Green Circle
- Regenerated Polyamide-6 Fiber | Brand: Sinofiber



桐昆
GOODEN COCK

推荐理由

符合绿色发展理念，丰富了循环再利用纤维差别化品种，拓展了应用领域和市场空间。

Recommendation Reasons

The fiber conforms to the concept of green development, enriches the differentiated varieties of recycled fibers, and expands the application field and market space.

高透气性循环再利用聚酯纤维

High Permeability Regenerated PET Fiber

制备技术

Processing Technology

以再生聚酯切片为原料，经过干燥、预结晶，采用“十字型”喷丝板，通过熔融纺丝工艺后卷绕成型。

Regenerated polyester chips, used as raw materials, are first dried and pre-crystallized and then wound into shape through the melt spinning process and application of a “cross-shaped” spinneret to produce the fiber.



制备流程图
Flow Chart of Preparation

纤维及制品特点

Characteristics of Fiber and Product

主要规格

长丝：180dtex/144F (POY)

标准及认证

《涤纶预取向丝》(FZ/T 54003-2012)

通过 GRS 标准认证

Main Specifications

Filaments: 180dtex/144F(POY)

Standards and Certifications

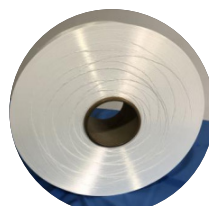
"Polyester pre-oriented yarn" (FZ/T 54003-2012)

Passed GRS standard certification

纤维性能与制品特点



- 绿色环保、品质接近原生
- 十字型截面、纤维内部稳定、蓬松
- 低旦多孔、吸湿排汗、透气性好



纤维原貌图
Fiber original appearance



纤维横截面图
Fiber cross section

Fiber Performance and Product Features

- Green and environment-friendly, quality close to virgin fiber
- Cross-shaped cross-section, fiber internally stable and fluffy
- Low denier porous, moisture wicking, good breathability

产品规格 Specification	断裂强度 (cN/dtex) Breaking tenacity (cN/dtex)	断裂伸长率 (%) Elongation at break (%)
180dtex/144F	≥ 2.50	135 ± 5.0
条干不匀率 CV 值 (%) CV value of yarn unevenness (%)	含油率 (%) Oil content (%)	热应率 Heat response rate
≤ 1.50	0.4 ± 0.05	60 ± 5

应用技术

Application Technology

加弹：再生 POY 伸长偏长 10% 左右，要增加 DTY 的拉伸倍数，加弹速度应适当下降。

Texturing: Regenerated POY stretches about 10% longer. To increase the stretching ratio of DTY, the texturing speed should be appropriately reduced.



纤维应用

Fiber Application

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	运动服 sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
	✓							
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
			✓					
羽绒服 Down jacket	高端成衣 High-end ready-to-wear	帽子 Cap	专业运动服 Professional sportswear					

Q&A

Q: 高透气性循环再利用聚酯纤维研发的意义，与其他再生产品相比有何优势？

A: 废旧聚酯回收、加工的再生聚酯切片，大大减少了固废的排放，同时实现了资源再利用，符合循环经济的发展趋势。高透气性循环再利用聚酯纤维与传统聚酯纤维相比，通过纤维截面设计提升了透气性，能够使消费者得到更好的穿着体验，其纤维制品主要用于生产运动服装、家居服等。

Q: What is the significance of the research and development on recycled polyester fiber with high breathability compared with other regenerated products?

A: The regenerated polyester chips recycled and processed from waste polyester plastics have greatly reduced the discharge of solid waste, and at the same time have realized the reuse of resources, which is in line with the development trend of circular economy. Compared with traditional polyester fibers, recycled polyester fiber with high breathability has improved breathability through designing fiber cross-sections, which enables consumers to get a better wearing experience. The fiber products are mainly used for producing sportswear, loungewear, etc.

弹性循环再利用聚酯纤维

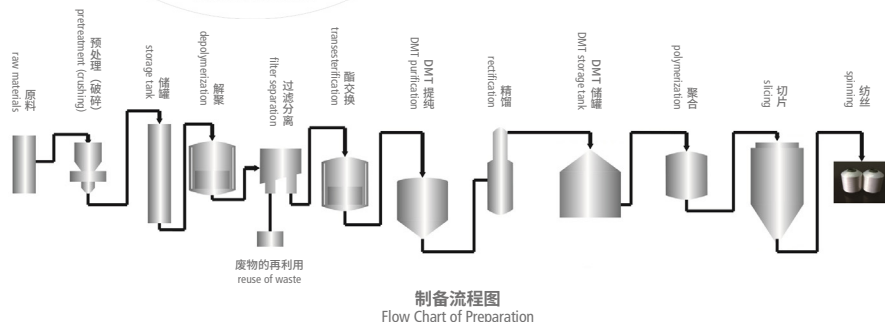
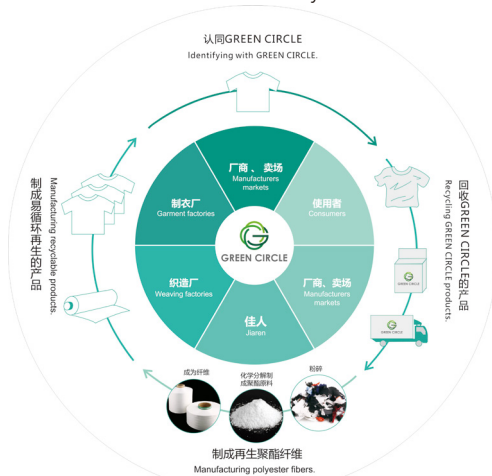
Elasticity Regenerated PET Fiber

制备技术

Processing Technology

以废旧纺织品为原料，利用先进的化学法循环再生技术，经熔融纺丝工艺制备，再通过调整后处理工序的工艺参数，赋予纤维优良的弹性性能。

Recycled polyester fiber uses waste textiles as raw materials, and is prepared by adopting advanced chemical recycling and regeneration technology through the melt spinning process, and then by adjusting the process parameters of the post-treatment process, the recycled polyester fiber is endowed with excellent elasticity.



Green Circle
Green Circle

推荐理由

绿色环保，实现纤维—纤维的闭环循环。化学法循环再生技术缔造更多可能，实现循环再利用聚酯纤维的差别化及高值化开发。

Recommendation Reasons

Going green and environmental protection is conducive to realizing the fiber-fiber closed loop cycle. The chemical recycling and regeneration technology creates more possibilities and realizes differentiated and high-value development of recycled polyester fibers.

纤维及制品特点

Characteristics of Fiber and Product

主要规格

长丝：82.5dtex/72F (DTY)

标准及认证

《再生涤纶牵伸丝》(FZ/T 54048-2012)

通过 Oeko-Tex 认证



纤维原貌图
Fiber in original appearance

Main Specifications

Filaments: 82.5dtex/72F (DTY)

Standards and Certifications

“Recycled polyester drawn yarn” (FZ/T 54048-2012)

Passed Oeko-Tex certification

纤维性能与制品特点



- 化学法循环再生，实现资源再利用
- 高弹性、卷曲收缩率高
- 产品品质稳定，接近原生纤维

Fiber Performance and Product Features

- Chemical recycling and regeneration method to realize the reuse of resources
- High elasticity, high crimp shrinkage rate
- Product quality is stable and close to virgin fiber

产品规格 Specification	断裂强度 (cN/dtex) Breaking tenacity(cN/dtex)	断裂伸长率 (%) Elongation at break(%)	含油率 (%) Oil content(%)	网络度 (t/m) Degree of intertwining(t/m)
82.5dtex/72F	3.66	6.16	2.47	180.78
网络牢度 (%) Intertwining fastness(%)	卷曲收缩率 (%) Crimp shrinkage(%)	卷曲稳定度 (%) Crimp stability(%)	沸水收缩率 (%) Boiling water shrinkage(%)	染色等级 (级) Dyeing grade(Grade)
85.37	28.18	79.63	2.69	4.5



应用技术

Application Technology

参照常规聚酯纤维

Refer to conventional polyester fibers(for parameters in the table)



纤维应用

Fiber Application

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	运动服 sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
✓	✓							
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
羽绒服 Down jacket	高端成衣 High-end ready-to-wear	帽子 Cap	专业运动服 Professional sportswear					

Q&A

Q: 化学法循环再利用技术的特点是什么？

A：化学法循环再利用技术，以废旧纺织品为原料，通过彻底的化学分解还原成聚酯原料，重新制成新的具有高品质、多功能、可永久循环的聚酯纤维。其最大特点是能够在确保高品质的前提下进行聚酯产品的不断循环再生，从而实现从纺织品到纺织品的完全闭合循环。相比传统以石油为原料的生产工艺，该工艺可降低 CO₂ 排放量的 52%，能源消耗量减少 39%。

Q: What are the characteristics of the chemical recycling and regeneration technology?

A: The chemical recycling and regeneration technology uses waste textiles as raw materials, which are reduced into polyester raw materials through thorough chemical decomposition, and then these polyester raw materials are reproduced into new polyester fibers with high-quality, multifunction, and permanent recyclability. Its biggest characteristic is the continuous recycling of polyester products under the premise of ensuring high quality, so as to achieve a completely closed cycle from textiles to textiles. Compared with the traditional production process using petroleum as the raw material, this process can reduce CO₂ emission by 52% and energy consumption by 39%.



中纤
Sinofiber

推荐理由

变废为宝，将纺织前道废弃物回收并转化为聚酰胺 6 纤维，纤维品质媲美原生。

Recommendation Reasons

Through turning waste into treasure, textile waste is recycled and converted into polyamide 6 fiber, whose fiber quality is comparable to virgin fiber.

循环再利用聚酰胺 6 纤维

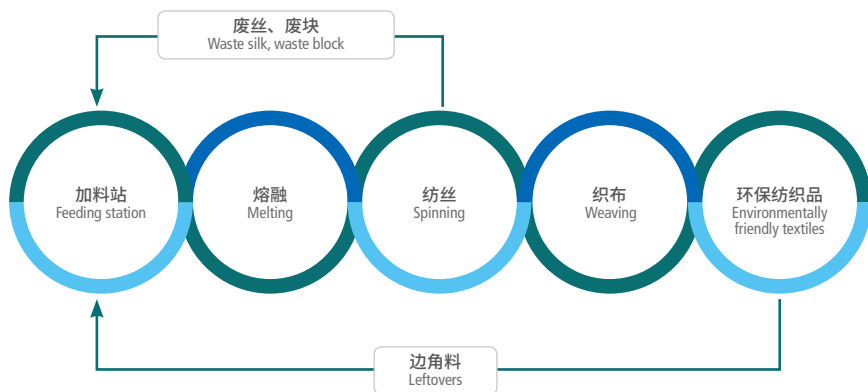
Regenerated Polyamide-6 Fiber

制备技术

Processing Technology

纺丝或织造过程中的产生的废丝、废料块、边角料，通过物理法再生技术，经破碎、熔融、过滤、冷却、切粒、干燥得到再生切片，经熔融纺丝制备。

The waste yarns, scrap pieces, and leftover materials generated in the spinning or weaving process are broken, melted, filtered, cooled, pelletized, and dried to obtain regenerated chips through physical regeneration technology, which are used to prepare recycled polyamide 6 fiber through the melt spinning process.



制备流程图
Flow Chart of Preparation

纤维及制品特点

Characteristics of Fiber and Product

主要规格

短纤：1.33dtex×38mm、1.67dtex×38mm、
3.33dtex×38～88mm

标准及认证

《锦纶短纤维》（FZ/T 52002-2012）
通过 GRS 标准认证

纤维性能与制品特点



- 物理法再生，减轻环保压力
- 强度高、耐磨性好
- 产品稳定性高

产品规格 Specification	断裂强度 (cN/dtex) Breaking tenacity(cN/dtex)	断裂强度 CV 值 (%) CV value of breaking strength(%)
1.33dtex×38mm	6.01	15.2
断裂伸长率 (%) Elongation at break(%)	断裂伸长 CV (%) CV value of elongation at break(%)	体积比电阻 (Ω•cm) Volume resistivity(Ω•cm)
51.81	19.3	10 ⁸

应用技术

Application Technology

纺纱：与其他短纤维均可混纺，可根据客户需求定制。

织造：高比例的锦纶混纺纱会有弹性，需考虑纱线抱合力带来的强力变化，针对性下达工艺。

染整：纤维缩率较其他纤维大 6%～12%，同时可染色的染料种类多，混纺纱线或面料染色时需要避免沾色现象。

Spinning: The fiber can be blended with other staple fibers and can be customized according to customer requirements.

Weaving: blended yarns with a high proportion of nylon will be elastic, so it is necessary to consider strength changes brought about by the cohesive force of yarns, and adopt specific process.

Dyeing and finishing: The fiber shrinkage rate is 6%-12% higher than that of other fibers. At the same time, there are many types of dyes applicable. When dyeing blended yarns or fabrics, it is necessary to avoid staining.



纤维原貌图
Fiber original appearance

Main Specifications

Staple fiber: 1.33dtex×38mm, 1.67dtex×38mm, 3.33dtex×38~88mmY

Standards and Certifications

“Nylon staple fiber” (FZ/T 52002-2012)
Passed GRS Standard Certification

Fiber Performance and Product Features

- Physical regeneration method to reduce the pressure on environment
- High strength, good wear resistance
- High product stability

纤维应用

Fiber Application

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	运动服 sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
✓	✓						✓	✓
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
羽绒服 Down jacket	高端成衣 High-end ready-to-wear	帽子 Cap	专业运动服 Professional sportswear					
家用纺织品 Home textiles								
床上用品 Bedding	窗帘 Curtain	地毯 Carpet	沙发布 Sofa fabric	填充物 Filler	毛巾 Towel	玩具 Toys		
✓				✓				
产业用纺织品 Industrial textiles								
汽车内饰 Automotive interior	电池隔膜 Battery separator	体育用品 Sporting goods	医用纺织品 Filtration products	卫生纺织品 Sanitary textiles	军用纺织品 Military textiles	特种纸 Special papers	清洁用品 Cleaning supplies	过滤产品 Filtration products
✓								
消防用品 Fire Supplies	航空航天 Aerospace	户外用品 Outdoor products	建筑增强 Building enhancement	面膜 Masks	口罩 Gauze mask	缆绳 Cable	织带 TAPS	发动机壳体 Motor case
无人机 UAV								

Q&A

Q: 循环再利用聚酰胺 6 纤维的市场需求情况？

A：消费者对功能性纤维的认知提升、对环保的关注以及消费理念的转变，使得循环再利用聚酰胺 6 纤维在混纺纱线上的应用需求日益增多，未来市场前景很大。后期会对循环再利用纤维进行复合功能与差异化开发，让产品在服装、家纺等领域得到更多的应用。目前产品主要是外销。

Q: What is the market demand for recycled polyamide 6 fiber?

A: Consumers has increased their awareness of functional fibers, being concerned about environmental protection and changing their consumption concepts, which have led to an increasing demand for recycled polyamide 6 fibers in blended yarns and a promising market prospects in the future. In the future, the composite function and differentiated development of recycled fibers will be carried out, so that the products will be largely applied in the fields of clothing and home textiles. Currently, the recycled fiber products are mainly exported.

原液着色 化学纤维

DOPE-DYED CHEMICAL FIBER

推荐理由

采用先进的原液着色技术，赋予纤维色彩属性，打造纤维“天生丽质”，勾勒出千变万化的时尚个性，演绎充满活力的创趣风格。原液着色纤维减少后道印染环节，坚守了纺织产业链的绿色生态价值，创造了更优的经济效益。

Recommendation Reasons

The advanced dope dyeing technology is adopted to give fiber rich colors, create “natural beauty” of fiber, outline the ever-changing fashion, and interpret a vibrant and creative style. The dope-dyed fiber reduces subsequent processes of printing and dyeing and adheres to the green ecological value of the textile industry chain, thereby improving economic benefits.

推荐品种

- 原液着色细旦超黑聚酯纤维 | 品牌：桐昆
- 原液着色循环再利用空变聚酯纤维 | 品牌：百川
- 原液着色高耐日晒户外专用聚酯纤维 | 品牌：恒运
- 原液着色细旦聚丙烯纤维 | 品牌：蒙泰丝

Specific Variety

- Fine-Denier and Ultra Black Dope-Dyed PET Fiber | Brand: GOODEN COCK
- Dope-Dyed Regenerated Air Interlaced PET Fiber | Brand: Baichuan
- Dope-Dyed High UV-Resistant PET Fiber for Outdoors | Brand: Hengyun
- Dope Dyed Fine-denier PP Fiber | Brand: Moderns



桐昆
GOODEN COCK

推荐理由

攻克高浓度均匀添加，实现原液着色超黑与细旦异形相结合，减少后道印染过程，纤维外观鲜亮，手感柔软。

Recommendation Reasons

The dope-dyed fiber overcomes technical difficulties to achieve uniform dispersion of the high-concentration masterbatch, realizes the combination of the dope-dyed ultra-black fiber and the fine-denier special-shaped fiber, and reduces the subsequent processes of printing and dyeing, thereby creating the fiber with bright appearance and soft touch.

纤维及制品特点

Characteristics of Fiber and Product

主要规格

长丝：140dtex/144F（POY 特黑丝）

标准及认证

《有色涤纶预取向丝》（FZ/T54063-2012）
通过 ISO 9001、ISO 14001 认证

原液着色细旦超黑聚酯纤维

Fine-Denier and Ultra Black Dope-Dyed PET Fiber

制备技术

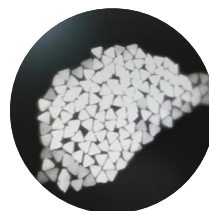
Processing Technology

通过在线添加结合动静态共混方式，将高浓度色母粒熔融注入聚酯熔体管道中，实现母粒均匀性分散，设计三角形细旦纤维用喷丝板，经熔融纺丝工艺制备。

Through on-line addition combined with dynamic and static blending methods, high-concentration color masterbatch is melted and injected into the polyester melt pipeline to achieve uniform dispersion of masterbatch. The spinneret is used to design triangular fine-denier fibers and they are used to prepare dope-dyed fibers through the melt spinning process.



纤维原貌图
Fiber in original appearance



纤维横截面图
Fiber in original appearance

Main Specifications

Filaments: 140dtex/144F (POY super-black yarn)

Standards and Certifications

“Colored polyester pre-oriented yarn”
(FZ/T54063-2012)

Passed ISO 9001, ISO 14001 certification



纤维性能与制品特点



- 色彩鲜亮、色牢度高
- 三角形截面，纤维手感滑爽，柔软亲肤

Fiber Performance and Product Features

- Bright color, high color fastness
- Triangular cross-section, the fiber feels smooth, soft and skin-friendly

产品规格 Specification	断裂强度 (cN/dtex) Breaking tenacity(cN/dtex)	断裂强度变异系数 CV (%) Breaking tenacity CV (%)	断裂伸长率 (%) Elongation at break(%)
140dtex/144F	2.24	2.40	138.8

断裂强度变异系数 CVb (%) Breaking tenacity CVb(%)	条干不匀率 CV (%) Unevenness CV(%)	含油率 (%) Oil content(%)	色泽均匀度 (级) Color uniformity	耐皂洗色牢度 (级) Color fastness to soaping
2.45	1.26	0.47	4.5	5.0

应用技术

Application Technology

加弹：在加弹过程中加入 20D 氨纶纤维，使氨纶与纤维混为一体形成有规律的网点，纤维既蓬松又具有弹力。

织造：适合喷水织机、圆机、大圆机。该纤维比较爽滑，建议织造机台速度提升至 630 米 / 秒，提高生产效率。

Texturing: The 20D spandex fiber is added during the next process of texturing to mix spandex and fiber to form regular grid nodes, thereby creating fluffy and elastic fibers.

Weaving: The dope-dyed fiber is suitable for water-jet looms, circular knitting machines and large circular knitting machines. The fiber feels relatively smooth, and it is recommended to increase the speed of the weaving machine to 630 m/s so as to improve production efficiency.

纤维应用

Fiber Application

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	运动服 sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
✓					✓			
羽绒服 Down jacket	高端成衣 High-end ready-to-wear	帽子 Cap	专业运动服 Professional sportswear					

Q&A

Q: 与常规纤维相比较，原液着色细旦超黑聚酯纤维有哪些优势？

A：对环境友好：原液着色所用着色剂不含禁用染料和有害成分，不会对人体造成伤害。纺丝过程不产生废渣，原料利用率为 100%；低能耗：每吨有色纤维的能耗约为 50KWh，比印染节能；无污染：原液着色技术避免了后道对纤维染色导致的环境污染。

Q: Compared with traditional fiber, what are the advantages of dope-dyed fine-denier ultra-black polyester fiber?

A: Environmentally-friendly: the colorant used for dope-dyeing does not contain forbidden structure and harmful components, and will not cause harm to human body. The spinning process does not produce waste residue, and the utilization rate of raw materials is 100%; low energy consumption: the coloring energy consumption per ton of colored fiber is about 50KWh, which is more energy-saving than printing and dyeing; pollution-free: the dope-dyed technology avoids the environmental pollution caused by dyeing fibers in following process.

Q: 原液着色细旦超黑聚酯纤维的制备特点是什么？

A：原液着色细旦超黑聚酯纤维的黑亮度比常规黑丝更高，生产工艺中对母粒熔点的温度要求更高，普通黑丝母粒熔点温度在 250℃，而该纤维的母粒熔点温度在 265℃。另经过工艺的再优化，纤维耐皂洗色牢度达到国家标准要求，后道使用中机器上未出现褪色现象，经过多次模拟洗涤未发现褪色情况，达到真正的零污染，实现超黑的价值。

Q: What are the preparation characteristics of dope-dyed fine-denier ultra-black polyester fiber?

A: The black brightness of dope-dyed fine-denier ultra-black polyester fiber is higher than that of traditional black yarn, and the production process has higher requirements to the melting point of masterbatch. The melting point of masterbatch of traditional black yarn is 250℃ , while that in this kind of fiber is 265℃ . In addition, after re-optimization of the process, the color fastness to soaping of the fiber meets the requirements of the national standard, and there is no color fading on the machine in the following process. After repeated simulated washing tests, no color fading is found, thus achieving the real zero pollution and the value of ultra-black fiber.



百川
Baichuan

原液着色循环再利用空变 聚酯纤维

Dope-Dyed Regenerated Air Interlaced PET Fiber

制备技术

Processing Technology

以 100% 废弃饮料瓶为原料，加入多色系的无机颜料，通过熔融共混，制备多色的原液着色循环再利用聚酯纤维。经过不同的超喂比，通过高压空气无序扰乱，实现特殊的外观风格和手感。

With 100% waste beverage bottles as raw materials, polychromatic inorganic pigments are added to prepare polychromatic dope-dyed recycling polyester fiber by melt blending. Special visual style and hand feeling are realized through different overfeeding ratios and disorderly disturbance of high-pressure air.

推荐理由

融合循环再利用 + 原液着色绿色工艺属性，迎合多色系、多风格、快反应的市场需求。

Recommendation Reasons

The green process attributes of recycling combined dope-dyeing meets the market demands for multi-color, multi-style and quick response .



制备流程图
Flow Chart of Preparation

纤维及制品特点

Characteristics of Fiber and Product

主要规格

长丝：333 ~ 2000dtex/96 ~ 576F

标准及认证

《再生有色涤纶低弹丝》(FZ/T 54096-2017)

通过 Oeko-100、GRS 认证

Main Specifications

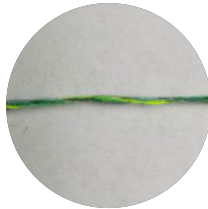
Filaments:333~2000dtex/96~576F

Standards and Certifications

"Spun-dyed recycled polyester drawn textured yarn"

(FZ/T 54096-2017)

Passed Oeko-100, GRS certification



纤维原貌图
Fiber in original appearance

纤维性能与制品特点



- 减少染整能耗、绿色环保
- 多色系、色彩丰富、色牢度高
- 仿毛、仿麻、仿棉效果
- 小批量、高品质、快反应

Fiber Performance and Product Features

- Reducing energy consumption of dyeing and finishing with the environmentally-friendly feature
- Polychromatic, diversified colors with high color fastness
- Emulation effects of hair, flax and cotton
- small batch, high quality, fast response

产品规格 Specification	断裂强度 (cN/dtex) Breaking tenacity(cN/dtex)	断裂强度 CV 值 Breaking tenacity CV	断裂伸长率 (%) Elongation at break(%)	断裂伸长率 CV 值 Elongation atbreak CV	色牢度 Color fastness
666dtex/144F	≥ 3.16	≤ 2.71	32.2	≤ 4.77	4 级 level 4



应用技术

Application Technology

后整理：定型温度建议控制在 180℃以内

After-finish: below 180℃ setting temperature is recommended



纤维应用

Fiber Application

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	运动服 sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	✓ 衬衣 Shirt	婚纱 Wedding dress	✓ 服装里料 Garment lining
羽绒服 Down jacket	高端成衣 High-end ready-to-wear	帽子 Cap	✓ 专业运动服 Professional sportswear					
		✓						
家用纺织品 Home textiles								
床上寝具 Bedding	窗帘 Curtain	地毯 Carpet	沙发布 Sofa fabric	填充物 Filler	毛巾 Towel	玩具 Toys		
	✓	✓	✓					
产业用纺织品 Industrial textiles								
汽车内饰 Automotive interior	电池隔膜 Battery separator	体育用品 Sporting goods	医用纺织品 Filtration products	卫生纺织品 Sanitary textiles	军用纺织品 Military textiles	特种纸 Special papers	清洁用品 Cleaning supplies	过滤产品 Filtration products
✓		✓			✓			
消防用品 Fire Supplies	航空航天 Aerospace	户外用品 Outdoor products	建筑增强 Building enhancement	面膜 Masks	口罩 Gauze mask	缆绳 Cable	织带 TAPS	发动机壳体 Motor case
		✓						
无人机 UAV								

Q&A

Q: 原液着色工艺生产的空变纱线，节能降耗方面的成效如何？

A：相比原生传统染色工艺，每生产 1 吨彩色空变纱，可减少水资源消耗 155t，减少二氧化碳排放 5.3t。

Q: What is the effect on energy saving and consumption reduction of air-jet textured yarn produced by dope-dyed process?

A: Compared with the original traditional dyeing process, the water consumption and carbon dioxide emission can be reduced by 155t and 5.3t respectively for each ton of colored air-jet textured yarn produced.



HENGYUN 恒运

恒运
Hengyun

推荐理由

原液着色聚酯纤维的功能性延伸。实现节能环保的同时赋予纤维良好的耐日晒、抗紫外等性能，为户外用品提供专属选择。

Recommendation Reasons

As the functional extension of dope-dyed polyester fiber, it can not only achieve energy saving and environmental protection, but also has good performances such as sunlight resistance and ultraviolet resistance, thus offering an exclusive choice for outdoor products.

原液着色高耐日晒户外专用 聚酯纤维

Dope-Dyed High UV-Resistant PET Fiber for Outdoors

制备技术

Processing Technology

将色母粒、抗紫外抗老化母粒采用共混改性技术添加到聚酯切片中，再通过熔融纺丝工艺制备，经卷绕成型、加弹等工艺形成低弹丝。

Color masterbatch and ultraviolet-resistant coupled with anti-aging masterbatch are blended into polyester chips, then low-stretch yarn is prepared by melt spinning process, winding molding, elasticizing and other processes.

纤维及制品特点

Characteristics of Fiber and Product

主要规格

长丝：82 ~ 165dtex/48 ~ 144F (DTY)

标准及认证

通过 GRS、ISO 9001 认证

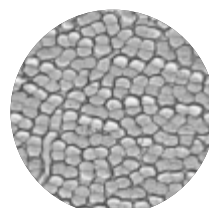
纤维性能与制品特点



- 色牢度高、色彩丰富
- 耐日晒、耐磨耐热
- 强度高、有弹性



纤维原貌图
Fiber original appearance



纤维横截面图
Fiber cross section

Main Specifications

Filaments: 82~165dtex/48~144F(DTY)

Standards and Certifications

Passed GRS, ISO 9001 certification

Fiber Performance and Product Features

- Diversified colors and color fastness
- Sunlight-fastness, wear-resisting and heat-resisting
- High elasticity and high strength

产品规格 Specification	断裂强度 (cN/dtex) Breaking tenacity(cN/dtex)	断裂强度 CV (%) Breaking TenacityCV(%)	断裂伸长率 (%) Elongation at break(%)	断裂伸长变异系数 (%) Variable coefficient of elongation at break (%)
82.5dtex/72F	3.14	2	17.2	2

卷曲收缩率 (%) Crimp shrinkage (%)	沸水收缩率 (%) Boiling water shrinkage (%)	染色均匀度 (%) Dyeing uniformity (%)	日晒色牢度 Sunlight color fastness	
10.8	2.71	4	600h, 4.5 级 600h,level 4.5	1200h, 4 级 1200h,level4



应用技术

Application Technology

后整理：水洗温度一般不超过 200℃
After-finish: The washing temperature is generally not above 200℃

纤维应用

Fiber Application

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	运动服 sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
羽绒服 Down jacket	高端成衣 High-end ready-to-wear	帽子 Cap	专业运动服 Professional sportswear	✓				

产业用纺织品 Industrial textiles								
汽车内饰 Automotive interior	电池隔膜 Battery separator	体育用品 Sporting goods	医用纺织品 Medical textiles	卫生纺织品 Sanitary textiles	军用纺织品 Military textiles	特种纸 Special papers	清洁用品 Cleaning supplies	过滤产品 Filter products
消防用品 Fire Supplies	航空航天 Aerospace	户外用品 Outdoor products	建筑增强 Building enhancement	面膜 Masks	口罩 Gauze mask	缆绳 Cable	织带 TAPS	发动机壳体 Motor case
无人机 UAV		✓						

Q&A

Q: 原液着色高耐日晒户外专用聚酯纤维具有哪些优势？
A：原液着色高耐日晒户外专用聚酯纤维日晒牢度强，色织不易褪色，相对于后道印染有成本优势，对人体防紫外线保护有显著的作用。应用于户外遮阳篷、遮阳伞、休闲椅、休闲沙发、靠垫、沙滩椅、箱包、手提包等。

Q: What are the advantages of dope-dyed high sunlight-resistant outdoor-dedicated polyester fiber?
A: The dope-dyed high sunlight-resistant outdoor-dedicated polyester fiber has the features such as high sunlightfastness , hard-to-fade in yarn-dyed textiles. , it showscost advantages compared with the following printing and dyeing.And it has a significant effect on protecting human body fromultraviolet rays. It is applied in outdoor awnings, umbrellas, leisure chairs, leisure sofas, cushions, beach chairs, bags, handbags, etc.



蒙泰丝
Moderns

推荐理由

采用原液着色技术，绿色环保。聚丙烯纤维单丝细度小，在提高手感舒适性的同时增强单向导湿的功能，应用于高端运动服。

Recommendation Reasons

The dope-dyed technology is green and environment-friendly. Small fineness of Polypropylene monofilament not only improves hand feeling but also enhances one-way moisture permeability function. It is applied in high-end sportswear.

主要规格

长丝：33dtex/48F

标准及认证

《丙纶弹力丝标准（纱线标准）》

(FZ/T 54009-2012)

通过 Oeko-Tex、ISO 9001 认证

纤维性能与制品特点



- 原液着色、色牢度高、绿色环保
- 单丝细度小，细度达到 0.68dtex
- 织物具有柔软、舒适、透气、导汗、导湿、快干的特点

原液着色细旦聚丙烯纤维

Dope Dyed Fine-denier PP Fiber

制备技术

Processing Technology

采用聚丙烯切片，结合原液着色技术，通过熔融纺丝工艺及调节喷丝孔径比，实现原液着色细旦聚丙烯纤维的制备。

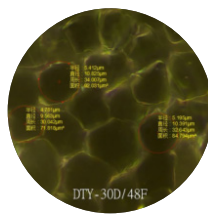
Combined with dope-dyed technology, dope-dyed fine-denier polypropylene fiber is prepared with polypropylene chips by melt spinning process and spinning aperture ratio adjustment.

纤维及制品特点

Characteristics of Fiber and Product



纤维原貌图
Fiber original appearance



纤维横截面图
Fiber cross section

Main Specifications

Filaments: 33dtex/48F

Standards and Certifications

"Polypropylene drawn textured yarns standard (yarn standard)" (FZ/T 54009-2012)

Passed Oeko-Tex, ISO 9001 certification

Fiber Performance and Product Features

- Dope-dyeing, high color fastness and environment protection
- Small monofilament fineness, reaching 0.68dtex
- Fabric with soft, comfortable, breathable, sweat-conducting, moisture-conducting, fast-drying characteristics

产品规格 Specification	断裂强度 (cN/dtex) Breaking tenacity(cN/dtex)	强度不匀率 CVb (%) Strength unevenness CV(%)	断裂伸长率 (%) Elongation at break(%)
33dtex/48F	≥ 4.7	≤ 4.55	34.4
断裂长度变异系数 CVb (%) Variable coefficient of elongation at break CV(%)	卷曲收缩率 (%) Crimp shrinkage (%)	色牢度 Color fastness	
≤ 5.15	10.8	> 4 级 > Level 4	

应用技术

Application Technology

定型：后定型温度不要超过 110℃

Shaping: the post-shaping temperature should not above110℃

纤维应用

Fiber Application

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	运动服 sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
✓	✓		✓					
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
羽绒服 Down jacket	高端成衣 High-end ready-to-wear	帽子 Cap	专业运动服 Professional sportswear					
产业用纺织品 Industrial textiles								
汽车内饰 Automotive interior	电池隔膜 Battery separator	体育用品 Sporting goods	医用纺织品 Medical textiles	卫生纺织品 Sanitary textiles	军用纺织品 Military textiles	特种纸 Special papers	清洁用品 Cleaning supplies	过滤产品 Filtration products
消防用品 Fire Supplies	航空航天 Aerospace	户外用品 Outdoor products	建筑增强 Building enhancement	面膜 Masks	口罩 Gauze mask	缆绳 Cable	织带 TAPS	发动机壳体 Motor case
		✓						
无人机 UAV								

Q&A

Q: 与普通聚丙烯纤维相比，原液着色细旦聚丙烯纤维的突出特点在哪里？

A：该纤维单丝细度达到 0.68dtex，接近超细旦水平，纺丝难度较大。原液着色技术解决了聚丙烯纤维后道难染色难题，赋予纤维时尚性，产品绿色环保。细旦聚丙烯纤维更容易和其他纤维交织，扩大了在高端运动服领域的应用。

Q: Compared with ordinary polypropylene fiber, what are the outstanding characteristics of dope-dyed fine-denier polypropylene fiber?

A: The monofilament fineness of the fiber reaches 0.68 dtex, which is close to ultra-fine denier, and it is difficult to spin. The dope-dyed technology solves the problem of difficult subsequent dyeing of polypropylene fiber, endows the fiber with fashion features, and environmental protection property. Fine-denier polypropylene fiber is easier to interweave with other fibers, which expands its application in the field of high-end sportswear.

中国纤维流行趋势
CHINA FIBERS FASHION TRENDS

纤/筑安心

FIBER

Building Consumer Confidence

屏障构筑，安全守护。中国纤维科技聚焦消费升级，不断超越自我，围绕抑菌主题，绽放舒适健康属性，走进千万中国家庭；中国纤维致力于为消费者们的健康舒适提供解决方案，打造环保阻燃、高强、抗老化等纤维，构筑安全防御的“保护锁”，让消费者拥有健康安心的品质生活。中国纤维追本溯源，实现从供应链下游至上游的双向流通，提升整体产业链透明度。

The protective barriers are built to guarantee safety. China's fiber technology focuses on consumption upgrades, constantly makes self-perfection, centers on the theme of antibacterial features, and provides millions of Chinese families with comfort and health; China's fiber industry is committed to providing solutions for consumers' health and comfort, creating electric, flame-retardant, high-strength, aging-resistant and other functional fibers to build a "security lock" of safety and defense, allowing consumers to enjoy a healthy and secure high-quality life. Tracing back to the whole-course of fiber manufacturing, China's fiber industry realizes bilateral circulation from upstream to downstream of the supply chains and improves the transparency of the overall industrial chain.

健康防护纤维

HEALTH PROTECTION FIBER

推荐理由

新冠病毒席卷全球让人们重新开始审视生活中的健康需求。纤维融入健康元素，透过锌离子、银离子、银 / 锌复合等抑菌剂打造健康防护属性；高透气小孔径 PTFE 微孔薄膜实现口罩和防护服的高效低阻及可重复性使用性。由外到内、由日常服用到医疗防护，纤维与健康防护共升级，满足人们对安心生活的新期待。

Recommendation Reasons

The COVID-19 epidemic sweeps the world, which makes people re-examine their health needs in life. The fiber incorporates healthy elements and creates health protection properties through bacteriostatic agents such as zinc ion, silver ion and silver/zinc composite elements. Fiber are incorporated with healthy elements through zinc ions, silver ions, silver/zinc compound and other bacteriostatic agents to create health protection properties; high-permeability small-bore PTFE microporous membrane realizes high efficiency, low resistance and repeatability of masks and protective clothing. From outside to inside, from daily use to medical protection, fiber and health protection have been upgraded simultaneously to meet people's new expectations for a safe and secure life.

推荐品种

- 锌系抑菌聚酯纤维 | 品牌：锌力康
- 银离子抑菌氨纶 | 品牌：奥神
- 银 / 锌复合抑菌聚酰胺 6 纤维 | 品牌：达洁纶
- PTFE 微纳纤维膜 | 品牌：禾海

Specific Variety

- Zinc Antibacterial Polyester Fiber | Brand: Zinycon
- Silver Ion Antibacterial Spandex | Brand: AOSHEN
- Silver Zinc Composite Antimicrobial Polyamide-6 Fiber | Brand: DACLEANON
- PTFE Micro-Nano Fiber Membrane | Brand: Hehai

锌力康
Zinycon

锌力康
Zinycon

推荐理由

融合锌系抑菌、异形截面设计和原液着色技术的聚酯纤维，带给消费者兼具颜色艳丽、导湿快干和安全有效的抑菌体验。

Recommendation Reasons

Polyester fiber, combining and zinc-series antibacterial function, the profiled cross-section design and the dope-dyed technology, brings consumers colorful, moisture-conducting, quick-drying and safe and effective antibacterial experience. The polyester fiber combining with zinc anti-bacteria, shaped cross-section design and original liquid coloring technology brings consumers both colorful, moisture-conducting and fast-drying anti-bacteria experience safely and effectively.

锌系抑菌聚酯纤维

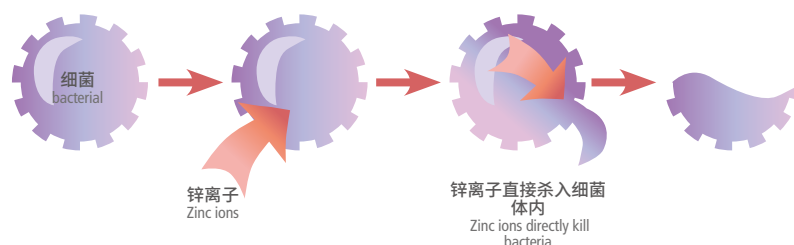
Zinc Antibacterial Polyester Fiber

制备技术

Processing Technology

以锌系抑菌剂作为改性剂，对聚酯进行共混添加改性，设计独特的四 T 型异形截面，采用原液着色技术经熔融纺丝制备。

With zinc-series bacteriostatic agent as modifier, polyester is modified by blending, and designed with a unique four-T-shaped deformed section. After such procedures, it is prepared by melt spinning with dope-dyed technology.



锌离子能进入菌体，抑制病菌繁殖
Zinc ions can enter the bacteria and inhibit the growth of bacteria

纤维及制品特点

Characteristics of Fiber and Product

主要规格

短纤：1.33 ~ 6.67dtex×32 ~ 102mm

标准及认证

《抗菌涤纶短纤维》(FZ/T 52035-2014)

获得 GRS 认证和 Oeko-Tex Standard 100

环保纺织品认证

纤维性能与制品特点



- 有效抑制纤维表面细菌、真菌的繁殖
- 具有良好的防霉功能、防止异味
- 纤维四 T 型截面赋予制品导湿快干功能
- 采用原液着色技术，低碳环保

Fiber Performance and Product Features

- Inhibiting the reproduction of bacteria and fungi on the fiber surface effectively
- Favorable anti-mildew and odor prevention properties
- The four T-shaped profiled cross-section of fiber, endowing products with moisture-conducting and quick-drying function
- Adopting low-carbon and environmentally friendly dope-dyed technology

纤维性能参数 Fiber performance parameters						
产品规格 Specification	断裂强度 (cN/dtex) Breaking strength (cN/dtex)	断裂伸长率 (%) Elongation at break (%)	180°C 干热收缩率 (%) 180°C drying and heating shrinkage (%)	卷曲数 (个/25mm) Crimp number (Pc/25mm)	卷曲率 (%) Crimp ratio (%)	比电阻 (Ω·cm) Specific resistance (Ω·cm)
1.67dtex×38mm	4.5	30.7	6.5	11.8	10.6	4.0×10 ⁶



抑菌织物性能参数 Antibacterial fabric performance parameters		
金黄色葡萄球菌抑菌率 (%) Bacteriostasis rate of staphylococcus aureus	大肠杆菌抑菌率 (%) Bacteriostasis rate of escherichia coli (%)	白色念珠菌抑菌率 (%) Bacteriostasis rate of candida albicans (%)
94.2	88.0	89.8

应用技术

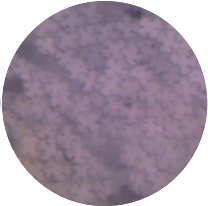
Application Technology

纺纱：建议加入量 30% 以上，后道需混合均匀

染色：控制疏水性染整助剂的添加



纤维原貌图
Fiber original appearance



四 T 型横截面
Four T-shaped cross section

Main Specifications

Staple fiber: 1.33~6.67dtex×32~102mm

Standards and Certifications

“Antibacterial polyester staple fiber”

(FZ/T 52035-2014)

Certificated by GRS and Oeko-Tex Standard

100 environmentally-friendly textile

Spinning: the addition is recommended to be more than 30%, and the uniform mixture is needed in the subsequent process.

Dyeing: the addition of hydrophobic dyeing and finishing auxiliaries should be controlled

纤维应用

Fiber Application

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	运动服 sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
✓								
羽绒服 Down jacket	高端成衣 High-end ready-to-wear	帽子 Cap	专业运动服 Professional sportswear					
家用纺织品 Home textiles								
床上寝具 Bedding	窗帘 Curtain	地毯 Carpet	沙发布 Sofa fabric	填充物 Filler	毛巾 Towel	玩具 Toys		
✓	✓		✓					
产业用纺织品 Industrial textiles								
汽车内饰 Automotive interior	电池隔膜 Battery separator	体育用品 Sporting goods	医用纺织品 Filtration products	卫生纺织品 Sanitary textiles	军用纺织品 Military textiles	特种纸 Special papers	清洁用品 Cleaning supplies	过滤产品 Filtration products
✓								
消防用品 Fire Supplies	航空航天 Aerospace	户外用品 Outdoor products	建筑增强 Building enhancement	面膜 Masks	口罩 Gauze mask	缆绳 Cable	织带 TAPS	发动机壳体 Motor case
无人机 UAV								

Q&A

Q：锌系抑菌的原理，你了解吗？

A：锌离子具有氧化还原性，当它和细菌细胞膜相结合时，与其中的有机物发生反应，破坏了细菌细胞膜的蛋白结构，达到杀菌的目的。当细菌被杀死后，锌离子又会从菌体中游离出来，再与其他细菌接触，完成新的杀菌任务，所以显示出很强的杀菌活性。

Q: Do you understand the antibacterial principle of zinc series?

A: Zinc ion has redox property. When it combines with bacterial cell membrane, it reacts with the organic matter therein, destroying the protein structure of bacterial cell membrane and achieving the purpose of sterilization. After the bacteria are sterilized, zinc ions will be released from the bacteria, and then contact with other bacteria to complete the new sterilization task, thus showing strong bactericidal activity.



奥神
AOSHEN

推荐理由

兼具氨纶的优势，并赋予氨纶优异的非溶出型抑菌功效，安全可靠、抑菌效果持久，具有良好的市场认可度。

Recommendation Reasons

The kind of fiber has the advantages of spandex, and endows spandex with excellent non-dissolution antibacterial effect, which is safe, reliable and long-lasting to be well recognized in the market.

银离子抑菌氨纶

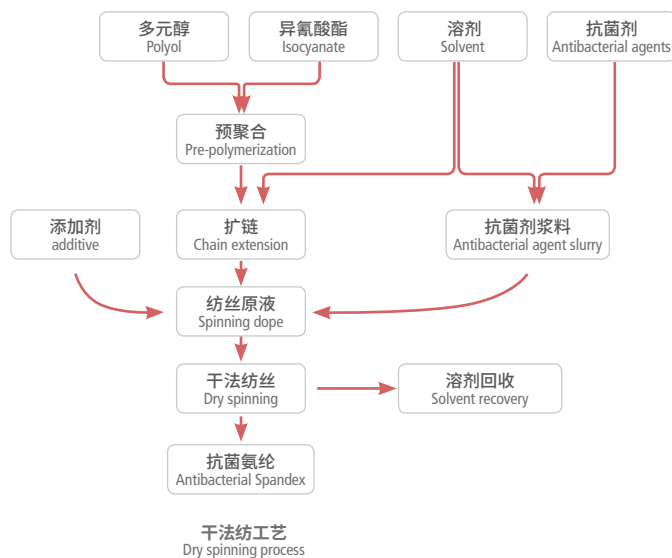
Silver Ion Antibacterial Spandex

制备技术

Processing Technology

在连续聚合干法纺丝的生产工艺流程上，采用共混技术，将银离子抑菌剂加入氨纶纺丝原液中，实现柔性稳定生产。

In the production process of continuous polymerization dry spinning, silver ion bacteriostatic agent is added into spandex spinning dope dyeing by blending technology to realize flexible and stable production.



纤维及制品特点

Characteristics of Fiber and Product

主要规格

长丝：15-150D

标准及认证

《氨纶长丝》（FZ/T 54010-2014）

通过抗菌标志、ROHS 认证

Main Specifications

Filaments:15-150D

Standards and Certifications

“Spandex filament ”（FZ/T 54010-2014）

Passing antibacterial mark and ROHS certification

纤维性能与制品特点



- 兼具氨纶弹性与抑菌功能，菌种抑菌圈宽度为 0，非溶出
- 织物耐洗涤性优异，对金黄色葡萄球菌、大肠杆菌和白色念珠菌的抑菌率达 99% 以上，达 FZ/T 73023-2006 AAA 级

Fiber Performance and Product Features

- Has spandex's elastic and bacteriostatic function, the width of bacterial inhibition zone of 0, and non-dissolution.Both spandex elasticity and antibacterial function, strain inhibition circle width of 0, non-soluble
- Excellent washing resistance, with the antibacterial rate of over 99% against staphylococcus aureus, escherichia coli and candida albicans, reaching FZ/T 73023-2006 AAA level

产品规格 Specification	断裂强度 (cN/dtex) Breaking tenacityStrength (cN/dtex)	断裂伸长率 (%) Extension at break(%)	金黄色葡萄球菌抑菌 率 (%) Bacteriostasis rate ofStaphylococcus aureus(%)	大肠杆菌抑菌率 (%) Bacteriostasis rate ofEscherichia coli (%)	白色念珠菌抑菌率 (%) Bacteriostasis rate of candida albicans (%)	三种菌种抑菌圈宽度 (mm) Widths of inhibition zone of three bacteria (mm)
30D	1.2	400-900	≥ 99	≥ 99	≥ 99	0，非溶出 0,non-permeable

应用技术

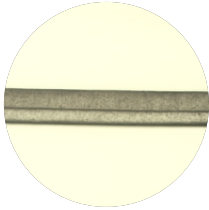
Application Technology

染色和整理：参照常规氨纶工艺

Dyeing and finishing: referring to traditional spandex process



纤维原貌图
Fiber original appearance



40D 纵面图
40D longitudinal section



40D 横截面图
40D cross section





纤维应用

Fiber Application

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	运动服 sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
✓		✓						
羽绒服 Down jacket	高端成衣 High-end ready-to-wear	帽子	专业运动服					
产业用纺织品 Industrial textiles								
汽车内饰 Automotive interior	电池隔膜 Battery separator	体育用品 Sporting goods	医用纺织品 Medical textiles	卫生纺织品 Sanitary textiles	军用纺织品 Military textiles	特种纸 Special papers	清洁用品 Cleaning supplies	过滤产品 Filtration products
			✓					
消防用品 Fire Supplies	航空航天 Aerospace	户外用品 Outdoor products	建筑增强 Building enhancement	面膜 Masks	口罩	缆绳	织带	发动机壳体
					✓			
无人机								

Q&A

Q：银离子抑菌氨纶的优势是什么？

A：通过在纺前加入银离子抑菌剂，在保持氨纶优异性能的同时添加纤维的抑菌性能。银离子抑菌氨纶通过 ROHS 认证，不含多溴联苯等物质，该纤维制作的面料区别于通过后期抑菌剂浸渍处理的面料，具有优异的耐洗性，抑菌效果更加持久。

Q: What are the advantages of silver ion antibacterial spandex?

A: By adding silver ion bacteriostatic agent before spinning, the excellent performance of spandex is maintained and the bacteriostatic performance of fiber is added. Silver ion antibacterial spandex has passed ROHS certification, without polybrominated biphenyls and other substances. The fabric made of it is different from the fabric impregnated with antibacterial agent in the following period, and has excellent washing resistance and superior antibacterial effect.

银 / 锌复合抑菌聚酰胺 6 纤维

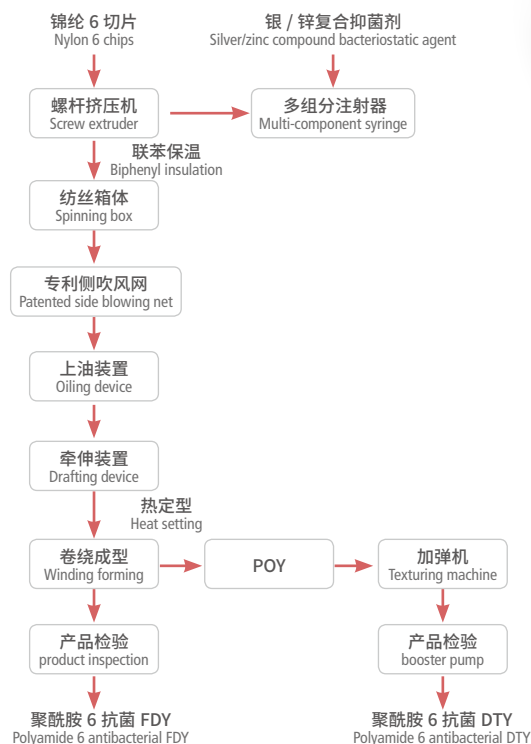
Silver Zinc Composite Antimicrobial Polyamide-6 Fiber

制备技术

Processing Technology

采用银 / 锌复合抑菌剂在线添加，与聚酰胺 6 切片共混，经熔融纺丝制备。

The silver/zinc composite bacteriostatic agent is added on-line, blended with polyamide 6 chips, and prepared by melt spinning.



制备流程图
Flow Chart of Preparation

Dacleanon

达洁纶

达洁纶

DACLEANON

推荐理由

针对医护人员贴身着装领域开发的功能复合纤维，兼具抑菌与温湿调控功能。

Recommendation Reasons

The functional composite fiber, developed for the field of close-fitting clothing for medical staff, has the functions of bacteriostasis and temperature and humidity control.

纤维及制品特点

Characteristics of Fiber and Product

主要规格

长丝 :44.4 ~ 77.7dtex/12 ~ 68F (FDY、DTY)

标准及认证

《锦纶牵伸丝》(GB/T 16603-2017)

《耐久性抗菌聚酰胺纤维》(DB44/T 1703-2015)

Main Specifications

Filaments:44.4~77.7dtex/12~68F(FDY,DTY)

Standards and Certifications

“Polyamide drawn yarn” (GB/T 16603-2017)

“Durable antibacterial polyamide fiber” (DB44/T 1703-2015)

纤维性能与制品特点



- 兼具聚酰胺 6 纤维自身特点，同时具有高效抑菌特性。对金黄色葡萄球菌、大肠埃希氏菌、白色念珠菌抑菌率均大约 95%
- 其面料通过 AATCC-100 的抑菌性能测试，亲肤舒适，适合贴身穿着

Fiber Performance and Product Features

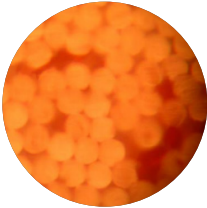
- It has the characteristics of polyamide 6 fiber, and can inhibit bacteria efficiently. The bacteriostasis rates of Staphylococcus aureus, Escherichia coli and Candida albicans are about 95%
- The fabric has passed AATCC-100 antibacterial performance test, which is skin-friendly, comfortable and suitable for close-fitting wear

产品规格 Specification	断裂强度 (cN/dtex) Fracture strength (cN/dtex)	断裂伸长率 (%) Elongation at break (%)	卷曲收缩率 (%) Crimp shrinkage rate (%)	断裂强度变异系数 Variable coefficient of fracture strength
77.7dtex/68F	3.6	26±4	≥ 15	< 8.0

染色均匀度 Dyeing uniformity	金黄色葡萄球菌抑菌率 (%) Bacteriostasis rate of Staphylococcus aureus (%)	大肠埃希氏菌抑菌率 (%) Bacteriostasis rate of Escherichia coli (%)	白色念珠菌抑菌率 (%) Bacteriostasis rate of Candida albicans (%)
≥ 4	> 95	> 95	> 95



纤维原貌图
Fiber original appearance



纤维横截面图
Fiber cross section



应用技术

Application Technology

纺纱、织造：建议纤维用量在 30% 以上，保证制品体现相关功能

Spinning and weaving: it is recommended to use more than 30% fibers to ensure that the products reflect relevant functions

纤维应用

Fiber Application

产业用纺织品 Industrial textiles								
汽车内饰 Automotive interior	电池隔膜 Battery separator	体育用品 Sporting goods	医用纺织品 Filtration products	卫生纺织品 Sanitary textiles	军用纺织品 Military textiles	特种纸 Special papers	清洁用品 Cleaning supplies	过滤产品 Filtration products
			✓					
消防用品 Fire Supplies	航空航天 Aerospace	户外用品 Outdoor products	建筑增强 Building enhancement	面膜 Masks	口罩 Gauze mask	缆绳 Cable	织带 TAPS	发动机壳体 Motor case
无人机 UAV								

Q&A

Q：银 / 锌复合抑菌聚酰胺 6 纤维的开发背景，您了解吗？

A：银 / 锌复合抑菌聚酰胺 6 纤维是针对医护人员工作环境，专门开发的产品。纤维具有永久的抑菌功能，已经应用于医护人员内衣贴身着装，并计划推广应用到医护人员防护套装、头套、鞋垫等用途。

Q: Do you know the development background of silver/zinc composite antibacterial polyamide 6 fiber?

A: Silver/zinc composite antibacterial polyamide 6 fiber is a dedicated product for the working environment of medical staff. The fiber has a permanent antibacterial function, which has been applied to the underwear of medical staff, and plans to promotethe applicationofmedical staff protective suits, headgear, insoles and other applications.



更快的干燥速率
Faster drying rate

持久的抑菌功能
Lasting antibacterial function

亲肤舒适
Skin-friendly and comfortable



禾海
Hehai

推荐理由

可作为熔喷材料的应急产品，其制作的口罩可实现重复使用，并可拓展在空气过滤领域应用。

Recommendation Reasons

It can be used as an emergency product of melt-blown materials, and the mask can be used repeatedly and expanded in the field of air filtration.

PTFE 微纳纤维膜

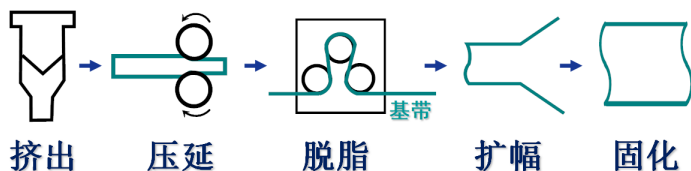
PTFE Micro-Nano Fiber Membrane

制备技术

Processing Technology

融合树脂共混改性、异型截面设计、高剪切挤出技术及共牵伸工艺，实现了不同孔径、不同微孔形状、不同高孔隙率的 PTFE 全纤维膜的制备。

The combination of blending modification of resin, special-shaped cross-section design, high-shear extrusion technology and co-drafting process achieves the preparation of PTFE all-fiber membranes with different pore sizes, different micropore shapes and different high porosity.



制备流程图
Flow Chart of Preparation

纤维及制品特点

Characteristics of Fiber and Product

主要规格

厚度：0.2 mm；幅宽：1600 mm；长度：5000 m

标准及认证

通过毒理安全性测试：急性经口毒性试验、皮肤刺激和变态反应

Main Specifications

Thickness:0.2 mm;Width:1600 mm;Length:5000 m

Standards and Certifications

It has passed toxicological safety test: acute oral toxicity test, skin irritation and allergy reactions

纤维性能与制品特点

PTFE 微纳粗纤维直径 0.5-1 μ m，PTFE 微纳细纤维 17-26nm，

粗纤维（微米级纤维）比例为 8%，细纤维（纳米级纤维）比例 92%

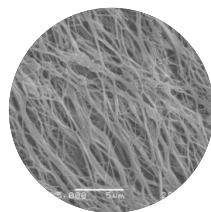
PTFE 微纳纤维膜厚度 10-15 μ m，孔径小于 0.1 μ m，膜阻 38Pa。具有高效低阻，过滤性能持久稳定的特点。

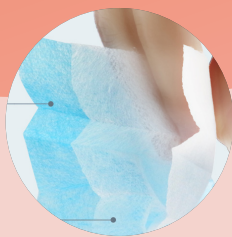
Fiber Performance and Product Features

The diameter of PTFE micro-nano crude fiber is 0.5-1 μ m, and the diameter of PTFE micro-nano fine fiber is 17-26 nm,

The proportion of crude fiber (micronfiber) is 8%, and the proportion of fine fiber (nanofiber) is 92%

The PTFE micro-nano fiber membrane has a thickness of 10-15 μ m, a pore size of less than 0.1 μ m and a membrane resistance of 38 Pa. It has the characteristics of high efficiency, low resistance and lasting and stable filtration performance.





PTFE 微纳纤维膜口罩过滤参数
Filter parameters of PTFE micro-nano fiber membrane mask

主要技术指标 Main technical indexes	国际 / 国家 / 行业口罩标准要求 International/National/Industrial mask standard requirements	PTFE 微纳纤维膜滤效与压差 Filtration efficiency and pressure difference of PTFE micro-nano fiber membrane
日常防护口罩 (GB/T 32610-2016) Daily protective mask(GB/T 32610-2016)	NaCl 过滤效率 (PFE) $\geq 90\%$ NaCl filtration efficiency (PFE) $\geq 90\%$	盐性 : 95.5%, 91Pa Salinity:95.5%, 91Pa
	吸气阻力 $\leq 175\text{Pa}$ Inhalation resistance $\leq 175\text{Pa}$	
	呼气阻力 $\leq 145\text{Pa}$ Exhalation resistance $\leq 145\text{Pa}$	
一次性医用防护口罩 (YY/T 0969-2013) Disposable medical protective mask(YY/T 0969-2013)	细菌过滤效率 (BFE) $\geq 95\%$ Bacterial filtration efficiency (BFE) $\geq 95\%$	盐性 : 94.8%, 32 Pa / cm^2 Salinity:94.8%, 32 Pa / cm^2
	压力差 (ΔP) $\leq 49\text{ Pa / cm}^2$ Pressure difference (ΔP) $\leq 49\text{ Pa / cm}^2$	
医用外科口罩 (YY0469-2011) Medical surgical mask(YY0469-2011)	细菌过滤效率 (BFE) $\geq 95\%$ Bacterial filtration efficiency (BFE) $\geq 95\%$	
	颗粒过滤效率 (PFE) $\geq 30\%$ Particle filtration efficiency (PFE) $\geq 30\%$	
	合成血液 : 2ml, 16KPa 喷射不穿透 Synthetic blood:2ml, Spraying impenetrability 16KPa	
	压力差 (ΔP) $\leq 49\text{ Pa / cm}^2$ Pressure difference (ΔP) $\leq 49\text{ Pa / cm}^2$	
KN95 口罩 (GB2626-2016) KN95 mask(GB2626-2016)	NaCl 过滤效率 (PFE) $\geq 95\%$ NaCl filtration efficiency (PFE) $\geq 95\%$	盐性 : 98.9%, 125Pa Salinity:98.9%, 125Pa
	吸气阻力 $\leq 343.2\text{Pa}$ Inhalation resistance $\leq 343.2\text{Pa}$	
	呼气阻力 $\leq 343.2\text{Pa}$ Exhalation resistance $\leq 343.2\text{Pa}$	
FFP 系列口罩 (EN 149) Series of FFP mask(EN 149)	FFP2 $\geq 94\%$	盐性 : 95.6%, 107Pa Salinity:95.6%, 107Pa 油性 : 99.8, 155Pa Oiliness:99.8, 155Pa
	FFP3 $\geq 99\%$	盐性 : 99.2%, 196Pa Salinity:99.2%, 196Pa 油性 : 99.8, 168Pa Oiliness:99.8, 168Pa

应用技术

Application Technology

选材 : 针对不同类型口罩和防护效果, 选取不同结构的纳米纤维膜

Material selection: according to different types of masks and their protective effects, nano-fiber membranes with different structures are selected

纤维应用

Fiber Application

儿童口罩、民用防护口罩、医用口罩和 FFP2/FFP3 类别口罩

Children's masks, civil protective masks, medical masks and FFP2/FFP3 masks

Q&A

Q：采用聚四氟乙烯（PTFE）微纳纤维膜作为口罩的过滤阻隔材料，其过滤原理与传统熔喷布有何不同？

A：传统熔喷布无论静电驻极还是水驻极，都是利用静电吸附机理，在使用过程中，过滤效果容易受环境影响，例如温度、湿度、溶剂等。在长期存贮超过 2 年之后，使用效果下降。相比而言，PTFE 微纳纤维膜主要利用机械阻隔，对时间、环境条件的变化不敏感，适合长期存储使用。

Q: What's the difference between the filter principle of the filter barrier material of mask by using PTFE micro-nano fiber membrane for mask and that of the traditional melt-blown cloth?

A: The traditional melt-blown cloth uses electrostatic adsorption mechanism regardless of electrostatic electret or water electret. The filtration effect is easily affected by environment in the process of use, such as temperature, humidity and solvent. After long-term storage for more than 2 years, the use effect is challenging. In contrast, PTFE micro-nano fiber membrane mainly uses mechanical barrier, which is insensitive to changes in time and environmental conditions, and is suitable for long-term storage.

Q：口罩种类繁多，采用聚四氟乙烯（PTFE）微纳纤维膜作为口罩的过滤阻隔材料，在哪类口罩应用方面存在优势？

A：目前，PTFE 微纳纤维膜口罩在日常防护口罩、医用口罩、FFP2、FFP3 等类型口罩均能成功应用。在盐性颗粒物过滤阻隔方面，目前的熔喷材料口罩已能实现很好的防护效果。但是油性颗粒物，特别是 FFP3 等高性能防护口罩，采用 PTFE 微纳纤维膜口罩，可以很好的结合 PTFE 纤维膜 + 熔喷材料支撑体的综合优势，其中 PTFE 扮演了“守门员”的角色，实现了高效的油性防护效果。

Q: Since there are various masks, which kind of masks which use PTFE micro-nano fiber membrane as the filter barrier material has advantages in application?

A: At present, PTFE micro-nano fiber membrane masks can be successfully applied in daily protective masks, medical masks, FFP2, FFP3 and other types of masks. Now, the masks made of melt-blown materials can achieve good protection effect with respect to filtering and blocking salt particulate matters. However, for oily particulate matters, especially high-performance protective masks such as FFP3 masks, PTFE micro-nano fiber membrane masks can well combine the comprehensive advantages of PTFE fiber membrane + melt-blown material support, in which PTFE plays the role of "goalkeeper" and achieves efficient oily protection effect.

安全防护纤维

SAFETY PROTECTION FIBER

推荐理由

安全防护纤维以人为本，安全为先，复配与再生、聚合与萃取，由繁至简、由好到精，不断打磨纤维的内在价值，构筑生命安全屏障。环保阻燃、抗熔滴、抗老化、高强耐磨等性能亮点精锐尽出，在工装防护、装备防护等领域发挥着举足轻重的作用。

Recommendation Reasons

Safety protection fiber is people-oriented, following the principle of safety first, compounding and recycling, polymerization and extraction, simplification and refinement, constantly increasing the intrinsic value of fiber, and building the life safety barrier. The features of environmental protection, flame retardance, anti-droplet, anti-aging resistance, high strength and wear resistance show extraordinary advantages. They play an important role in tooling protection, equipment protection and other fields.

推荐品种

- 阻燃抗熔滴聚酯纤维 | 品牌：葛伦森
- 一步法高强聚酰胺 6 纤维 | 品牌：恒申集团
- 抗老化阻燃循环再利用聚酯纤维 | 品牌：鹭安丝

Specific Variety

- Flame Retardant and Anti-Dripping Polyester Fiber | Brand: EMT
- One-step Method High Strength Polyamide-6 Fiber | Brand: HSCC
- Anti-Aging and Anti-Flame Regenerated PET Fiber | Brand: Lugard



葛伦森
EMT

阻燃抗熔滴聚酯纤维

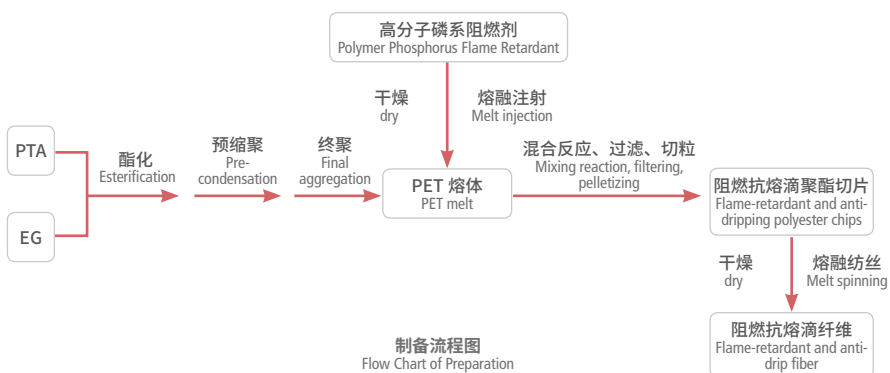
Flame Retardant and Anti-Dripping Polyester Fiber

制备技术

Processing Technology

通过熔体混合反应的方式，在低聚物熔体段注入反应型高分子磷系阻燃剂，制得阻燃抗熔滴聚酯切片，再经熔融纺丝制得阻燃抗熔滴纤维。

Through melt mixing reaction, reactive macromolecular phosphorus flame retardance is injected into the oligomer melt section to prepare flame-retardant and anti-droplet polyester chips, and then flame retardant and anti-droplet fiber is prepared by melt spinning.



推荐理由

经特殊阻燃改性后的聚酯具有良好的可纺性，制得的纤维具备高阻燃、高残炭量以及一定的抗熔滴性能。

Recommendation Reasons

The polyester modified by special flame resistance has good spinnability, and the prepared fiber has high flame retardance, high carbon residue content and certain anti-droplet performance.

阻燃抗熔滴实现机理 Flame retardant and anti-droplet mechanism

阻燃抗熔滴聚酯纤维重点引入具有独特结构的磷系高分子阻燃剂，在大幅提高磷含量的同时，保持较高熔点及良好可纺性，进一步提升了材料的凝聚相阻燃效果，增加燃烧过程中的残炭量，形成致密炭层结构，最终实现阻燃抗熔滴。

Phosphorus macromolecular flame retardance with unique structure is mainly introduced into flame-retardant and anti-droplet polyester fiber, which can not only greatly increase phosphorus content, but also keep higher melting point and good spinnability. It can further improve the condensed phase flame-retardant effect of the materials, and increase the content of carbon residue in the combustion process, form a dense carbon layer structure, thus finally realizing flame-retardant and anti-droplet function.

纤维及制品特点

Characteristics of Fiber and Product

主要规格

短纤：1.67dtex×38mm、2.22dtex×51mm



纤维原貌图
Fiber original appearance

标准及认证

《阻燃涤纶短纤维》(FZ/T 52022-2012)

Main Specifications

Staple fiber: 1.67dtex×38mm, 2.22dtex×51mm

Standards and Certifications

“Flame-retardant dacron staple fiber” (FZ/T 52022-2012)

纤维性能参数 Fiber performance parameters					
产品规格 Specification	断裂强度 (cN/dtex) Breaking strength (cN/dtex)	断裂伸长率 (%) Extension at break (%)	180°C干热收缩率 (%) 180°C drying and heating shrinkage(%)	切片极限氧指数 (%) Chip limit oxygen index(%)	氮气气氛下 450 度残炭量 (%) Carbon residue content at 450°C in nitrogen atmosphere(%)
2.22dtex×51mm	4,2	28.8	8.5	35.6	≥ 38

阻燃抗熔滴面料 Flame-retardant and anti-droplet fabric		
续燃时间 (s) After-flame time(s)	引燃时间 (s) Ignition time(s)	磷含量 (ppm) Phosphorus content(ppm)
≤ 2	≤ 2	≥ 20000



纤维性能与制品特点



- 无卤阻燃、成炭性好，符合 RoHS、REACH 无卤环保
- 燃烧残炭量高，具有良好自熄性，抗熔滴效果好

Fiber Performance and Product Features

- Halogen-free flame-retardant, good-charring, in line with RoHS, REACH halogen - free environmental protection
- High content of burning carbon residue, good self-extinguishing property and good anti-droplet effect

应用技术

Application Technology

纺纱：可单独使用，也可与阻燃抗熔滴纤维混纺，如与阻燃粘胶、阻燃腈纶、芳纶、芳砵纶等，混纺添加比可大于 30%

Spinning: it can be used alone or blended with flame-retardant anti-droplet fibers, such as flame-retardant viscose, flame-retardant acrylic, aramid, polysulfonamide, etc. The blending ratio can be greater than 30%

纤维应用

Fiber Application

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	运动服 sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
		✓					✓	
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
羽绒服 Down jacket	高端成衣 High-end ready-to-wear	帽子 Cap	专业运动服 Professional sportswear					
产业用纺织品 Industrial textiles								
汽车内饰 Automotive interior	电池隔膜 Battery separator	体育用品 Sporting goods	医用纺织品 Filtration products	卫生纺织品 Sanitary textiles	军用纺织品 Military textiles	特种纸 Special papers	清洁用品 Cleaning supplies	过滤产品 Filtration products
					✓			
消防用品 Fire Supplies	航空航天 Aerospace	户外用品 Outdoor products	建筑增强 Building enhancement	面膜 Masks	口罩 Gauze mask	缆绳 Cable	织带 TAPS	发动机壳体 Motor case
✓								
无人机 UAV								

Q：熔滴现象的危害及阻燃抗熔滴织物的发展趋势是什么？

A：纺织品的熔滴危害较大，发生火灾时，熔融滴落物会损伤皮肤且高温滴落物容易引发二次火灾，加速火焰传播。在特殊应用领域中，大多采用芳纶、阻燃粘胶与普通阻燃聚酯纤维混纺，但易出现灯芯效应。因此，提高阻燃聚酯纤维燃烧过程中的残炭量，使炭层结构进一步成为熔滴的附着点，已成为阻燃抗熔滴织物的发展趋势。

Q: What is the harm of molten drop phenomenon and the development trend of flame retardant and anti-droplet fabrics?

A: The molten drop of textiles does great harm. In case of fire, melting drops will damage skin, and high temperature drops will easily cause secondary fire and accelerate flame propagation. In special application fields, aramid fiber, flame retardant viscose and common flame-retardant polyester fiber are mostly blended, but wicking effect is easy to appear. Therefore, it has become the development trend of flame-retardant and anti-dropping fabrics to increase the content of carbon residue during the combustion of flame-retardant polyester fiber and make the carbon layer structure become the attachment point of molten drop.

Q：您了解磷系阻燃的机理吗？

A: 其一为气相阻燃，含磷化合物在高温下分解为小分子的 $\bullet\text{PO}_2$ 、 $\bullet\text{PO}$ 和 $\bullet\text{HPO}$ 等自由基，与燃烧过程生成的 $\bullet\text{H}$ 以及 $\bullet\text{OH}$ 自由基反应，中断燃烧反应链实现阻燃；
 其二是凝聚相阻燃，含磷化合物燃烧过程中生成沸点 300°C 的磷酸，磷酸进一步脱水生成偏磷酸和聚偏磷酸，促进PET高分子链脱水炭化后在燃烧表面形成致密炭层以隔绝空气并阻碍热量传递，从而实现阻燃；
 其三是含磷化合物在燃烧过程中可以生成水分，稀释可燃气体并带走燃烧热量，进一步增强了阻燃效果。

Q: Do you understand the mechanism of phosphorus flame retardance?

A: First, it is gas-phase flame retardant. Phosphorus compounds decompose into small molecular free radicals such as $\bullet\text{PO}_2$, $\bullet\text{PO}$ and $\bullet\text{HPO}$ at high temperature, and react with $\bullet\text{H}$ and $\bullet\text{OH}$ radicals generated during the combustion process to interrupt the combustion reaction chain and realize flame retardance;

Second, it is condensed phase flame retardant. Phosphoric acid with a boiling point of 300°C is generated during the combustion of phosphorus-containing compounds. The phosphoric acid is further dehydrated to produce metaphosphoric acid and poly-metaphosphoric acid, which promotes the dehydration and carbonization of PET polymer chains to form a dense carbon layer on the combustion surface to isolate air and hinder heat transfer, thus achieving flame retardance;

Third, the phosphorus-containing compounds generate water during the combustion process, which dilutes the combustible gas and takes away the heat of combustion, further enhancing the flame-retardant effect of the phosphorus flame retardant.

推荐理由

高强聚酰胺纤维强度远高于常规锦纶，可用于军用纺织品及户外用品。

Recommendation Reasons

The strength of this high-strength grade polyamide fiber is much higher than that of conventional nylon, which can be used in military textiles and outdoor products.

一步法高强聚酰胺 6 纤维

One-step Method High Strength Polyamide-6 Fiber

制备技术

Processing Technology

采用两段式聚合和切片多段萃取技术，制备低聚物含量低的高性能锦纶切片；利用高效冷却、多倍牵伸、高效热定型、长纺程、慢冷却纺丝技术，保证熔体从喷丝板喷出后缓慢冷却，防止形成皮芯结构，制得高强度聚酰胺 6 纤维。

Two-stage polymerization and multi-stage chip extraction technology are used to prepare high-performance nylon chips containing low content of oligomer; high-efficiency cooling, multiple drafting, high-efficiency heat setting, long spinning process, and slow cooling spinning technology are used to ensure a slow cooling process of the melt after it was spun from the spinneret to prevent the formation of a skin-core structure, thus producing high-strength nylon fiber.

纤维及制品特点

Characteristics of Fiber and Product

主要规格

长丝：16.5 ~ 88.8dtex/5 ~ 24F (FDY)

Main Specifications

Filaments: 16.5 ~ 88.8dtex/5 ~ 24F (FDY)



纤维原貌图
Fiber original appearance

标准及认证

《锦纶牵伸丝》(GBT16603-2017)
通过 Oeko-Tex、OHSAS 18001 认证

Standards and Certifications

“Nylon drawn yarn ” (GBT16603-2017)
Passed Oeko-Tex, OHSAS 18001 certification

纤维性能与制品特点



Fiber Performance and Product Features

- 强度高、耐磨性好
 - 吸湿性好
 - 织物的弹性及弹性回复性优异
- High strength and good wear resistance
 - Good hygroscopicity
 - Excellent elasticity and elastic recovery of the fabric

产品规格 Specification	断裂强度 (cN/dtex) Breaking tenacity (cN/dtex)	断裂强度变 CV (%) Breaking tenacity CV(%)	断裂伸长率 (%) Extension at break(%)	断裂伸长率 CV (%) Extension at break CV(%)
88.8dtex/24F	≥ 8.0	≤ 8.0	≥ 22.0	≤ 7.0

线密度偏差率 (%) Yarn density deviation rate (%)	染色均匀度 (级) Dyeing uniformity(Grade)
±2.0	3-4

应用技术

Application Technology

染色：由于纱线在生产过程中含油，在染色过程中应充分洗油，避免染色条痕
后整理：避免长时间的日光和紫外光照射

Dyeing: Since the yarn contains oil during the production process, the oil should be washed thoroughly during the dyeing process to avoid streaks.
After-finishing: Prolonged exposure to sunlight and ultraviolet radiationshould be avoided.



纤维应用

Fiber Application

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	运动服 sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
	✓	✓						
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
			✓					
羽绒服 Down jacket	高端成衣 High-end ready-to-wear	帽子 Cap	专业运动服 Professional sportswear					
产业用纺织品 Industrial textiles								
汽车内饰 Automotive interior	电池隔膜 Battery separator	体育用品 Sporting goods	医用纺织品 Filtration products	卫生纺织品 Sanitary textiles	军用纺织品 Military textiles	特种纸 Special papers	清洁用品 Cleaning supplies	过滤产品 Filtration products
					✓			
消防用品 Fire Supplies	航空航天 Aerospace	户外用品 Outdoor products	建筑增强 Building enhancement	面膜 Masks	口罩 Gauze mask	缆绳 Cable	织带 TAPS	发动机壳体 Motor case
		✓						
无人机 UAV								

Q&A

Q：一步法高强聚酰胺 6 纤维为何比常规聚酰胺纤维强度高，实现的难点是什么？

A：该纤维制备采用两段式聚合和多段萃取技术，可高效萃取出切片里的单体，提升切片的纺丝性能。此外，采用无氧干燥技术，配合丝束高效冷却、多倍牵伸工艺、高效热定型等技术，大幅提高纤维的强度，最高可达到 8.5cN/dtex。

Q: Why is this one-step prepared high-strength polyamide 6 fiber stronger than conventional polyamide fiber, and what are the difficulties in production?

A: The fiber is prepared by adopting a two-stage polymerization and a multi-stage extraction technology, which can efficiently extract the monomers in the chips and improve their spinning performance. In addition, oxygen-free drying technology, combined with high-efficiency tow cooling, multiple drafting, high-efficiency heat setting and other technologies are used to greatly increase the strength of the fiber to a maximum of 8.5cN/dtex.



鹭安丝
Lugard

推荐理由

功能复合纤维，兼具力学性能的同时，集阻燃、抗紫外、抗老化、再生环保性于一体，提升了产品附加值。

Recommendation Reasons

The functional composite fiber has good mechanical properties while integrating flame retardant, anti-ultraviolet, aging-resistant and recyclable properties, increasing the added value of the product.

抗老化阻燃循环再利用聚酯纤维

Anti-Aging and Anti-Flame Regenerated PET Fiber

制备技术

Processing Technology

将聚酯瓶片、废料等经过物理法回收切粒得到再生切片，然后与阻燃母粒、抗老化剂等改性剂共混，经熔融纺丝制备。

The polyester bottle flakes or other waste materials are recycled and pelletized through physical methods to produce regenerated chips, which are then blended with modifiers such as flame-retardant masterbatch and anti-aging agent, and prepared through the melt spinning process.

紫外线等级科普
Popular science knowledge of UV grade

紫外线指数 UV Index	暴晒级数 Exposure level
0-2	最弱 Weakest
3-5	弱 weak
6-7	中等 medium
8-10	强 strong
> 11	很强 very strong

纤维及制品特点

Characteristics of Fiber and Product

主要规格

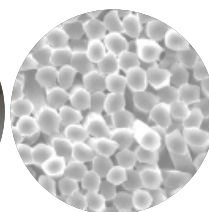
长丝：167dtex/48F

Main Specifications

Filaments: 167dtex/48F



纤维原貌图
Fiber original appearance



纤维横截面图
Fiber cross section

标准及认证

《再生涤纶牵伸丝》(FZ/T 54048-2012)
《阻燃涤纶低弹丝》(FZT 54085-2016)
通过 Oeko-Tex、GRS 认证

Standards and Certifications

“Regenerated polyester drawn yarn” (FZ/T 54048-2012)
“Flame retardant polyester low stretch yarn”
(FZT54085-2016)
Passed Oeko-Tex, GRS certification

纤维性能与制品特点



- 物理再生，实现资源再利用
- 抗紫外老化性好，使用寿命长
- 磷氮系阻燃，低烟无毒

Fiber Performance and Product Features

- Physical recycling method to achieve the reuse of resources
- Good UV resistance and aging resistance with long service life
- Phosphorus nitrogen flame retardance, low smoke and non-toxicity

产品规格 Specification	断裂强度 (cN/dtex) Breaking tenacity (cN/dtex)	断裂伸长率 (%) Elongation at break(%)	卷曲收缩率 (%) Crimp shrinkage rate(%)	沸水收缩率 (%) Boiling water shrinkage(%)
167dtex/48F	≥ 3.5	30.0±3.0	11.0±3.0	4.2±0.6

含油率 (%) Oil content (%)	磷含量 (PPM) Phosphorus content(PPM)	极限氧指数 LOI Limiting oxygen index LOI(%)	抗老化性能 Aging-resistant performance
2.8±1.0	≥ 6500	≥ 30	40W 荧光紫外灯连续 8h 暴晒，强度保持 94.6% The strength remains at 94.6% after 8 hours of continuous exposure to a 40W fluorescent ultraviolet lamp.

应用技术

Application Technology

织造与染整：参照常规循环再利用聚酯纤维工艺
Weaving, dyeing and finishing: Refer to the conventional recycling process of polyester fiber.

纤维应用

Fiber Application

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	运动服 sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
羽绒服 Down jacket	高端成衣 High-end ready-to-wear	帽子 Cap	专业运动服 Professional sportswear					

家用纺织品 Home textiles								
床上寝具 Bedding	窗帘 Curtain	地毯 Carpet	沙发布 Sofa fabric	填充物 Filler	毛巾 Towel	玩具 Toys		
✓	✓		✓			✓		
产业用纺织品 Industrial textiles								
汽车内饰 Automotive interior	电池隔膜 Battery separator	体育用品 Sporting goods	医用纺织品 Filtration products	卫生纺织品 Sanitary textiles	军用纺织品 Military textiles	特种纸 Special papers	清洁用品 Cleaning supplies	过滤产品 Filtration products
✓								
消防用品 Fire Supplies	航空航天 Aerospace	户外用品 Outdoor products	建筑增强 Building enhancement	面膜 Masks	口罩 Gauze mask	缆绳 Cable	织带 TAPS	发动机壳体 Motor case
		✓						
无人机 UAV								

Q&A

Q：抗老化阻燃循环再利用聚酯纤维的核心竞争优势是什么？

A：该纤维的阻燃性和抗紫外老化性的差异化特性得到了很好的体现，且在力学性能上保持良好，解决了共聚法阻燃纤维强度下降大的问题，赋予了产品更高的价值。符合国家提倡的可绿色发展和持续性发展主题，市场需求可观。

Q: What is the core competitive advantage of anti-UV and flame-retardant recycled polyester fiber?

A: The fiber's differentiated characteristics of flame retardance and anti-UV properties are well demonstrated, and the mechanical properties are maintained well, which solves the problem of the significantly weakened strength of the flame-retardant fiber produced with the copolymerization method and increases the product's value. It is also in line with the green and sustainable development themes that China is advocating, thus having an impressive market demand.

Q：抗老化聚酯纤维的原理是什么？

A：在聚酯切片中添加紫外线吸收剂（抗老化剂），再通过熔融纺丝、假捻变形等工序得到具有抗紫外老化功能的聚酯纤维。紫外吸收剂因其特有结构，在吸收紫外线后，氢键断裂发生分子异构，分子内结构发生热振动，氢键破坏，螯合环打开，将吸收的能量以热能或无害的低能辐射释放出来消耗掉。避免了聚酯因吸收紫外线能量，发生光化学分解，导致强度降低，从而达到纤维抗老化效果。

Q: What is the mechanism of aging-resistant polyester fiber?

A: Anti-UV polyester fiber is produced by adding UV absorber (anti-UV agent) to polyester chips that are then processed through melt spinning and false twisting. Due to the unique molecular structure of anti-UV agent, the hydrogen bond of the ultraviolet absorber breaks after absorbing ultraviolet rays and molecular isomerism occurs, and the intramolecular structure undergoes thermal vibration, opening the chelating ring so as to release the absorbed energy as heat or harmless low-energy radiation. This method can avoid the photochemical decomposition of polyester due to the absorption of ultraviolet energy, which results in a decrease in strength, thereby achieving the aging-resistant effect of the fiber.

可追溯性纤维

TRACEABLE FIBER

推荐理由

采用分子追踪技术，即使纺织加工、后道印染，历经千变万化，仍可在终端产品中识别出纤维的前世今生。再生纤维素纤维追溯体系的建立，实现从供应链下游至上游的双向流通，提升整体产业链透明度及可持续发展水平。

Recommendation Reasons

With molecular tracking technology, the origin of the fiber can be identified in the end product regardless of countless changes in textile processing and subsequent processes of printing and dyeing. The establishment of a traceability system for regenerated cellulose fibers enables double-direction circulation from downstream to upstream in the supply chain, and improves the transparency and sustainable development of the overall industrial chain.

推荐品种

· 可追溯性再生纤维素纤维 | 品牌：唐丝

Specific Variety

· Traceable Regenerated Cellulose Fiber | Brand: TangCell



唐丝
TangCell

推荐理由

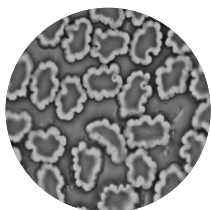
纤维制备过程中加入示踪技术，实现从原材料到终端品牌整体产业链的透明。

Recommendation Reasons

Tracking technology is implemented in the fiber preparation process to realize the transparency of the overall industrial chain from raw materials to terminal brands.



纤维原貌图
Fiber original appearance



纤维横截面图
Fiber cross section

可追溯性再生纤维素纤维

Traceable Regenerated Cellulose Fiber

制备技术

Processing Technology

采用可分子追踪的特殊成分，与纤维素纺丝溶液共混形成均匀分散体系，经湿法纺丝制备。

Special components that can be molecularly traced, are used and blended with cellulose spinning solution to form a uniform dispersion system, so as to prepare the fiber through the wet spinning process.

纤维及制品特点

Characteristics of Fiber and Product

主要规格

短纤：1.33dtex×38mm

标准及认证

《粘胶短纤维》(GB/T 14463-2008)

通过 Oeko-Tex 认证、符合 EU-BAT 标准

生产过程符合 EU-BAT 标准

Main Specifications

Staple fiber: 1.33dtex×38mm

Standards and Certifications

"Viscose staple fiber" (GB/T 14463-2008)

Passed Oeko-Tex certification and complies with EU-BAT standard

The production process complies with EU-BAT standard

纤维性能与制品特点



- 采用特殊成分的分子追踪技术，即使通过纺织品加工过程后，仍可在终端应用中识别原料来源。
- 纤维具有吸湿性好，易于染色，不易起静电，有较好的可纺性特点
- 织物柔软光滑、透气性，穿着舒适，染色后色泽鲜艳、色牢度好

Fiber Performance and Product Features

- Molecular tracking technology is adopted to identify the origin of the raw material in the terminal application even after the textile processing procedures.
- The fiber is hygroscopic, easy to dye, antistatic, and has good spinnability.
- The fabric is soft and smooth, breathable and comfortable to wear, with bright color and good color fastness after dyeing.

产品规格 Specification	干断裂强 (cN/dtex) Breaking tenacity in dry state (cN/dtex)	干断裂伸长率 (%) Breaking elongation in dry state(%)	湿断裂强度 (cN/dtex) Breaking tenacity in wet state (cN/dtex)	湿断裂伸长率 (%) Breaking elongation in wet state(%)	湿模量 (cN/dtex) Wet modulus(cN/dtex)
1.33dtex×38mm	2.5	22	1.4	20	0.26

应用技术

Application Technology

纺纱：可以纯纺，也可以与其他纤维混纺

Spinning: Pure spinning is available or it can be blended with other fibers.

纤维应用

Fiber Application

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	运动服 sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
✓			✓	✓				✓
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
✓								✓
羽绒服 Down jacket	高端成衣 High-end ready-to-wear	帽子 Cap	专业运动服 Professional sportswear					
✓	✓							
家用纺织品 Home textiles								
床上用品 Bedding	窗帘 Curtain	地毯 Carpet	沙发布 Sofa fabric	填充物 Filler	毛巾 Towel	玩具 Toys		
				✓				
产业用纺织品 Industrial textiles								
汽车内饰 Automotive interior	电池隔膜 Battery separator	体育用品 Sporting goods	医用纺织品 Filtration products	卫生纺织品 Sanitary textiles	军用纺织品 Military textiles	特种纸 Special papers	清洁用品 Cleaning supplies	过滤产品 Filtration products
				✓				
消防用品 Fire Supplies	航空航天 Aerospace	户外用品 Outdoor products	建筑增强 Building enhancement	面膜 Masks	口罩 Gauze mask	缆绳 Cable	织带 TAPS	发动机壳体 Motor case
无人机 UAV								

中国纤维流行趋势
CHINA FIBERS FASHION TRENDS

纤/致风尚

FIBER

Leading the Trend

风尚所领，至臻至美。中国纤维洞察消费者的身心感受，捕捉风尚潮流趋势，将极致、专注、创新融入产品每一个环节，通过点、线、面、体、色彩等多维度的技术设计，表达纤维弹性仿真效果。通过静态与动态美学设计结合，满足多场景下多姿伸展的极致需求，让服装与运动同步，开启形随心动的舒适轻松体验；吸取自然灵感，利用仿真技术，超越真实体验，满足消费者追求时尚的同时提供最佳伦理选择，开启消费新时代。

Efforts to lead the trend can reach perfection. China's fiber industry has insight into consumers' physical and spiritual feelings, captures the fashion trends and integrates extremeness, concentration, and innovation into every aspect of its products. Through multi-dimensional technical designs in the aspects of point, line, plane, dimension, and color, the fibers demonstrate great simulative elastic effects. Through the design that combines both static and dynamic aspect of aesthetics, the fibers can meet the various needs of stretching in multiple scenarios, and ensure the clothing accommodates every single movement to create a comfortable and relaxing experience; Drawing inspiration from nature, the fibers apply simulation technology to provide the best ethical choice for customers while satisfying their fashion tastes to create an era of a new trend of consumption.



弹性纤维

ELASTIC FIBER

推荐理由

设计异材质、异截面、异收缩、异功能等多元组合，以复合纺丝、混纤、加弹等工艺为支撑，打造功能性弹性纤维；突破 PBT 纤维熔体直纺技术，提品创效。无氨弹纤维开启随心所欲的运动舒适体验、低熔点氨纶打造随心裁时尚面料……让消费者身随意动，型随心动。

Recommendation Reasons

Functional elastic fiber is created through combinations of varied materials, varied special-shaped cross-sections, varied shrinkage rates and varied functions, and supported by composite spinning, fiber blending, draw texturing or other processing techniques; the breakthrough in PBT fiber melt direct spinning technology has enhanced the quality and production efficiency of the product. Non-spandex elastic fiber provides a comfortable sporting experience, and low-melting spandex fiber creates fashionable fabrics that can be tailored to suit various demands...enabling consumers to enjoy the freedom, comfort and flexibility offered by these products.

推荐品种

- 异组分异收缩全消光聚酯纤维 | 品牌：舒棉弹
- 凉感 PET/PTT 双组份复合纤维 | 品牌：桐昆
- 熔体直纺原液着色 PBT 纤维 | 品牌：海洋天丝纤维
- 低温易粘合氨纶 | 品牌：千禧

Specific Variety

- Heteromorphosis Full-Dull PET Fiber with Foreign Constituents | Brand: SUMITAN
- Cool PET/PTT Bicomponent Composite Fiber | Brand: GOODEN COCK
- Melt Direct Spinning Dope Dyed PBT Fiber | Brand: Oceanles
- Low-Temperature Adhesive Spandex | Brand: QIANXI

舒棉弹 SUMITAN

推荐理由

复合纺丝、混纤与加弹技术的创新结合，提高了纤维差异化水平，纤维棉感优异，市场热度颇高。

Recommendation Reasons

The innovative combination of composite spinning, fiber blending and draw texturing technology has improved the fiber differentiation level. The fiber has excellent cotton-like feeling and is much sought for on the market.

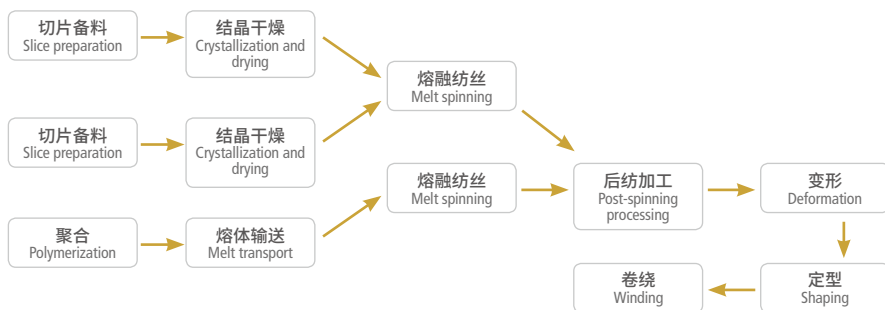
异组分异收缩全消光聚酯纤维

Heteromorphosis Full-Dull PET Fiber with Foreign Constituents

制备技术

Processing Technology

弹性复合纤维与全消光聚酯纤维同时喂入罗拉，经过特殊加弹、变形、定型、卷绕等工序制备。
The elastic composite fiber and the full matting polyester fiber are simultaneously fed into the roller and prepared through special processes such as draw texturing, deformation, shaping, and winding.



制备流程图
Flow Chart of Preparation

纤维及制品特点

Characteristics of Fiber and Product



纤维原貌图
Fiber original appearance

主要规格

长丝：60 ~ 167dtex/53 ~ 152F

标准及认证

《涤纶低弹丝》(GB/T 14460-2008)

纤维性能与制品特点



- 具有优异的弹性，其面料弹力好
- 光泽柔和，触感温暖，仿棉效果优异
- 织物组织紧密、染色均匀

Main Specifications

Filaments: 60~167dtex/53~152F

Standards and Certifications

“Polyester low stretch yarn”
(GB/T 14460-2008)

Fiber Performance and Product Features

- Excellent elasticity and fabrics with good elastic force
- Soft luster, warm touch, excellent cotton-like effect
- The fabric is tightly woven and evenly dyed

产品规格 Specification	断裂强度 (cN/dtex) Breaking tenacity (cN/dtex)	断裂伸长率 (%) Elongation at break (%)	沸水收缩率 (%) Boiling water shrinkage (%)	卷曲收缩率 (%) Crimp shrinkage rate (%)
148dtex/133F	≥ 2.2	≥ 20%	≥ 6.0	≥ 28



应用技术

Application Technology

织造、染色：参照常规聚酯纤维技术参数

Weaving and dyeing: It refers to the technical parameters of conventional polyester fiber.

纤维应用

Fiber Application

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	运动服 sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
✓	✓							
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
羽绒服 Down jacket	高端成衣 High-end ready-to-wear	帽子 Cap	专业运动服 Professional sportswear					

Q&A

Q：异组分异收缩全消光聚酯纤维的性能和优势是什么？

A：该产品具有两种原料成分，一种全消光原料，光泽和触感比普通涤纶仿棉更优异。另一种是弹性复合纤维成份，经过特殊加弹工艺，使得纤维具有优异的弹性，大大地提高了产品的差异性和功能性。其面料染色均匀，棉感细腻，组织紧密，弹力好，特别适合应用在户外、运动服装面料上。

Q: What are the properties and advantages of profiled components and different shrinkage full matting polyester fiber?

A: This product has two raw materials. One is the full matting raw material with better luster and touch feeling than ordinary cotton-like polyester. The other is the elastic composite fiber which has excellent elasticity that greatly improves the product's differentiation and functionality, after a special draw texturing process. The fabric is evenly dyed and tightly woven and has a fine cotton touch feeling with good elasticity, which is particularly ideal for outdoor and sportswear fabrics.



桐昆
GOODEN COCK

推荐理由

该复合纤维的 PTT 组分采用生物基原料，具有可再生性和环保性。纤维具有优异的弹性回复性、抗皱性、易染性和接触凉感性能，竞争优势明显。

Recommendation Reasons

The PTT component of the composite fiber uses bio-based raw materials, which is recyclable and environmentally friendly. The fiber has excellent elasticity, elastic recovery, wrinkle resistance, dyeability and cooling touch, and has obvious competitive advantages.

凉感 PET/PTT 双组份复合纤维

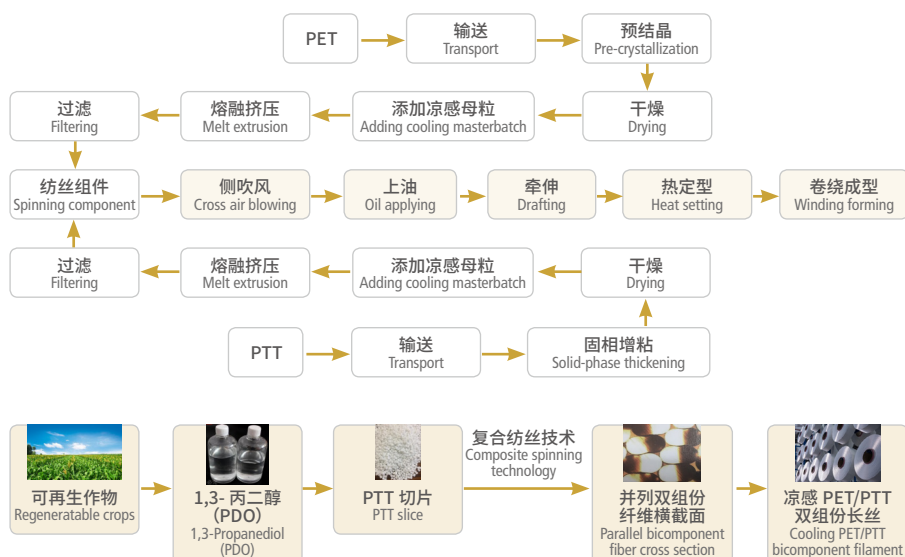
Cool PET/PTT Bicomponent Composite Fiber

制备技术

Processing Technology

采用 PET、PTT 两种组分，并在线添加一定比例的凉感母粒，经复合纺丝技术制成的弹性凉感纤维。由于两种组分不同的收缩性能，使纤维形成永久性的弹簧状卷曲。

Two components of PET and PTT are used to produce the elastic cooling fiber with composite spinning technology by adding a certain proportion of cooling masterbatch online. The different shrinkage properties of the two components offer the fiber a permanent spring-like crimp.



制备流程图
Flow Chart of Preparation

纤维及制品特点

Characteristics of Fiber and Product

主要规格

长丝：55~83dtex/32F

标准及认证

《聚对苯二甲酸丙二醇酯 / 聚对苯二甲酸乙二醇酯 (PTT/PET) 复合牵伸丝》(FZ/T54094-2017)

Main Specifications

Filaments: 55~83dtex/32F

Standards and Certifications

“Polytrimethylene terephthalate/polyethylene terephthalate (PTT/PET) composite drawn yarn” (FZ/T54094-2017)

纤维性能与制品特点



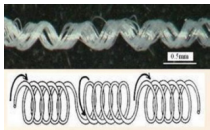
- 生物基原料，绿色环保
- 极佳的卷曲弹性，弹性永久
- 接触凉感
- 易上染，色彩鲜艳
- 面料蓬松柔软、耐污、抗皱、挺括、易打理

Fiber Performance and Product Features

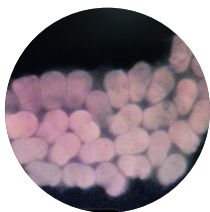
- FBio-based raw materials, green and environmentally friendly
- Excellent crimp elasticity, permanent elasticity
- Cooling touch
- Easy to dye with rich colors
- The fabric is fluffy, soft, stain-resistant, wrinkle-resistant, crisp, and easy to care

产品规格 Specification	断裂强度 (cN/dtex) Breaking tenacity (cN/dtex)	断裂伸长率 (%) Elongation at break (%)	沸水收缩率 (%) Boiling water shrinkage (%)
55 dtex /32F	3.30	32.9	7.0

卷曲弹性收缩率 (%) Crimp elasticity shrinkage rate (%)	含油率 (%) Oil content (%)	网络度 (个 /m) Degree of intertwining (PC/m)
43.1	1.20	19



纤维原貌图
Fiber original appearance



纤维截面图
Fiber cross section view



应用技术

Application Technology

染色：设备采用高温高压松式溢流机，染色温度控制在 110 ~ 120℃左右

定型：建议温度应保持在 160 ~ 170℃，注意纵横向弹性与门幅、克重的变化，可根据工艺定型的需要来制定超喂速度

Dyeing: The high temperature and high pressure loose-stock dyeing machine is adopted, and the dyeing temperature is controlled at 110°C to 120°C .

Setting: It is recommended that the temperature should be maintained at 160 °C to 170 °C , and changes in vertical and horizontal elasticity, width and weight should be paid attention to. The overfeeding speed can be determined according to the needs of setting process.

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	运动服 sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
✓	✓		✓					
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
✓								
羽绒服 Down jacket	高端成衣 High-end ready-to-wear	帽子 Cap	专业运动服 Professional sportswear					

Q&A

Q：凉感 PET/PTT 双组份复合纤维的性能特点和应用情况如何？

A：无弹不成布已经成为目前纤维及面料的流行趋势，人们对穿着弹性和舒适度的要求越来越高。该纤维具有较好的蓬松性、柔软性、自然卷曲弹性，其面料具有吸湿排汗、耐污性、抗皱性等功能，已经在安踏、李宁等知名服装品牌得到广泛应用。

Q: What are the performance characteristics and applications of the cooling PET/PTT bicomponent composite fiber?

A: Elasticity has become a ubiquitous characteristic for fabrics and fibers in the current trend. People have higher and higher requirements for apparel elasticity and comfort. The fiber has good fluffiness, softness and natural crimp elasticity, whose fabric produced is moisture-absorbing, stain-resistant, wrinkle-resistant, etc., and has been widely used in well-known apparel brands such as ANTA and Li-Ning.

熔体直纺原液着色 PBT 纤维

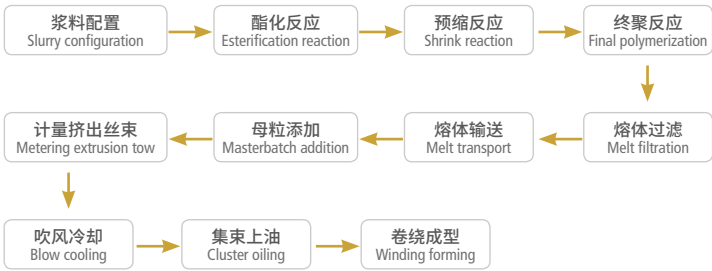
Melt Direct Spinning
Dope Dyed PBT Fiber

制备技术

Processing Technology

以对苯二甲酸和 1,4- 丁二醇为原料，采用钛系催化剂，优化催化剂加入量和加入方式，调控酯化釜回流比，控制酯化率，开发熔体输送系统实施动态协同控制技术，降低熔体粘度的波动，增加在线添加混合系统，实现熔体直纺原液着色 PBT 纤维的制备。

The fiber is produced by using Terephthalic acid and 1,4-Butanediol as raw materials and titanium-based catalysts; through optimizing the addition amount and method of catalyst, the reflux ratio of the esterification kettle is adjusted and the esterification rate is controlled; a melt transport system is developed to implement dynamic and coordinated control technology, thus reducing the fluctuation of melt viscosity, increasing the online addition and mixing system, and realizing the production of PBT melt direct spinning solution-dyed fiber.



制备流程图
Flow Chart of Preparation



海洋天丝纤维
Oceanles

推荐理由

率先在国际上实现了 PBT 纤维熔体直纺技术。该纤维产品品质优良稳定、条干不匀率明显下降、节能降耗效果突出、经济和社会效益显著。

Recommendation Reasons

The product has been a global pioneer in realizing PBT fiber melt direct spinning technology. The fiber product has excellent and stable quality, significantly reduced yarn unevenness, outstanding energy-saving and consumption-reducing effects, as well as significant economic and social benefits.

纤维及制品特点

Characteristics of Fiber and Product

主要规格

长丝：56 ~ 110dtex/24 ~ 48F

标准及认证

《聚对苯二甲酸丁二醇酯（PBT）弹力丝》(FZ/T 54040-2011)

《聚对苯二甲酸丁二醇酯（PBT）弹力丝》(Q/XS 001-2014)

产品通过 Oeko-Tex 认证

Main Specifications

Filaments:56~110dtex/24~48F

Standards and Certifications

“Polybutylene terephthalate (PBT) elastic yarn” (FZ/T 54040-2011)

“Polybutylene terephthalate (PBT) elastic yarn” (Q/XS 001-2014)

Product passed Oeko-Tex certification

纤维性能与制品特点



- 良好的染色性能、色泽鲜艳饱满、耐氯性优良
- 优良的耐化学药品性、耐光性和耐热性
- 色级控制精准、色牢度高，免染整废水排放，绿色环保
- 纤维卷曲性、拉伸弹性和压缩弹性极好且弹性不受湿度的影响
- 其制品手感柔软、尺寸稳定性好、耐磨性好、易打理

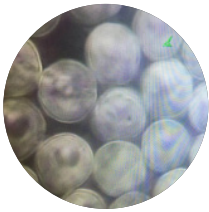
Fiber Performance and Product Features

- Good dyeing performance, bright and full color, excellent chlorine resistance
- Excellent chemical resistance, light resistance and heat resistance
- Precise color grade control, high color fastness, no wastewater discharge from dyeing and finishing, and environmentally friendly
- Excellent fiber crimp, tensile elasticity and compression elasticity, and the elasticity is not affected by humidity.
- The product has a soft feel, good dimensional stability, good wear-resistance, and it is easy to care.

产品规格 Specification	断裂强度 (cN/dtex) Breaking tenacity (cN/dtex)	断裂强度 CV (%) Breaking tenacity CV(%)	断裂伸长率 (%) Elongation at break(%)	断裂伸长率 CV (%) Elongation at break CV(%)
110dtex/48F(黑色)	2.67	2.96	40.8	3.18
75dtex/36F(红色)	3.08	2.60	41.6	3.12
卷曲收缩率 (%) Crimp shrinkage rate (%)	沸水收缩率 (%) Boiling water shrinkage(%)	对应预取向丝的条干不匀率 (%) Yarn unevenness of corresponding pre-oriented yarn(%)		色牢度 (级) Color fastness (Grade)
40.63	5.6	< 1.26		≥ 4
43.82	5.88	< 1.05		≥ 4



纤维原貌图
Fiber original appearance



纤维横截面图
Fiber cross section

应用技术

Application Technology

纱线染色：不建议筒染，可用普通分散染料进行常压沸染，且无需载体

织物染色：建议在 70℃开始上色，由于上染快，与涤纶比要降低升温速度，后整理温度不高于 180℃

Yarn dyeing: tube dyeing is not recommended; atmospheric pressure dyeing is applicable with ordinary dispersivedyes without using carrier.

Fabric dyeing: It is recommended to start dyeing at 70 ℃ . Due to fast coloring, the heating speed should be reduced compared with polyester, and the finishing temperature should not be higher than 180℃ .



纤维应用

Fiber Application

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	运动服 sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
	✓					✓		
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
		✓			✓			
羽绒服 Down jacket	高端成衣 High-end ready-to-wear	帽子 Cap	专业运动服 Professional sportswear					
			✓					
产业用纺织品 Industrial textiles								
汽车内饰 Automotive interior	电池隔膜 Battery separator	体育用品 Sporting goods	医用纺织品 Filtration products	卫生纺织品 Sanitary textiles	军用纺织品 Military textiles	特种纸 Special papers	清洁用品 Cleaning supplies	过滤产品 Filtration products
			✓					
消防用品 Fire Supplies	航空航天 Aerospace	户外用品 Outdoor products	建筑增强 Building enhancement	面膜 Masks	口罩 Gauze mask	缆绳 Cable	织带 TAPS	发动机壳体 Motor case
无人机 UAV								

纤致风尚
LEADING THE TREND

Q&A

Q：熔体直纺 PBT 纤维与常规切片纺 PBT 纤维相比，优势有哪些？

A：熔体直纺 PBT 纤维与常规切片纺 PBT 纤维相比，省略了造粒、干燥、包装、运输、再干燥、熔融等环节，综合能耗下降 45.2%。此外，熔体直纺 PBT 纤维均匀性更好，预取向丝的条干不匀率低于 1.2%，具有成本低、质量更加稳定的优势。

Q: What are the advantages of melt direct spinning PBT fiber compared with conventional chip spinning PBT fiber?

A: Compared with conventional chip spinning PBT fiber, melt direct spinning PBT fiber omits the steps of pelletizing, drying, packaging, transporting, re-drying, melting, etc., and the overall energy consumption is reduced by 45.2%. In addition, melt direct spinning PBT fiber has better uniformity, and the yarn unevenness of pre-oriented yarn is less than 1.2%, having the advantages of low cost and more stable quality.



千禧
QIANXI

推荐理由

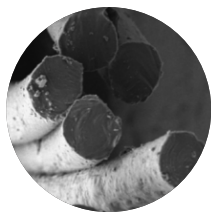
具有低温熔融粘着特点，在织物中形成粘结点，增加终端制品的强度。

Recommendation Reasons

The product has the characteristics of low-temperature melting and adhesion, thus forming bonding points in the fabric and increasing the strength of the final product.



纤维原貌图
Fiber original appearance



纤维截面图
Fiber cross section

低温易粘合氨纶

Low-Temperature Adhesive Spandex

制备技术

Processing Technology

使用特殊的聚合原料及功能助剂，对聚合工艺、纺丝工艺进行创新性改变，降低氨纶熔点，使其具有低温熔融特点。

Special polymerization materials and functional additives are used to make innovative changes to the polymerization process and spinning process, reduce the melting point of spandex and render it with low temperature melting property.

纤维及制品特点

Characteristics of Fiber and Product

主要规格

长丝：18D

标准及认证

《功能型氨纶长丝》(Q/HFA 102-2020)

Main Specifications

Filaments: 18D

Standards and Certifications

"Functional spandex filament" (Q/HFA 102-2020)

纤维性能与制品特点



- 弹性优异，伸长率高，应力低
- 熔融温度低，氨纶丝的编织相交点易形成粘结点
- 提高织物使用寿命和美观度

Fiber Performance and Product Features

- Excellent elasticity, high elongation, low stress
- The melting temperature is low, and the woven intersection point of the spandex yarn is easy to form a bonding point.
- Improve fabric service life and beauty

产品规格 Specification	断裂强度 Breaking tenacity (cN/dtex)	断裂伸长率 (%) Elongation at break(%)	300% 伸长时强度 (cN/dtex) 300% elongation tenacity (cN/dtex)	热粘合力 (cN) Thermal adhesion (cN)	热粘合温度 (°C) Product specification(°C)	热粘合时间 (s) Heat adhesive time(s)
18D	≥ 1.0	520±40	≥ 0.25	≥ 0.40	≤ 125	≤ 30

应用技术

Application Technology

包纱：牵伸倍数 ≤ 2.5，捻度 1500-1800，定型蒸汽温度 ≤ 125℃，热处理时间 ≤ 30s

Core-spun yarn: drafting ratio ≤2.5, twist 1500-1800, setting steam temperature ≤125℃ , heat treatment time ≤30s.

纤维应用

Fiber Application

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	运动服 sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
✓	✓							
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
✓		✓						
羽绒服 Down jacket	高端成衣 High-end ready-to- wear	帽子 Cap	专业运动服 Professional sportswear					



纤致风尚
LEADING THE TREND

Q&A

Q：该纤维与常规氨纶相比，特点和优势是什么？

A：该产品具有常规氨纶的性能优点，通过聚合改性，还具有低温熔融粘着的特点，使织物上氨纶丝的编织相交处被熔融粘结，形成网状分布的粘结点，该粘结点能够阻止破洞扩大、脱丝，从而达到防脱散的效果，提高织物使用寿命和美观度。

Q: Compared with conventional spandex, what are the characteristics and advantages of this fiber?

A: This product has the performance advantages of conventional spandex. Through polymerization modification, it also has the characteristics of low-temperature melting adhesion, so that the woven intersections of spandex yarns on the fabric are melted and bonded to form a network of bonding points, which can prevent enlargement of holes and yarns pulling off, thereby making the fabric run-resistant and improving the service life and beauty of the fabric.

仿真纤维

SIMULATED FIBER

推荐理由

仿真纤维从视觉、触觉等多角度无限接近自然属性，演绎棉花触感、皮草视感、羊毛暖感……材料的科技创新为时尚服装、舒馨家纺、多元产业用等领域提供最佳伦理选择，点缀时尚的灵动与活力，刷新消费者体验。

Recommendation Reasons

The imitated fiber is very much similar to natural fibers from multiple angles such as vision and touch, offering the touch of cotton, the vision of fur, the warmth of wool... The technological innovation of materials provides the best ethical choice for fashion clothing, cozy home textiles, and multiple industrial applications, generating new inspiration and vitality for fashion and offering consumers a brand-new experience.

推荐品种

- 全消光聚酯仿棉纤维 | 品牌：凤逸棉
- 仿皮草用异形循环再利用聚酯纤维 | 品牌：龙杰
- 仿马海毛聚丙烯腈纤维 | 品牌：马海腈纶
- 车内饰专用原液着色仿毛 PBT/PET 复合纤维 | 品牌：旷达

Specific Variety

- Full-Dull Cotton-like PET Fiber | Brand: Phoenix cotton
- Fur-like Regenerated Special-shaped PET Fiber | Brand: Loo Gee
- Mohair-like Polyacrylonitrile Fiber | Brand: Mohair Acrylic
- Dope-Dyed Wool-like PBT/PET Fiber Composite for Car Interiors | Brand: KDTECH



凤逸棉
Phoenix cotton

全消光聚酯仿棉纤维

Full-Dull Cotton-like PET Fiber

制备技术

Processing Technology

采用原位共聚和熔体直纺技术，卷绕采用高速纺丝工艺（3400m/min 以上），一步法生产低伸长、高强度 POY 全消光产品。

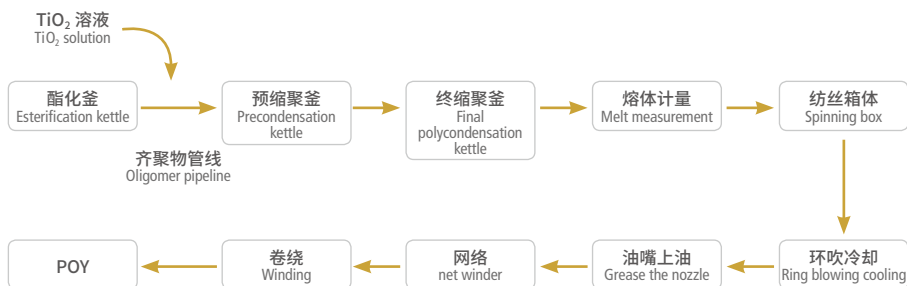
In-situ copolymerization and melt direct spinning technology are adopted, high-speed spinning process (above 3,400m/min) is used in winding, and low elongation, high strength POY full-matting products are produced through a one-step approach.

推荐理由

采用原位聚合技术，实现高浓度 TiO_2 的均匀、稳定添加，从手感、光泽上实现仿棉。

Recommendation Reasons

In-situ polymerization technology is adopted to realize uniform and stable addition of high-concentration TiO_2 , producing cotton-like touch and gloss.



制备流程图
Flow Chart of Preparation

纤维及制品特点

Characteristics of Fiber and Product

主要规格

长丝：72dtex/72F（POY）

标准及认证

《全消光涤纶预取向丝》
(FZ/TZ54106-2018 执行)
已经通过 Oeko-Tex 认证

纤维性能与制品特点



- 强度高、低伸长
- 光泽柔和，触感似棉



纤维原貌图
Fiber in original appearance

Main Specifications

Filaments: 72dtex/72F(POY)

Standards and Certifications

“Full matting polyester pre-oriented yarn”
(Executed FZ/TZ54106-2018 standard)
Passed Oeko-Tex certification

Fiber Performance and Product Features

- High strength, low elongation
- Elegant gloss, cotton-like touch

产品规格 Specification	断裂强度 (cN/dtex) Breaking tenacity (cN/dtex)	断裂强度变异系数 (%) Variation coefficient of breaking strength(%)	断裂伸长率 (%) Elongation at break(%)	断裂伸长率变异系数 (%) Variation coefficient of elongation at break(%)	条干 CV (%) Yarn CV(%)	含油率 (%) Oil content(%)
72dtex/72F	3.1	3.2	98	3.5	1.2	0.68



应用技术

Application Technology

加弹：合股使用，一般采用全消光聚酯仿棉 POY 和 FDY 合股使用，特殊加弹工艺让产品手感、风格像棉。

Draw texturing: Generally, twisted fiber is used to produce cotton-likefull-matting polyester POY and FDY. The special draw texturing process gives the product cotton-like style and touch.

纤维应用

Fiber Application

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	运动服 sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
			✓					
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
✓						✓		
羽绒服 Down jacket	高端成衣 High-end ready-to-wear	帽子 Cap	专业运动服 Professional sportswear					
家用纺织品 Home textiles								
床上用品 Bedding	窗帘 Curtain	地毯 Carpet	沙发布 Sofa fabric	填充物 Filler	毛巾 Towel	玩具 Toys		
✓					✓			
产业用纺织品 Industrial textiles								
汽车内饰 Automotive interior	电池隔膜 Battery separator	体育用品 Sporting goods	医用纺织品 Filtration products	卫生纺织品 Sanitary textiles	军用纺织品 Military textiles	特种纸 Special papers	清洁用品 Cleaning supplies	过滤产品 Filtration products
							✓	
消防用品 Fire Supplies	航空航天 Aerospace	户外用品 Outdoor products	建筑增强 Building enhancement	面膜 Masks	口罩 Gauze mask	缆绳 Cable	织带 TAPS	发动机壳体 Motor case
无人机 UAV								

Q&A

Q：全消光聚酯仿棉纤维的应用特点及开发意义？

A：全消光聚酯仿棉纤维主要用于复合高支仿棉和 FDY 合股，采用特殊加弹工艺，让合股仿棉产品的物理指标、手感、风格接近纺棉纱。仿棉技术和仿棉产品的开发，有利于增加仿棉面料产量，减少棉花种植面积，提升粮食作物种植率，保障国民粮食安全。

Q: What are the application characteristics and significance of fully matting polyester cotton-like?

A: The cotton-like full-matting polyester fiber is mainly used for composite high-count cotton-like fibers. Twisted with FDY, it adopts a special draw texturing process to make the physical indicators, touch and style of the twisted cotton-like products similar to cotton yarns. The development of cotton-like technology and cotton-like products will help increase the output of cotton-like fabrics, reduce cotton planting area, increase the planting rate of grain crops, and ensure national food security.



龙杰
Loo Gee

推荐理由

引领仿皮草纤维向着循环再生、节能环保方向发展，符合目前环保概念的流行趋势。

Recommendation Reasons

It leads the development of imitation fur fiber towards the direction of recycling, energy saving and environmental protection, which is in line with the current trend of environmental protection concept.

仿皮草用异形循环再利用 聚酯纤维

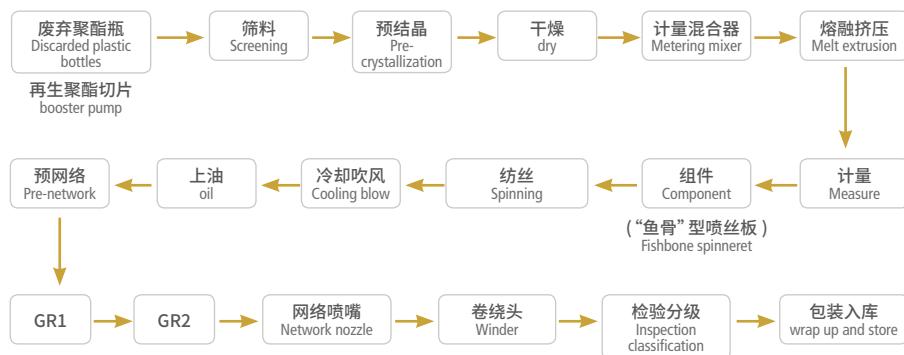
Fur-like Regenerated Special-shaped PET Fiber

制备技术

Processing Technology

以废弃聚酯瓶再生聚酯为原料，经筛料、预结晶、干燥、熔融、计量等工序后从自主设计的鱼骨形特殊孔型喷丝板喷出，再经过侧吹风冷却、上油、卷绕而制得。

Regenerated polyester from waste plastic bottles as the raw material is spinning from self-designed fishbone-shaped special hole spinneret after sieving, pre-crystallization, drying, melting, and metering, and then by cross air blasting, Oiling and winding.



制备流程图
Flow Chart of Preparation

纤维及制品特点

Characteristics of Fiber and Product

主要规格

长丝：83dtex/36F、72dtex/24F

标准及认证

《仿生涤纶异形牵伸丝》
(Q/320582 LJT7-2016)

纤维性能与制品特点



- 再生资源，绿色环保
- “鱼骨状”截面，纤维具有持久的弹性
- 仿真度高、光泽柔和、手感顺滑
- 耐磨、抗拉伸性能好，织物清洁、保养方便、易打理

产品规格 Specification	断裂强度 (cN/dtex) Breaking tenacity (cN/dtex)	断裂伸长率 (%) Elongation at break(%)
83dtex/36F	≥ 2.15	40.3
沸水收缩率 (%) Boiling water shrinkage(%)		含油率 (%) Oil content(%)
4.2		1.63



纤维原貌图
Fiber original appearance



“鱼骨”形横截面
"Fishbone-shaped" cross-section

Main Specifications

Filaments: 83dtex/36F,72dtex/24F

Standards and Certifications

“Bionic dacron profiled drawn yarn”
(Q/320582 LJT7-2016)

Fiber Performance and Product Features

- Renewable resources with green and environmentally-friendly features
- "Fishbone-shaped" cross-section. The fiber has certain elasticity and persistence
- High simulation, soft luster, and smooth hand feeling
- Good wear and tensile resistance, cleanliness of textile, and convenient care and maintenance

应用技术

Application Technology

后整理：无需添加消光剂、软化剂等改善仿皮草纤维光泽和手感的后整理剂。

After-finishing: there is no need to add matting agent, softener and other after-finishing agents used to improve the luster and hand feeling of imitation fur fiber.



纤维应用

Fiber Application

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	运动服 sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
✓			✓					
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
	✓		✓					
羽绒服 Down jacket	高端成衣 High-end ready-to-wear	帽子 Cap	专业运动服 Professional sportswear					
	✓							
家用纺织品 Home textiles								
床上寝具 Bedding	窗帘 Curtain	地毯 Carpet	沙发布 Sofa fabric	填充物 Filler	毛巾 Towel	玩具 Toys		
		✓				✓		
产业用纺织品 Industrial textiles								
汽车内饰 Automotive interior	电池隔膜 Battery separator	体育用品 Sporting goods	医用纺织品 Filtration products	卫生纺织品 Sanitary textiles	军用纺织品 Military textiles	特种纸 Special papers	清洁用品 Cleaning supplies	过滤产品 Filtration products
✓								
消防用品 Fire Supplies	航空航天 Aerospace	户外用品 Outdoor products	建筑增强 Building enhancement	面膜 Masks	口罩 Gauze mask	缆绳 Cable	织带 TAPS	发动机壳体 Motor case
无人机 UAV								



Q：该纤维制备过程中，采用的节能减排理念和措施，你了解吗？

A：首先，采用废弃聚酯瓶再生聚酯为原料，减少对石油资源的依赖，实现废弃塑料瓶的高价值利用；其次，采用高速一步法纺丝技术，纺速可达 5000m/min，降低产品单位能耗；最后，使用特制喷丝板和特殊工艺，在保证高仿真度的同时避免了消光剂、软化剂等后整理剂的使用，减轻了后道企业污水排放的压力，提高清洁生产水平。该纤维目前在 ZARA、宜家、H&M 等终端品牌上得到推广应用。

Q: Do you know the concept and measures of energy conservation and emission reduction used in the preparation of this fiber?

A: Firstly, regenerated polyester from waste plastic bottles is used as the raw material to reduce the dependence on oil resources and realize the high-value utilization of waste plastic bottles; secondly, high-speed one-step spinning technology is adopted to achieve the spinning speed of 5,000 m/min and reduce the unit energy consumption of products; finally, the use of special spinneret and special process avoids the use of after-finishing agents such as matting agents and softeners while ensuring high simulation, so as to reduce the pressure of sewage discharge from enterprises in the subsequent process, and improve the level of cleaner production. At present, the fiber has been popularized and applied in ZARA, IKEA, H&M and other terminal brands.



吉林化纤
JL FIBER

马海腈纶
Mohair Acrylic

仿马海毛聚丙烯腈纤维

Mohair-like Polyacrylonitrile Fiber

制备技术

Processing Technology

采用 DMAC 湿纺两步法，利用特殊工艺生产具有马海毛特性的腈纶纤维。

Acrylic fiber with the characteristics of mohair is produced by two-step of DMAC wet spinning method with special process.

推荐理由

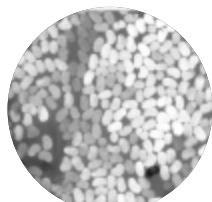
腈纶仿马海毛，风格独特，可部分替代马海毛，供高端服饰

Recommendation Reasons

Acrylic imitated mohair, with unique style, can partially replace mohair for high-end clothing.



纤维原貌图
Fiber original appearance



纤维截面图
Fiber cross section

纤维及制品特点

Characteristics of Fiber and Product

主要规格

短纤：12.2dtex×102mm

标准及认证

《腈纶短纤维和丝束》(GBT 16602-2008)

Main Specifications

Staple fiber: 12.2dtex×102mm

Standards and Certifications

"Acrylic staple fiber and tow "(GBT 16602-2008)

纤维性能与制品特点



- 表面光滑，光泽闪亮
- 极强的回弹性和蓬松感
- 卷曲数少，酷似幼羔马海毛，仿天然马海毛风格
- 染料亲和力强色彩鲜艳

Fiber Performance and Product Features

- Smooth surface with shiny luster
- Excellent resilience and fluffiness
- Few crimps, looking like lamb mohair and imitating natural mohair style
- Strong dye affinity and bright colors

产品规格 Specification	断裂强度 (cN/dtex) Breaking tenacity (cN/dtex)	断裂强度 CV (%) Breaking tenacity CV(%)	断裂伸长率 (%) Elongation at break (%)	断裂伸长率 CV (%) Elongation at break CV(%)	沸水收缩率 (%) Boiling water shrinkage(%)
12.2dtex×102mm	2.6	13	37	11	3

应用技术

Application Technology

染整：染色温度 90~130℃升温染色

Dyeing and finishing: dyeing temperature is 90-130°C of heating dyeing





纤维应用

Fiber Application

服装用纺织品 Clothing textiles								
休闲服 Leisure wear	运动服 sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
								✓
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
羽绒服 Down jacket	高端成衣 High-end ready-to-wear	帽子 Cap	专业运动服 Professional sportswear					
		✓						
家用纺织品 Home textiles								
床上寝具 Bedding	窗帘 Curtain	地毯 Carpet	沙发布 Sofa fabric	填充物 Filler	毛巾 Towel	玩具 Toys		
						✓		

Q&A

Q：你了解马海毛吗？

A: 马海毛指安哥拉山羊身上的被毛，又称安哥拉山羊毛，得名于土耳其语，意为“最好的毛”。其形态与长羊毛相似，纤维表面光滑、光泽较强、强度高、弹性好、卷曲少、易于洗涤，不仅是制造长毛绒织物的优良原料，也是目前世界市场上高级的动物纺织纤维原料之一。可用于提花毛毯、长毛大衣呢以及高光泽的毛织物。

Q: Do you know mohair?

A: Mohair refers to the coat of Angora goats, also known as Angora goat hair, which is named after the Turkish word meaning "the best hair". Its shape is similar to that of long wool, with smooth surface, strong luster, high strength, good elasticity, less crimp and easy washing. It is not only an excellent raw material for manufacturing plush fabrics, but also one of the advanced animal textile fiber raw materials in the world market. It can be used in jacquard blankets, long wool overcoats and high-luster wool fabrics.



旷达
KDTech

推荐理由

粗旦仿毛双组分复合纤维，结合原液着色技术，开发汽车内饰专用定制化产品。

Recommendation Reasons

Coarse denier wool-like bi-component composite fiber, combined with dope-dyed technology, is used to develop customized products for automotive interiors.

主要规格

长丝：556 ~ 1111dtex / 146 ~ 288F

标准及认证

《空变丝标准》(Q/320412KDF001-2016)

纤维性能与制品特点



Fiber Performance and Product Features

- Three-dimensional crimp, with strong elongation and fluffiness
- High color fastness and green environment protection realized by using solution dyed technology
- Soft, fluffy, and moderately flexible hand feel of the fabric with a great decorative effect

车内饰专用原液着色仿毛 PBT/PET 复合纤维

Dope-Dyed Wool-like PBT/PET Fiber Composite for Car Interiors

制备技术

Processing Technology

采用原液着色在线添加技术，将熔点较低的PBT与PET材料先经复合纺丝，再结合空气变形后纺工艺及芯纱加湿工艺制备而成。

By using dope dyed on-line addition technology, it is prepared by the procedures that PBT with lower melting point and PET materials are subject to composite spinning firstly, and then combined with air deformation post-spinning process and core yarn humidification process.

纤维及制品特点

Characteristics of Fiber and Product



纤维原貌图
Fiber original appearance

Main Specifications

Filaments: 556~1111dtex / 146~288F

Standards and Certifications

"Air-jet textured filament standard"
(Q/320412 KDF001-2016)

- 三维立体卷曲，具有很强的延伸性，蓬松性好
- 采用原液着色技术，色牢度高，绿色环保
- 织物柔软蓬松、弹性适中的手感，极具装饰效果

产品规格 Specification	断裂强度 (cN/dtex) Breaking tenacity (cN/dtex)	断裂伸长率 (%) Elongation at break (%)	含油率 (%) Oil content(%)	沸水收缩率 (%) Boiling water shrinkage(%)	色牢度 (级) Color fastness (Grade)
850dtex/192F	> 0.8	20±7	1.0±0.5	2~9	≥ 4 级

应用技术

Application Technology

针织：采用针织横机技术，针型选用 3、5、7 针，度目选用 40 针

筒染：染色温度 130℃，时间 30min，升温速率 1℃ /min

定型：建议温度 150℃，速度 20m/min

Knitting: using flat knitting machine (3, 5 and 7 needles for needle type, and 40 needles for mesh size)

Bobbin dyeing: dyeing temperature (130℃), time (30min), heating rate (1℃ /min)

Shaping: recommended temperature (150℃), speed (20m/min)



服装用纺织品 Clothing textiles								
休闲服 Leisure wear	运动服 sportswear	安全防护服 Safety protection suit	家居服 Home wear	婴儿服 Baby clothes	西装 Suit	牛仔服 Jeans	工装 Overalls	毛衣 Sweater
✓			✓					✓
贴身内衣 Lingerie	围巾 Scarf	袜子 Sock	鞋材 Shoe materials	箱包 Luggage	泳衣 Swimsuit	衬衣 Shirt	婚纱 Wedding dress	服装里料 Garment lining
羽绒服 Down jacket	高端成衣 High-end ready-to-wear	帽子 Cap	专业运动服 Professional sportswear					

产业用纺织品 Industrial textiles								
汽车内饰 Automotive interior	电池隔膜 Battery separator	体育用品 Sporting goods	医用纺织品 Medical textiles	卫生纺织品 Sanitary textiles	军用纺织品 Military textiles	特种纸 Special papers	清洁用品 Cleaning supplies	过滤产品 Filtration products
✓								
消防用品 Fire Supplies	航空航天 Aerospace	户外用品 Outdoor products	建筑增强 Building enhancement	面膜 Masks	口罩 Gauze mask	缆绳 Cable	织带 TAPS	发动机壳体 Motor case
无人机 UAV								

Q&A

Q：该纤维的加工技术和纤维特点是什么？

A：汽车、火车、飞机等内饰用纤维的总旦数高（850dtex/216F），对纤维的色牢度、耐摩擦性能要求高，因此在纺丝过程中需要对两组分进行调试，确保冷却均匀，空气变形过程中严格控制超喂和张力，保证形成的纤维具有良好的弹性和毛圈效果。

Q: What are the processing technology and characteristics of the fiber?

A: The total denier count of fibers used for interior decoration of automobiles, trains, aircraft, etc. is high (850dtex/216F), which requires high color fastness and friction resistance of the fiber. Therefore, it is necessary to debug the two components in the spinning process to ensure uniform cooling, strictly control the overfeeding and tension in the air deformation process, and ensure that the formed fibers have good elasticity and terry effect.

中国纤维流行趋势
CHINA FIBERS FASHION TRENDS

纤/创未来

FIBER

Creating the Future

创领未来，品质塑造。中国纤维勇攀高峰，挑战装备加工和纤维性能极限。突破超高强度碳纤维高品质制备技术，中模高强碳纤维预浸料制备工艺愈加成熟稳定。高性能碳纤维材料全方位渗透到民用大型飞机、无人机、固体发动机等领域，为工程制造提升革命性动力。聚酯工业丝、高强高模维纶性能与功能更上一层楼，为交通防护、特殊用纸领域注入新活力。中国纤维用科学、智慧、创新引领未来。

High-quality innovation can lead and create the future. China's fiber industry bravely challenges the limits of equipment processing and fiber performance. Breakthroughs have been made in the high-quality preparation technology of ultra-high-strength carbon fiber, and the preparation process of middle-modulus high-strength carbon fiber prepreg has become more mature and stable. High-performance carbon fiber materials have been introduced to the fields of large civil aircraft, unmanned aerial vehicles, solid engines and other fields in all aspects, enhancing the revolutionary new power of engineering and manufacturing. The performance and function of polyester industrial yarn and high-strength and high-modulus vinylon have been further improved, infusing new vitality into the fields of traffic protection and special paper. China's fiber industry is creating the future with science, wisdom and innovation.



产业用高强纤维

HIGH STRENGTH TECHNICAL FIBER

推荐理由

没有最强，只有更强。在固相增粘、凝胶纺丝工艺上升级，挑战纤维的加工及性能极限，提高纤维强度、韧性、耐候性、耐晒性，使纤维性能与功能更上一层楼，对接交通防护、证券用纸等领域新应用。

Recommendation Reasons

There is no strongest fiber, but only stronger fiber. It is upgraded in the process of solid-phase tackifying and gel spinning to challenge the processing and performance limits of fibers, and improve fiber strength, toughness, weatherability, and sunlight resistance, thus further improving fiber performance and function, and connecting new applications in the fields of traffic protection and security paper.

推荐品种

- 原液着色黑色高强聚酯工业丝 | 品牌：尤夫
- 细旦高强高模聚乙烯醇纤维 | 品牌：皖维

Specific Variety

- Dope-Dyed Black High Strength Polyester Industrial Yarn | Brand: UNIFULL
- High Strength and High Modulus Fine Denier Polyvinyl Alcohol Fiber | Brand: WANWEI

原液着色黑色高强聚酯工业丝

Dope-Dyed Black High
Strength Polyester
Industrial Yarn

制备技术

Processing Technology

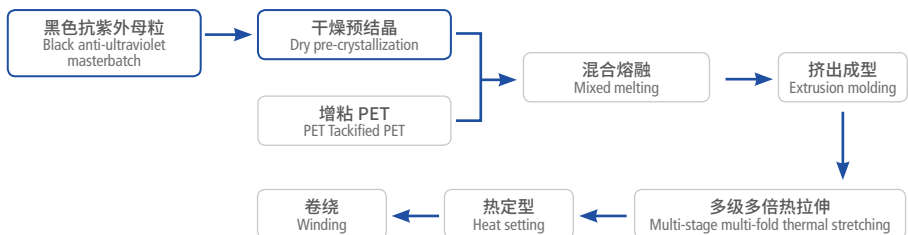
通过固相增粘改进技术制备熔体分子量分布均匀、分子链排列整齐的高粘聚酯切片，然后与原液着色黑色抗紫外母粒共混，经熔融纺丝制备。High-viscosity polyester slices with uniform melt molecular weight distribution and neatly arranged molecular chains are prepared by solid-phase tackifying technology, and then blended with solution dyed black UV-resistant master batch and finally prepared by melting spinning.

推荐理由

兼顾了高强聚酯工业丝的力学性能、尺寸稳定性、柔韧性、耐环境性和耐紫外老化性，在安全防护产品的减重轻量化方面具有突出优势。

Recommendation Reasons

It combines the mechanical properties, dimensional stability, flexibility, environmental resistance and UV aging resistance of high-strength polyester industrial yarn, and has outstanding advantages in weight loss and lightweight of safety protection products.



制备流程图
Flow chart of preparation

纤维及制品特点

Characteristics of Fiber and Product

主要规格

工业丝: 1100 ~ 3300dtex/192 ~ 384F

标准及认证

《涤纶工业长丝》(GBT 16604-2017)

纤维性能与制品特点



- 强度高
- 耐环境性、抗紫外老化性能良好
- 原液着色技术、色牢度高、绿色环保



纤维原貌图
Fiber original appearance

Main Specifications

Industrial yarn: 1100~3300dtex/192~384F

Standards and Certifications

“Dacron industrial filament” (GBT 16604-2017)

Fiber Performance and Product Features

- High strength
- Good environmental resistance and UV aging resistance
- Dope dyed technology, with high color fastness, and environmental protection property

产品规格 Specification	断裂强度 (cN/dtex) Breaking tenacity (cN/dtex)	断裂强力变异系数 (%) Coefficient of variation of breaking tenacity (%)	断裂伸长率 (%) Elongation at break (%)	断裂伸长率变异系数 (%) Coefficient of variation of elongation at break (%)	含油率 (%) Oil content (%)
1100dtex/192F	8.03	0.75	14.28	1.53	0.62

色牢度 Color fastness (Grade)	干热收缩率 (%) (177°C 2min 0.05cN/dtex) Dry-hot shrinkage (%) (177°C 2min 0.05cN/dtex)	连续紫外老化强度保持率 (%) (1.2w/m ² /nm, 500h) Continuous UV aging strength retention rate (%) (1.2w/m ² /nm, 500h)	人工气候紫外老化强度保持率 (%) (1.2w/m ² /nm, 504h) Artificial climate UV aging strength retention rate (%) (1.2w/m ² /nm, 504h)
4-5	6.9	57.18	89.88



应用技术

Application Technology

参照常规高强聚酯工业丝

Refer to conventional high-strength polyester industrial yarn

纤维应用

Fiber Application

产业用纺织品 Industrial textiles								
汽车内饰 Automotive interior	电池隔膜 Battery separator	体育用品 Sporting goods	医用纺织品 Filtration products	卫生纺织品 Sanitary textiles	军用纺织品 Military textiles	特种纸 Special papers	清洁用品 Cleaning supplies	过滤产品 Filtration products
✓					✓			
消防用品 Fire Supplies	航空航天 Aerospace	户外用品 Outdoor products	建筑增强 Building enhancement	面膜 Masks	口罩 Gauze mask	缆绳 Cable	织带 TAPS	发动机壳体 Motor case
		✓	✓			✓	✓	
无人机 UAV								

Q&A

Q：紫外线对人体有何影响，抗紫外的机理是什么？

A：太阳中的紫外线波长越长，透入皮肤的深度越大，能级较高的光子流能引起细胞内的核蛋白和部分酶变性，从而对皮肤造成不同程度的伤害，严重的甚至会引起各种皮肤病变。

抗紫外剂主要分无机类和有机类，无机类抗紫外剂主要是利用无机物质对入射波长有良好的折射、反射、散射性能来达到防紫外线的目的；原液着色黑色高强工业丝采用有机类抗紫外剂，通过吸收紫外线并将紫外线转换为低能量的热能或波长较长的电磁波，从而达到防紫外辐射的目的。

Q: What is the effect of UV light on the human body and what is the mechanism of anti-UV?

A: The longer the ultraviolet wavelength in the sun, the deeper the penetration into the skin is. The higher the energy level photon flow energy can cause the denaturation of nuclear protein and some enzymes in the cells, thus causing different degrees of damage to the skin, and even causing various skin lesions in severe cases.

Anti-UV agents are mainly divided into inorganic and organic types. Inorganic anti-UV agents mainly use inorganic substances' good refractive, reflective and scattering properties to the incident wavelength to achieve the purpose of anti-UV; the dope dyed black high-strength industrial yarn uses organic anti-UV agents to achieve the purpose of anti-UV radiation by absorbing UV and converting UV into low-energy thermal energy or electromagnetic wave with wavelength.



WANWEI
皖维

皖维
WANWEI

推荐理由

差异化小品种，竞争力强，通过技术革新，与下游市场精准对接。

Recommendation Reasons

Small differentiated varieties with strong competitiveness realize the accurate docking with downstream markets by technical innovation.

细旦高强高模聚乙烯醇纤维

High Strength and High Modulus Fine Denier Polyvinyl Alcohol Fiber

制备技术

Processing Technology

采用含硼凝胶湿法纺丝工艺，经纺丝原液配制、凝固成型、湿热拉伸、干燥定型制成。

It is prepared by spinning solution preparation, solidification, hot-wet drawing and drying with the process of wet spinning containing boron.

纤维及制品特点

Characteristics of Fiber and Product

主要规格

短纤：0.56~1.1dtex×3~12mm

标准及认证

《高强高模聚乙烯醇超短纤维》(Q/WW 02.002-2018)

通过 ISO 9001、ISO 14001、OHSAS 18001 认证

Main Specifications

Staple fiber: 0.56~1.1dtex×3~12mm

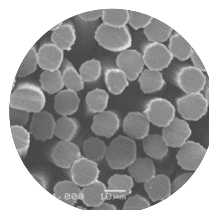
Standards and Certifications

"High-strength and high-modulus polyvinyl alcohol ultrashort fiber "(Q/WW 02.002-2018)

Passed ISO 9001,ISO 14001,OHSAS 18001 certification



纤维原貌图
Fiber original appearance



纤维截面图
Fiber cross section



纤维性能与制品特点



- 细旦纤维，比表面积大
- 纸张的柔软性、湿抗强度提高，整体品质提升

Fiber Performance and Product Features

- Fine denier fibers with a large specific surface area
- Improved softness, anti-wet strength and overall quality of the paper

产品规格 Specification	拉伸强度 (cN/dtex) Tensile strength (cN/dtex)	断裂伸长 (%) Elongation at break(%)	弹性模量 (cN/dtex) Elastic modulus(cN/dtex)	初熔温度 (°C) Initial melting temperature(°C)
1.1dtex×12mm	≥ 12.5	5~8	≥ 280	≥ 105

应用技术

Application Technology

先将木浆用疏解器疏解，并将木浆磨至一定转数后，加入细旦高强高模聚乙烯醇纤维，继续磨至已设定好的总转数。磨浆浓度为 10%。纤维使用量占浆料重量的 6% 左右。

Firstly, the wood pulp is defibered with the fluffer machine. And after the wood pulp is ground to a certain number of revolutions, fine denier high-strength and high-modulus polyvinyl alcohol fiber is added and the grinding is continued to a set total number of revolutions. The grinding concentration is 10%. The amount of fiber used is about 6% of the pulp weight.

纤维应用

Fiber Application

用于证券用纸、药品包装。

It is used for securities paper and drug packaging.



Q&A

Q：细旦高强高模聚乙烯醇纤维的应用特点是什么？

A：细旦高强高模聚乙烯醇纤维的比表面积较大，亲水性好，在造纸过程中少量添加该纤维后可以大幅提高成纸后纤维间的氢键作用力，使纸张的张力增大、过滤性和柔软性提高，特别是湿抗强度、断裂强度增加，在 95℃热水中收缩率可控制在 1.5% 以下，整体上提高成品纸张的品质。

Q: What are the application characteristics of fine denier high-strength and high-modulus polyvinyl alcohol fiber?

A: The specific surface area of fine denier high-strength and high-modulus polyvinyl alcohol fiber is large with good hydrophilicity. After adding a small amount of this fiber in the papermaking process, the hydrogen bond force between the fibers after papermaking can be greatly increased, so as to improve the tension of the paper, the filtration and softness. Especially, the wet resistance strength and breaking strength increase. The shrinkage rate can be controlled below 1.5% in hot water at 95℃, thus improving the quality of the finished paper as a whole.

Q：其他的维纶产品及应用，您了解吗？

A：水溶性聚乙烯醇纤维，广泛运用于家纺领域及医疗行业中。我们日常见到的医疗一次性手术衣、手术帽、术用纱布等都是运用水溶性纤维制作而成。水溶性聚乙烯醇纤维具有易水解、无污染环保的特点，可以避免因为焚烧终端产品而造成环境污染的问题。

Q: Do you know about other vinylon products and applications?

A: Water-soluble polyvinyl alcohol fiber is widely used in the home textile field and medical industry. The medical disposable surgical clothes, surgical caps and surgical gauze we see daily are made of water-soluble fibers. The water-soluble polyvinyl alcohol fiber is easy to hydrolyze, pollution-free and environmentally-friendly, which can avoid the problem of environmental pollution caused by the incineration of terminal products.

高性能碳纤维

HIGH-PERFORMANCE CARBON FIBER

推荐理由

碳纤维为复合材料之“芯”，大国之重器。企业自主研发全套国产化技术与装备，突破高品质超高强度碳纤维制备技术，强度达到 6400MPa 以上，整体水平达到国际先进；中模高强碳纤维预浸料制备技术愈加成熟，满足大尺寸、曲面复合材料主承力结构要求。高性能碳纤维为航空航天、固体发动机壳体等提供国产化原料支撑，也为进一步实现轻量化提供解决方案。

Recommendation Reasons

Carbon fiber is the "core" of composite materials and a treasure of a country. The company has independently developed a full set of domestic technology and equipment, breaking through the preparation technology of high-quality ultra-high strength carbon fibers, with a strength of more than 6,400MPa, and the overall level has reached the international advanced level; the preparation technology of medium-modulus high-strength carbon fiber prepreg becomes more and more mature, which can meet the requirements of the main bearing structure of large-size, curved surface composites. High-performance carbon fibers provide domestic raw material support for aerospace, solid engine housing, etc., and also provide solutions for further lightweight.

推荐品种

- 超高强度碳纤维 | 品牌：神鹰、拓展
- 中模高强碳纤维预浸料 | 品牌：恒神

Specific Variety

- Ultra High Strength Carbon Fiber | Brand: SY, TZ
- Middle Mould and High Strength Carbon Fiber Prepreg | Brand: HS



中国建材

神鹰
SY



拓展
TZ

推荐理由

企业自主开发技术，超高强度碳纤维力学性能、工艺性能均与国外同类产品相当，实现国产替代。

Recommendation Reasons

With the self-developed technologies by the company, the mechanical properties and technological properties of ultra-high-strength carbon fiber are equivalent to those of similar products abroad, so as to achieve the goal of domestic substitution.

超高强度碳纤维

Ultra High Strength Carbon Fiber

制备技术

Processing Technology

先制备出高分子量、高特性粘度、高均一性的聚合原液，然后采用干喷湿纺纺丝技术制备出T1000G 级超高强度碳纤维原丝，最后通过预氧化和碳化纤维结构精细控制技术制备出超高强度碳纤维。

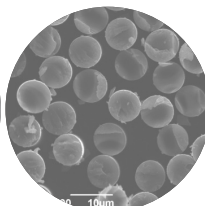
Firstly, the polymerization solution with high molecular weight, high intrinsic viscosity and high homogeneity is prepared. And then the T1000G grade ultra-high strength carbon fiber strand is prepared by dry-jet wet spinning technology. Finally the ultra-high strength carbon fiber is prepared by pre-oxidation and fine control technology of carbonized fiber structure.

纤维及制品特点

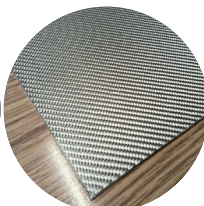
Characteristics of Fiber and Product



纤维原貌图
Fiber original appearance



纤维截面图
Fiber cross section



碳纤维织物图
Carbon fiber fabric diagram

主要规格

SYT65-12K、QZ6026-12K

Main Specifications

SYT65-12K, QZ6026-12K

标准及认证

《聚丙烯腈基碳纤维》
(GB/T 26752-2020)

Standards and Certifications

“Polyacrylonitrile-based carbon fiber”
(GB/T 26752-2020)

纤维性能与制品特点



- 超高强度、超高模量
- 可加工性好、纤维利用率高
- 复合材料转化率及其拉伸性能优异

Fiber Performance and Product Features

- Ultra-high strength and ultra-high modulus
- Good processability and high fiber utilization
- Excellent conversion and good tensile properties of composite materials

产品规格 Specification	拉伸强度 (MPa) tensile strength(MPa)	拉伸强度 CV 值 (%) CV value of tensile strength(%)	断裂伸长率 (%) Breaking elongation in state(%)	断裂伸长率 CV 值 (%) Breaking elongation in state CV(%)
SYT65-12K	≥ 6400	4.2	2.1	3.0
QZ6026-12K	6370	-	2.2	-

拉伸模量 (GPa) Tensile modulus (GPa)	线密度 (g/km) Yarn density (g/km)	体密度 (g/cm ³) Bulk density (g/cm ³)	企业 Enterprise
≥ 294	448±3	1.80±0.05	中复神鹰 Zhongfu Shengying
294	485	1.80	光威拓展 Tuozhan Fiber

应用技术

Application Technology

织物技术：适用于加工碳纤维机织物，也可与玻璃纤维、芳纶、玄武岩纤维混合编织。

预浸技术：适用于加工环氧树脂、酚醛树脂、双马树脂基等预浸料产品。

成型工艺：根据不同应用场景，在发挥材料性能优势的基础上综合考虑生产成本来选择成型加工工艺。适用于缠绕成型、树脂传递模塑成型、热压罐成型等。

Fabric technology: it is suitable for processing carbon fiber woven fabric, and can also be mixed with glass fiber, aramid fiber and basalt fiber.

Prepreg technology: it is suitable for processing epoxy resin, phenolic resin, bismaleimide resin base and other prepreg products.

Molding process: according to different application scenarios, the molding process is selected by comprehensively considering the production cost on the basis of exerting the advantages of material performance.It is applicable for winding molding, resin transfer molding, hot pressing tank molding and so on.



纤维应用

Fiber Application

产业用纺织品 Industrial textiles								
汽车内饰 Automotive interior	电池隔膜 Battery separator	体育用品 Sporting goods	医用纺织品 Filtration products	卫生纺织品 Sanitary textiles	军用纺织品 Military textiles	特种纸 Special papers	清洁用品 Cleaning supplies	过滤产品 Filtration products
		✓						
消防用品 Fire Supplies	航空航天 Aerospace	户外用品 Outdoor products	建筑增强 Building enhancement	面膜 Masks	口罩 Gauze mask	缆绳 Cable	织带 TAPS	发动机壳体 Motor case
	✓							✓
无人机 UAV								

Q&A

Q：超高强度碳纤维的技术和性能与国外同类产品相比，情况如何？

A：该产品开发过程中的聚合、干喷湿纺、碳化技术以及聚合釜、纺丝机、蒸汽牵伸机、预氧化炉、碳化炉等装置和油剂、上浆剂等辅料全为自主研发，拥有碳纤维生产成套装备技术，能够完全摆脱国外进口。干喷湿纺技术制备的纤维力学性能大幅提升、生产效率显著提高。纤维拉伸强度达到 6400MPa 以上，拉伸模量达到 294GPa 以上，达到国际先进水平。

Q: How is the technology and performance of ultra-high strength carbon fiber compared with similar products abroad?

A: The polymerization, dry-jet wet spinning, carbonization technology, polymerizer, spinning machine, steam draw machine, pre-oxidation furnace, carbonization furnace and other devices and oil agents, and sizing agents and other auxiliary materials in the product development process are all independently developed, with a complete set of equipment and technologies for carbon fiber production, which can completely get rid of imports from abroad. The mechanical properties of fibers prepared by dry-jet wet spinning technology are greatly improved, and the production efficiency is significantly improved. The tensile strength of the fiber reaches more than 6,400 MPa and the tensile modulus reaches more than 294 GPa, reaching the international advanced level.

中模高强碳纤维预浸料

Middle Mould and High Strength Carbon Fiber Prepreg

制备技术

Processing Technology

在一定的压力和温度下，把树脂胶膜和相应的纤维或织物经过热熔浸胶进行辊压浸渍，所制备出来的材料为热熔预浸料。

第一步涂膜：在涂膜设备上完成胶膜的制备，树脂面密度控制在 $\pm 2\%$ ；

第二步含浸：将制备好的胶膜转移至含浸设备与碳纤维进行复合，树脂在温度和压力的作用下完成对碳纤维的浸润，最后冷却收卷。预浸料面密度控制在 3% 。

Under a certain pressure and temperature, the resin film and the corresponding fiber or fabric are rolled and impregnated through hot melt dipping, and the prepared material is a hot melt prepreg.

The first step is coating that is completing the preparation of film on the coating equipment, and controlling the resin surface density at $\pm 2\%$; The second step is impregnation that is transferring the prepared film to the impregnation equipment and compounding it with the carbon fiber, conducting the infiltration of resin to the carbon fiber under the action of temperature and pressure, and finally completing cooling and crimping. The surface density of prepreg should be controlled at 3% .



恒神
HS

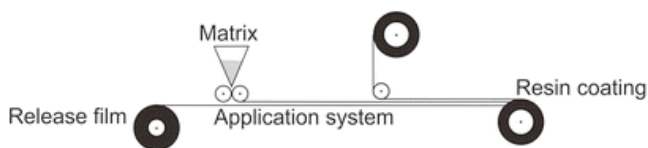
推荐理由

中模高强碳纤维预浸料具有比强度、比模量高和耐疲劳等特点，可应用于复合材料主承力结构部件，进一步实现在航空航天等领域的轻量化。

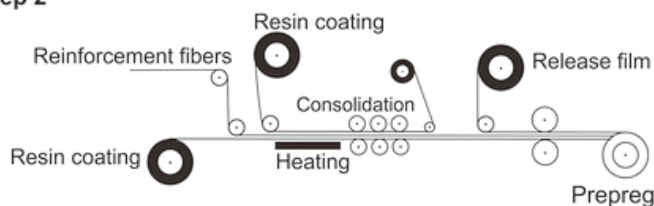
Recommendation Reasons

The medium-modulus and high-strength carbon fiber prepreg has the characteristics of high specific strength, high specific modulus and fatigue resistance. It can be applied to composite main bearing structure components to further realize lightweight in aerospace and other fields.

Step 1



Step 2



预浸料生产工艺流程图
Prepreg production process flow diagram

纤维及制品特点

Characteristics of Fiber and Product

主要规格

EH918-35%-12KHF40-U-145gsm-1000

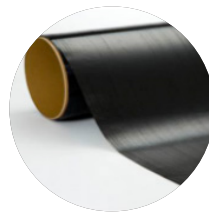
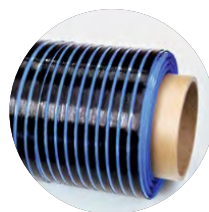
EH918-T-33%-12KHF40-U-133gsm-300

EH918-F-33%-12KHF40-U-133gsm-6.35

一类预浸料幅宽 1000mm，主要用于制造复杂结构的碳纤维复合材料，采用手工铺贴在模具上完成预制体的准备，并通过热压罐成型工艺完成制造。

二类预浸料幅宽 300mm，主要用于制造大尺寸简单形状的碳纤维复合材料，采用设备将预浸料自动铺贴在模具上完成预制体的准备，并通过热压罐成型工艺完成制造。

三类预浸料幅宽 6.35mm，主要适用自动铺丝工艺，可实现单独控制、并可进行转弯，具有较强的曲面适应能力，不仅可以铺放凹面、凸面，还可以实现开口、补强等变厚铺层。



预浸料产品
Prepreg products

Main Specifications

EH918-35%-12KHF40-U-145gsm-1000

EH918-T-33%-12KHF40-U-133gsm-300

EH918-F-33%-12KHF40-U-133gsm-6.35

The first type of prepreg is 1,000 mm wide, which is mainly used for manufacturing carbon fiber composite materials with complex structure. The prepreg is manually paved and pasted on the mold to complete the preparation of the preform, and is manufactured by autoclave molding process.



The second type of prepreg is 300 mm wide, which is mainly used for manufacturing large-size and simple-shaped carbon fiber composites. The prepreg is automatically paved and pasted on the mold by the equipment to complete the preparation of the preform, and the manufacturing is completed by the autoclave molding process.

The third type of prepreg is 6.35 mm wide, which is mainly suitable for automatic silk paving process. It can realize independent control and turn, and has strong surface adaptability. It can not only lay on concave and convex surfaces, but also realize variable thickening laying such as opening and reinforcement.

标准及认证

- Q/321181 THS002 聚丙烯腈基碳纤维企业标准
- HSCP3-ZS-J008 预浸料树脂原材料规范
- HSCP3-ZS-J027 预浸料用树脂规范

Standards and Certifications

- Q/321181 THS002Enterprise standard of polyacrylonitrile-based carbon fiber
- HSCP3-ZS-J008 Specification of Prepreg resin raw material
- HSCP3-ZS-J027 Specification of resin for prepreg

纤维性能与制品特点



- 碳纤维预浸料的强度可以达到钢材的 6-12 倍，密度只有钢材四分之一
- 可塑性好，可根据模具形状做成任何形状，成型容易，便于加工
- 粘性寿命长，能够满足大型航空航天制件的铺贴周期要求
- 抗冲击性能优异，单向预浸料冲击后压缩性能（CAI）大于 300MPa

Fiber Performance and Product Features

- The strength of carbon fiber prepreg can reach 6–12 times that of steel, and the density is only a quarter of that of steel
- It can be made into any shape on the basis of good plasticity according to the mold shape, which is easy to shape and process.
- It is able to meet the requirements of large aerospace parts paving cycle with long adhesive life
- Excellent impact resistance, with Compression After Impact (CAI) of unidirectional prepreg greater than 300 MPa

表 1 HF40 级碳纤维的力学性能
Table 1 Mechanical properties of carbon fiber HF40 grade

产品规格 Specification	拉伸强度 (MPa) Tensile strength(MPa)	断裂伸长率 (%) Breaking elongation in state(%)	拉伸模量 (GPa) Tensile modulus (GPa)	线密度 (g/km) Yarn density(g/km)	体密度 (g/cm ³) Bulk density(g/cm ³)
HF40-12K	5600	1.90±0.25	295	445±8	1.80±0.02



表 2 EH918 / HF40-12K 环氧碳纤维预浸料的性能指标
Table 2 EH918 / HF40-12K The performance index of epoxy carbon fiber prepreg

检测项目 Test item	试验环境 Test environment	检测结果 Test result		
		基本性能 Essential performance	三批次均值 a Three batches Mean value a	CV(%)b
0°拉伸 0° tensile	室温干态 Dry state at Room temperature	X1t(MPa)	2707	5.96
		E1t(GPa)	166	2.09
90°拉伸 90° tensile	室温干态 Dry state at Room temperature	X2t(MPa)	82.2	10.0
		E2t(GPa)	8.60	1.52
0°压缩 0° compression	室温干态 Dry state at Room temperature	X1c(MPa)	1382	9.04
		E1c(GPa)	151	2.05
	82°C湿态 82°C wet state	X1c(MPa)	1049	15.7
		E1c(GPa)	150	4.71
	130°C湿态 130°C wet state	X1c(MPa)	853	14.9
90°压缩 90° compression	室温干态 Dry state at Room temperature	X2c(MPa)	234	2.58
		E2c(GPa)	9.54	7.30
短梁强度 Short beam strength	室温干态 Dry state at Room temperature	sbs(MPa)	102	4.10
	82°C湿态 82°C wet state	sbs(MPa)	73.8	10.7
	130°C湿态 130°C wet state	sbs(MPa)	57.4	14.0
面内剪切 In-plane shear	室温干态 Dry state at Room temperature	Smax (MPa)	150	4.11
		S5%(MPa)	85.0	3.35
		G12(GPa)	4.77	2.68
	82°C湿态 82°C wet state	Smax (MPa)	112	3.27
		S5%(MPa)	57.4	2.98
		G12(GPa)	3.54	2.73
	130°C湿态 130°C wet state	Smax (MPa)	83.0	4.16
		S5%(MPa)	38.5	5.06
		G12(GPa)	2.51	6.31
开孔拉伸 Open hole tensile	室温干态 Dry state at Room temperature	oht(MPa)	470	2.82
开孔压缩 Open hole compression	室温干态 Dry state at Room temperature	ohc(MPa)	365	2.80
	82°C湿态 82°C wet state	ohc(MPa)	330	2.32
	130°C湿态 130°C wet state	ohc(MPa)	301	3.91

应用技术

Application Technology

操作过程：预浸料裁剪铺贴时要在洁净间内进行；铺贴过程要保持预浸料表面平整，不能有褶皱，发现层间有气泡时，及时赶出；建议预浸料铺贴每4层进行一次预压实操作；

固化过程：全真空，热压罐中施加6.0 bar压力；以1~3°C/min的升温速率加热至180°C（热电偶最低温处）；保持180°C，6.0 bar恒温至少2小时；以不大于3°C/min的降温速率降至60°C以下。

Operation process: the cutting and paving and pasting of prepreg should be carried out in the cleanroom; the surface of prepreg should be kept flat without wrinkles during the paving and pasting process, and the bubbles between layers should be driven out in time; it is suggested that the prepreg should be pre-compacted every 4 layers;

Curing process: In full vacuum environment, 6.0 bar pressure is applied in autoclave; heating conducted to 180°C at the heating rate of 1-3°C/min (the lowest temperature of thermocouple); The isothermal 180°C at 6.0 bar should be maintained for at least 2 hours; it is reduced to below 60°C at the cooling rate of no more than 3°C/min.

纤维应用

Fiber Application

民用大型飞机结构部件、无人机

Civil large aircraft structural components, UAV

Q&A

Q：中模高强碳纤维预浸料的优势是什么？

A：EH918/HF40 预浸料为增韧环氧树脂体系，主要用于平面型或低曲率曲面的准平面型复材整体结构件铺层制造，采用干法缠绕和铺贴工艺相结合的方法，技术可实现一体化成型，其CAI值在310MPa以上。

Q: What are the advantages of medium-modulus and high-strength carbon fiber prepreg?

A: EH918/HF40 prepreg is a toughened epoxy resin system, which is mainly used for the paving manufacturing of quasi-planar composite integral structural parts with planar or low-curvature curved surfaces. The integrated molding can be realized by using the method of dry winding and paving and pasting process, and its CAI value is above 310 MPa.

中国纤维流行趋势 2021/2022

入围产品

RECOMMEND PRODUCTS

安全防护纤维

SAFETY PROTECTION FIBER

白色抗静电聚酯纤维

White antistatic polyester fiber

碳黑导电聚酰胺 6 纤维

Conductive carbon black polyamide 6 fiber

弹性纤维

ELASTIC FIBER

低温定型熔纺氨纶

Low-temperature setting melt-spun spandex

瑜伽服专用高伸低模氨纶

High-stretch low-modulus spandex for yoga clothes

定制化纤维

CUSTOMIZED FIBER

单组份双捻抗皱聚酯纤维

Single-component double-twist wrinkle-resistant polyester fiber

抗起球喷织磨毛布专用聚酯纤维

Pilling-resistant jet-woven polyester fiber for brushed cloth

细旦多孔灯芯绒专用弹性聚酯纤维

Elastic fine-denier porous polyester fiber for corduroy

仿真纤维

SIMULATED FIBER

消光仿棉聚酰胺 6 混纤

Dull cotton-like polyamide 6 blend fiber

仿棉弹性双组分混纤

Cotton-like elastic bicomponent blended fiber

功能复合纤维

FUNCTIONAL COMPOSITE FIBER

遮光用聚酯复合纤维

Lightproof composite polyester fiber

原液着色功能复合聚酰胺 6 纤维

Dope dyed functional composite polyamide 6 fiber

石墨烯改性异形聚酰胺 6 纤维

Graphene modified special-shaped polyamide 6 fiber

石墨烯原位聚合改性细旦聚酰胺 6 纤维

Graphene in-situ polymerized modified fine-denier polyamide 6 fiber

太极石改性高强高模再生纤维素纤维

Taichi Stone modified high-strength high-modulus regenerated cellulose fiber

非六方氮化硼 (h-BN) 改性再生纤维素纤维

Non-hexagonal boron nitride (h-BN) modified regenerated cellulose fiber

健康防护纤维

HEALTH PROTECTION FIBER

艾草改性聚酯纤维

Wormwood modified polyester fiber

超低纤度锌系抑菌聚酰胺 6 纤维

Ultra-low denier zinc-based bacteriostaticpolyamide 6 fiber

锌系抑菌聚酰胺 6 纤维

Zinc-based bacteriostaticpolyamide 6 fiber

胶原蛋白改性聚酰胺 6 纤维

Collagen modified polyamide 6 fiber

铜系抑菌竹莱赛尔纤维

Copper-based bacteriostaticbamboo lyocell fiber

青蒿素改性再生纤维素纤维

Artemisinin modified regenerated cellulose fiber

消臭抑菌再生纤维素纤维

Deodorizing and bacteriostaticregenerated cellulose fiber

PE (PHBV) /PP 双组份皮芯复合纤维

PE (PHBV)/PP Bicomponent Skin Core Composite Fiber

生物基化学纤维

BIO-BASED CHEMICAL FIBER

抑菌莱赛尔纤维

Bacteriostatic Lyocell Fiber

三维卷曲 PLA/PTT 双组份高弹性纤维

Three-dimensional crimped PLA/PTT bicomponent high elastic fiber

舒感纤维

COMFORTABLE FIBER

异组分异规格异收缩棉感聚酯纤维

Different-component, different-specification, different-shrinkage cotton-like polyester fibers

一步法异形涤锦复合纤维

One-step special-shaped polyester nylon composite fiber

低熔点聚酰胺 6 纤维

Polyamide 6 fiber with a low melting point

小麦蛋白改性再生纤维素纤维

Wheat protein modified regenerated cellulose fiber

超高收缩聚丙烯腈纤维

Ultra-high shrinkage polyacrylonitrile fiber

一步法易染阳涤包覆纱

One-step easily dyed cationic polyester covered yarn

循环再利用化学纤维

RECYCLED CHEMICAL FIBER

循环再利用再生纤维素纤维

Recycling regenerated cellulose fiber

原液着色化学纤维

DOPE DYED CHEMICAL FIBER

原液着色超黑聚酯纤维

Dope dyed ultra-black polyester fiber

原液着色高蓬松聚酯纤维

Dope dyed high-fluffiness polyester fiber

原液着色异形截面混纤 BCF

BCFdope dyed special-shaped cross-section blended fiber

安全防护纤维

安全，是幸福生活的保障，安全防护纤维作为人类最亲密的守护者，不仅要保障消费者穿着的保暖与美观，更要为消费者提供全方位的安全防护。

Safety is the guarantee of a happy life. As our closest guardian, safety and protection fiber must not only offer warmth and aesthetics to consumers, but also provide comprehensive protection to guarantee consumers' safety.

白色抗静电聚酯纤维

特点：皮层为常规聚酯、芯层为导电聚酯成分，抗静电功能优异，耐水洗

规格：22dtex/3F

应用技术：可与各种长丝、短纤混并，建议采用阳离子及分散染料

应用领域：安全防护服、西装、工装、毛衣、沙发布、消防用品、医用纺织品

品牌：周导

申报企业：江苏中杰澳新材料有限公司

碳黑导电聚酰胺 6 纤维

特点：永久性导电、防静电、耐洗涤

规格：1.66dtex×38mm、22.2dtex/3F

应用技术：导电纤维电阻低，在混纺、染色时注意避免电容式设备，尽量使用光电式设备

应用领域：防尘防静电工作服、工装、医用防护服、劳保服装、手套、防静电内衣

品牌：泰尔欣

申报企业：海宁泰尔欣新材料有限公司



White antistatic polyester fiber

Feature: with conventional polyester as its cortex and conductive polyester as its core, excellent antistatic functions, as well as washability

Specification: 22dtex/3F

Applied technology: It can be blended with various filaments and staple fibers. Cationic and disperse dyes are recommended.

Application field: Protective clothing, business suit, work clothes, sweaters, sofa fabric, fireplace supplies, and medical textiles

- **Brand:** Zhou Dao
- **Enterprise:** Jiangsu ZJA New Material Co., Ltd.

Conductive carbon black polyamide 6 fiber

Feature: permanent electrically conductive, antistatic and wash resistant

Specification: 1.66dtex×38mm, 22.2dtex/3F

Applied technology: Conductive fiber has low resistance, avoid capacitive equipment when blending and dyeing, and try to use photoelectric equipment.

Application field: dust-proof and antistatic work clothing, workwear, medical protective clothing, labor insurance clothing, gloves, and antistatic underwear

- **Brand:** TAIERXIN
- **Enterprise:** Haining TAIERXIN New Materials Co., Ltd.

弹性纤维

与运动同频，为时尚添翼。经特殊改性和工艺设计的氨纶，打造高伸长低应力、防脱散、不卷边新性能，赋予消费者良好的接触体验，在保持运动舒适感的同时，兼顾时尚新概念。

The fiber guarantees close fitting in sports while adding a fashion element. Specially modified and process-designed spandex has new properties of high elongation, low stress, anti-stripping, and non-curling, offering consumers a good wearing experience, taking into account new fashion concepts while maintaining sports comfort.

低温定型熔纺氨纶

特点：120±5℃超低温定型，适宜制备随心裁面料

规格：10~50D

应用技术：定型温度：110±5℃；染色温度：≤ 95℃；染色 PH 值：3~7

应用领域：连裤袜、贴身内衣、户外运动服等

品牌：梦纱

申报企业：河北邦泰氨纶科技有限公司

瑜伽服专用高伸低模氨纶

特点：高伸长、低模量、耐酸、耐碱，织物穿着轻松柔软、舒适、无勒感

规格：22.2~400dtex/1~16F

应用技术：建议采用阳离子及分散染料。建议采用还原漂白剂。染色温度应该控制在 120℃以下，1.5h 以内；干式定型温度应控制在 190℃以下，30~90s；湿定型温度应控制在 125℃以下，30s 内，不能有牵伸

应用领域：瑜伽服、袜子、牛仔、内衣、织带

品牌：PT-SOFT

申报企业：杭州邦联氨纶股份有限公司



Low-temperature setting melt-spun spandex

Feature: $120\pm 5^{\circ}\text{C}$ ultra-low temperature setting, ideal for preparing free-cut fabrics

Specification: 10~50D

Applied technology: Setting temperature: $110\pm 5^{\circ}\text{C}$; dyeing temperature: $\leq 95^{\circ}\text{C}$; dyeing PH value: 3~7

Application field: pantyhose, underwear, outdoor sportswear, etc.

- **Brand:** Mengsha
- **Enterprise:** Hebei Bangtai Spandex Technology Co., Ltd.

High-stretch low-modulus spandex for yoga clothes

Feature: high elongation, low modulus, acid and alkali resistance, the fabric is easy to wear, soft, comfortable, and non-squeezing

Specification: 22.2~400dtex/1~16F

Applied technology: Cationic and disperse dyes are recommended. Reducing bleach is recommended. Dyeing temperature should be controlled below 120°C , within 1.5h; dry setting temperature should be controlled below 190°C , 30~90s; wet setting temperature should be controlled below 125°C , within 30s, without drafting.

Application field: yoga clothes, socks, denim, underwear, ribbon

- **Brand:** PT-SOFT
- **Enterprise:** Hangzhou Banglian Spandex Co., Ltd.

定制化纤维

精准对接下游需求，匹配终端细分应用。通过技术升级及工艺优化，打造专属定制化纤维，最大程度满足消费者的需求，提高产品核心竞争力。

The fiber precisely meets downstream demands and matches various specific terminal applications. Through technological upgrading and process optimization, exclusive customized fibers are created to meet the needs of consumers to the greatest extent and improve the core competitiveness of products.

单组份双捻抗皱聚酯纤维

特点：与纤维素纤维混纺织造的薄款面料不易褶皱、手感好；与羊毛混纺织造的面料弹性较好，不易产生折痕

规格：500~550dtex/96F

应用技术：可与纤维素纤维、羊毛等混纺

应用领域：西装、羊毛大衣等服装面料

品牌：桐昆

申报企业：桐昆集团浙江恒通化纤有限公司

抗起球喷织磨毛布专用聚酯纤维

特点：抗起球、抗皱免烫、坚固耐用，耐紫外光性好

规格：545dtex/384F

应用技术：加弹时，上加热箱温度和下加热箱温度比常规品种低 15℃左右，牵伸要拉足，保证染色均匀性

应用领域：高端衬布、风衣里料面料

品牌：桐昆

申报企业：桐昆集团浙江恒腾差别化纤维有限公司

细旦多孔灯芯绒专用弹性聚酯纤维

特点：吸色性、回弹性好，抗皱、轻柔

规格：333dtex/576F

应用技术：利用压力蒸箱，充入 0.25MPa 蒸汽 20min 后迅速升温至 145±2℃，使丝饼内外受热均匀，定型 5.5h，使产品均匀收缩定型

应用领域：灯芯绒面料

品牌：桐昆

申报企业：桐乡市恒基差别化纤维有限公司



Single-component double-twist wrinkle-resistant polyester fiber

Feature: The thin fabric produced with the fiber blended with cellulose fiber is wrinkle-free and has a fine touch; the fabric produced with the fiber blended with wool is elastic and is not easy to creases.

Specification: 500~550dtex/96F

Applied technology: The fiber can be blended with cellulose fiber, wool, etc.

Application field: fabrics for suits, wool coats and other clothing

- **Brand:** Tongkun
- **Enterprise:** Tongkun Group Zhejiang Hengtong Chemical Fiber Co., Ltd.

Pilling-resistant jet-woven polyester fiber for brushed cloth

Feature: pilling resistant, wrinkle resistant, non-ironing, sturdy and durable, UV resistance.

Specification: 545dtex/384F

Applied technology: When texturing, the temperatures of the upper heating box and the lower heating box are about 15°C lower than that for conventional varieties, and the drafting should be thoroughly done to ensure the uniformity of dyeing.

Application field: high-end interlining, windbreaker lining fabric

- **Brand:** Tongkun
- **Enterprise:** ongkun Group Zhejiang Hengteng Differential Fiber Co., Ltd.

Elastic fine-denier porous polyester fiber for corduroy

Feature: color absorption, good resilience, wrinkle resistance, softness

Specification: 333dtex/576F

Applied technology: A pressure steamer is filled with 0.25MPa steam for 20 minutes and then quickly heated up to 145±2°C to evenly heat the inside and outside of the cake, which is set for 5.5h, so that the product shrinks and sets uniformly.

Application field: corduroy fabric

- **Brand:** Tongkun
- **Enterprise:** Tongxiang Hengji Differential Fiber Co., Ltd.

仿真纤维

拥有合成纤维的保型特征，在结构、光泽、手感和性能等多角度无限接近自然纤维，从视觉和触觉上刺激消费者的购买欲望，实现肌肤亲近自然的梦想。

With the shape-retaining characteristics of synthetic fibers, it is infinitely similar to natural fibers in multi-dimensional such as structure, luster, touch and performance, which stimulate consumers' purchasing desire in its appearance and texture, and realize the dream of bringing skin close to nature.

消光仿棉聚酰胺 6 混纤

特点：仿棉效果好、光泽柔和、手感光滑细腻

规格：33.3~155.4dtex/19~96F

应用技术：后加工时注意张力调控，张力宜小于常规聚酰胺 6 纤维

应用领域：内衣、瑜伽服、T 恤或运动服等

品牌：锦柔纱

申报企业：福建永荣锦江股份有限公司

仿棉弹性双组分混纤

特点：异纤混合、弹性及回弹性好、常温易染、具有异色性能。其制品具有棉的光泽和手感、舒适弹性、垂感好

规格：22~167dtex/9~96F

应用技术：织造及染色参考常规聚酯纤维

应用领域：弹性裤、弹力麂皮绒、双色弹力布、运动服、休闲服

品牌：棉弹丝

申报企业：淮安三联新材料有限公司



Dull cotton-like polyamide 6 blend fiber

Feature: Good cotton-simulative effect, soft luster, smooth and delicate touch

Specification: 33.3~155.4dtex/19~96F

Applied technology: pay attention to tension control during post-processing, and the tension should be less than conventional polyamide 6 fiber.

Application field: underwear, yoga clothes, T-shirt or sportswear, etc.

- **Brand:** Brocade yarn
- **Enterprise:** Fujian Yongrong Jinjiang Co., Ltd.

Cotton-like elastic bicomponent blended fiber

Feature: Different fiber mixture, good elasticity and resilience, easy to dye at room temperature, and color-changing property. Its products have the luster and feel of cotton, being comfortable and elasticity with good drapability.

Specification: 22~167dtex/9~96F

Applied technology: Weaving and dyeing refer to conventional polyester fiber

Application field: stretch pants, stretch faux suede, two-tone stretch fabric, sportswear, and casual wear

- **Brand:** Cotton elastic yarn
- **Enterprise:** Huai'an Sanlian New Material Co., Ltd.

功能复合纤维

将大自然的不同功能性元素与化学纤维共聚或共混，经熔融纺丝或湿法纺丝制成，改变已有纤维分子结构、表面结构。精心设计、匠心打造，集抑菌、远红外、凉爽、保暖、防紫外线等功能于一体，实现功能纤维完美升级。

Blending and joining different functional elements of natural fiber with chemical fibers, the fiber is made by melt spinning or wet spinning which changes the molecular structure and surface structure of existing fibers. Well-designed and crafted, it integrates bacteriostatic, far-infrared, cool sensation, warmth-retainment, UV resistance and other functions, to achieve a perfect upgrade of functional fibers.

遮光用聚酯复合纤维

特点：手感柔软，具有很好的隔热性、遮光性；织物表面有一层绒感，款式、风格新颖

规格：135dtex/108F

应用技术：可直接应用于针织；机织备轴过程可免浆牵经、无需加捻或浆经处理；织造环节应控制张力，避免纤维拉伤、断头；染整过程需平幅精炼、按“精炼-预缩-染色-定型”工序处理

应用领域：室内窗帘、桌布

品牌：金鸡

申报企业：浙江恒优化纤有限公司

原液着色功能复合聚酰胺 6 纤维

特点：纤维色牢度强、色彩均匀、绿色环保，同时具有抑菌、除臭、抗紫外等功能，织成的面料手感柔软

规格：20~138dtex/5~36F

应用技术：定型温度、时间与常规聚酰胺纤维相同；建议采用低温染色；混纺、织造、后整理等工序参照常规聚酰胺纤维。该纤维制备的面料在进行染整或后处理时，严禁添加疏水性注剂、螯合剂、含高量钠离子注剂、含硫化物或氯化物

应用领域：服装面料、袜子、内衣、婴幼儿纺织品、医疗用品等

品牌：金旗

申报企业：浙江金旗新材料科技有限公司



Lightproof composite polyester fiber

Feature: The fabric has a soft touch and good heat insulation and lightproof properties; its surface has a layer of velvet and presents a novel style.

Specification: 135dtex/108F

Applied technology: It can be directly applied to knitting; the beaming process can be free of warp sizing; no twisting or sizing is required; the tension should be controlled in the weaving step to avoid fiber strain and breakage; the dyeing and finishing process requires open-width refining in the order of "refining-preshrinking-dyeing-finalizing".

Application field: indoor curtains, tablecloths

- **Brand:** Jinji
- **Enterprise:** Zhejiang Heng You Fiber Co., Ltd.

Dope dyed functional composite polyamide 6 fiber

Feature: the fiber has strong color fastness and evenness, while being green and environmentally friendly; it also has bacteriostatic, deodorization and anti-ultraviolet functions, among others, producing fabrics with soft touch.

Specification: 20~138dtex/5~36F

Applied technology: The setting temperature and time are the same as those of conventional polyamide fibers; low-temperature dyeing is recommended; refer to conventional polyamide fibers for processes such as blending, weaving, and finishing. When the fabric prepared by the fiber is dyed, finished or post-treated, it is strictly forbidden to add hydrophobic additives, chelating agents, high sodium ion additives, sulfur compounds or amides.

Application field: clothing fabrics, socks, underwear, infant textiles, medical supplies, etc.

- **Brand:** JinQI
- **Enterprise:** Zhejiang JinQI New Material Technology Co., Ltd.

石墨烯改性异形聚酰胺 6 纤维

特点：纤维 Y 形截面、与皮肤接触具有凉感、可减少出汗时的黏腻感，同时纤维具有抑菌、远红外、抗静电的功能

规格：1.5dtex×38mm

应用技术：染色、织造、后整理等工序均与常规聚酰胺纤维一致

应用领域：床品、内衣、衬衣、袜子、运动衣等

品牌：烯纳斯

申报企业：常州恒利宝纳米新材料科技有限公司

石墨烯原位聚合改性细旦聚酰胺 6 纤维

特点：抑菌、抑螨、抗紫外、远红外、负离子功能复合

规格：1.33~2.78dtex×38~88mm、22.2~122.2dtex/24~96F

应用技术：参考常规聚酰胺 6 纤维

应用领域：针织贴身服装、内衣内裤、袜类、毛巾、床品

品牌：高烯

申报企业：杭州高烯科技有限公司

太极石改性高强高模再生纤维素纤维

特点：具有高强高模再生纤维素纤维的特点，同时具备远红外、抑菌、蓄热保暖、负离子功能

规格：1.33dtex×38mm

应用技术：太极石纤维混纺时建议添加比例 30% 以上；染色、织造、后整理等工序参考常规莫代尔纤维

应用领域：内衣、T 恤、被子、衬衫、裤子、床垫

品牌：太极石

申报企业：太极石股份有限公司

非六方氮化硼 (h-BN) 改性再生纤维素纤维

特点：抑菌、防螨、远红外、抗紫外、抗静电功能复合

规格：1.5dtex×38mm

应用技术：与其它种类纤维混纺时，石墨烯纤维建议添加比例≥50%

应用领域：床品、毛巾、内衣裤、卫生护理产品、地毯等

品牌：凯瑞纳石墨烯

申报企业：南通强生石墨烯科技有限公司



Graphene modified special-shaped polyamide 6 fiber

Feature: Y-shaped cross-section of the fiber has a cooling sensation in contact with the skin and can reduce the sticky feeling when sweating. The fiber also has bacteriostatic, far-infrared and antistatic functions

Specification: 1.5dtex×38mm

Applied technology: Dyeing, weaving, finishing and other processes are the same with conventional polyamide fibers.

Application field: bedding, underwear, shirts, socks, sportswear, etc.

- **Brand:** Shinas
- **Enterprise:** Changzhou Highbery Nano New Material Technology Co., Ltd.

Graphene in-situ polymerized modified fine-denier polyamide 6 fiber

Feature: Combining bacteriostatic, anti-mite, anti-ultraviolet, far-infrared, and anion functions

Specification: 1.33~2.78dtex×38~88mm, 22.2~122.2dtex/24~96F

Applied technology: refer to conventional polyamide 6 fiber

Application field: knitted underwear, underwear, socks, towels, bedding

- **Brand:** Gaoxi
- **Enterprise:** Hangzhou Gaoxi Tech Co., Ltd.

Taichi Stone modified high-strength high-modulus regenerated cellulose fiber

Feature: In addition to characteristics of high-strength and high-modulus regenerated cellulose fiber, the fiber also has far-infrared, bacteriostatic, heat storage, warmth retainment and anion functions

Specification: 1.33dtex×38mm

Applied technology: It is recommended to add more than 30% Taichi stone fiber in blending; dyeing, refer to conventional modal fibers for weaving, finishing and other processes.

Application field: underwear, T-shirts, quilts, shirts, pants and mattresses

- **Brand:** Taichi Stone
- **Enterprise:** Taichi Stone Co., Ltd.

Non-hexagonal boron nitride (h-BN) modified regenerated cellulose fiber

Feature: combining bacteriostatic, anti-mite, far-infrared, anti-ultraviolet and antistatic functions

Specification: 1.5dtex×38mm

Applied technology: when blending with other types of fibers, the recommended proportion of graphene fiber is ≥50%.

Application field: bedding, towels, underwear, sanitary products, carpets, etc.

- **Brand:** Kyorene Graphene
- **Enterprise:** Nantong QS Group

健康防护纤维

随着对健康问题的重视，让人们重新开始审视生活中对健康防护的需求。纤维中融入锌离子、铜离子、植物源抑菌因子、动物源抑菌因子打造抑菌属性，带给消费者由外到内、由日常服用到医疗防护的健康防护升级。

With the growing attention on health issues, people are reconsidering the needs for health protection in life. The fiber incorporates zinc and copper ions, as well as bacteriostatic elements derived from plants and animals to create bacteriostatic properties, bringing consumers an upgrade of health protection from the outside to the inside, from daily use to medical protection.

艾草改性聚酯纤维

特点：植物源抑菌、高弹、耐热耐磨、可纺性优良

规格：1.2~3.0 dtex×38mm、55.6~222dtex /72~144F

应用技术：参考常规聚酯纤维

应用领域：工装、贴身内衣、童装、运动装、床上用品

品牌：百草

申报企业：青岛百草新材料股份有限公司

超低纤度锌系抑菌聚酰胺 6 纤维

特点：吸湿排汗、柔软透气、亲肤舒适、抑菌、抗紫外功能复合

规格：5.56dtex/3F

应用技术：染色：染浴液 PH 值：6~7；染色温度≤120℃；织造：建议采取取纱形式，织造车速≤800m/min；染色前压光：速度 20m/min，温度≤180℃；染色后压光：速度 30m/min，温度≤160℃

应用领域：蕾丝面料、超薄袜、速干运动衣、紧身衣、防护服内层材料、医用防护服透气层、口罩内层等

品牌：文峰

申报企业：江苏文凤化纤集团有限公司



Wormwood modified polyester fiber

Feature: plant-derived bacteriostatic property, high elasticity, heat resistance and wear resistance, as well as excellent spinnability

Specification: 1.2~3.0 dtex×38mm, and 55.6~222dtex / 72 ~144 F

Applied technology: refer to conventional polyester fiber

Application field: workwear, underwear, children's clothing, sportswear, and bedding

- **Brand:** Byherb
- **Enterprise:** Qingdao Byherb New Materials Co., Ltd.

Ultra-low denier zinc-based bacteriostatic polyamide 6 fiber

Feature: Combining moisture wicking, soft and breathable, skin-friendly and comfortable, bacteriostatic and anti-ultraviolet features

Specification: 5.56dtex/3F

Applied technology: dyeing: dye bath pH value: 6~7; dyeing temperature $\leq 120^{\circ}\text{C}$; weaving: warp sizing is recommended, weaving speed $\leq 800\text{m/min}$; calendaring before dyeing: speed 20m/min, temperature $\leq 180^{\circ}\text{C}$; calendaring after dyeing: speed 30m/min, and temperature $\leq 160^{\circ}\text{C}$

Application field: lace fabrics, ultra-thin socks, quick-drying sportswear, tights, inner material of protective clothing, medical protective clothing breathable lining, mask inner lining, etc.

- **Brand:** Wenfeng
- **Enterprise:** Jiangsu Wenfeng Chemical Fiber Group Co., Ltd.



锌系抑菌聚酰胺 6 纤维

特点：具备吸湿、亲肤、持久抑菌、除臭、防螨等特点

规格：44.4dtex/24F

应用技术：与其它种类纤维混纺时，该纤维的添加比例建议在 50% 左右；染整方面，避免经过强酸强碱环境，否则抑菌功能会下降

应用领域：内衣、服装、袜子、塑身衣、毛巾、窗帘

品牌：博富科技

申报企业：博富科技股份有限公司

胶原蛋白改性聚酰胺 6 纤维

特点：具有吸湿、抑菌、凉感、消臭等功能复合；其织物具有蚕丝般的光泽、羊绒般的轻柔润滑、麻纤维的吸湿透气等特点

规格：16.6~2.18dtex/6~34F

应用技术：可以与各种纱线交织，制备不同的纺织面料

应用领域：户外运动服饰、毛巾、内衣、袜子、高档床上用品等

品牌：恒申

申报企业：长乐恒申合纤科技有限公司

铜系抑菌竹莱赛尔纤维

特点：具有强力高、吸湿透气、易染色、抗静电等特点；其织物色牢度高、手感滑爽、光泽好

规格：1.33~1.56 dtex×38mm

应用技术：纺纱时采用紧密纺，减少毛羽指数；印染方面，采用普通莱赛尔纤维的印染处理工艺，防止布面原纤化

应用领域：内衣、毛巾、床上用品

品牌：里奥

申报企业：上海里奥纤维企业发展有限公司

Zinc-based bacteriostatic polyamide 6 fiber

Feature: Moisture absorption, skin-friendliness, long-lasting bacteriostatic property, deodorization, anti-mite property, etc.

Specification: 44.4dtex/24F

Applied technology: When blending with other types of fibers, the recommended proportion of the fiber is about 50%; in terms of dyeing and finishing, avoid going through a strong acid and strong alkali environment, or the bacteriostatic function will be reduced.

Application field: Underwear, clothing, socks, shapewear, towels, and curtains

- **Brand:** Bofu Technology
- **Enterprise:** Bofu Technology Co., Ltd.

Collagen modified polyamide 6 fiber

Feature: integrated moisture absorption, bacteriostatic, cooling sensation and deodorization; with silk-like luster, cashmere-like softness and smoothness; the moisture absorption and breathability of hemp fiber, etc.

Specification: 16.6~2.18dtex/6~34F

Applied technology: It can be interwoven with various yarns to prepare different textile fabrics

Application field: outdoor sportswear, towels, underwear, socks, high-end bedding, etc.

- **Brand:** Hengshen
- **Enterprise:** Changle Hengshen Synthetic Fiber Technology Co., Ltd.

Copper-based bacteriostatic bamboo lyocell fiber

Feature: high strength, moisture absorption, breathability, easy dyeing, antistatic property, etc.; its fabric has high color fastness, smooth touch and fine gloss

Specification: 1.33~1.56 dtex×38mm

Applied technology: compact spinning is used to reduce the hairiness index; the printing and dyeing process of ordinary lyocell fiber is used to prevent fibrillation of the fabric surface.

Application field: Underwear, towels, and bedding

- **Brand:** LYO
- **Enterprise:** Shanghai Lyocell Fiber Enterprise Development Co., Ltd.



青蒿素改性再生纤维素纤维

特点：植物源抑菌、驱蚊、防螨，其织物水洗牢度高

规格：83.3~333.3dtex/24~60F

应用技术：可单独使用或者与其他纤维交织，可与常规纤维素纤维或棉纺织品同浴染色处理

应用领域：内衣、袜子和家纺用品

品牌：蒿洁丝

申报企业：新乡化纤股份有限公司

消臭抑菌再生纤维素纤维

特点：吸湿透气，不但可以抑制细菌繁殖，还可以和汗液中的酸碱发生中和反应，消除汗臭

规格：1.33dtex×38mm

应用技术：与其他纤维混纺时，添加量建议为 50%；采用活性染料染色

应用领域：休闲服、内衣、床品

品牌：淼卡

申报企业：上海正家牛奶丝科技有限公司

PE (PHBV) /PP 双组份皮芯复合纤维

特点：含生物基成分、非溶出性广谱抑菌、持久长效

规格：2.0dtex×38mm

应用技术：主要用于无纺热风布，热风温度控制在 100~120℃

应用领域：袜子、卫生巾、尿不湿、口罩

品牌：禾素时代

申报企业：南京禾素时代抑菌材料科技有限公司



Artemisinin modified regenerated cellulose fiber

Feature: Plant-derived bacteriostatic, mosquito repellent and anti-mite properties; its fabric has high washing fastness.

Specification: 83.3~333.3dtex/24~60F

Applied technology: It can be used alone or interwoven with other fibers, and can be dyed in the same bath with conventional cellulose fibers or cotton textiles.

Application field: Underwear, socks and home textiles

- **Brand:** Hao Jiesi
- **Enterprise:** Xinxiang Chemical Fiber Co., Ltd.

Deodorizing and bacteriostatic regenerated cellulose fiber

Feature: Moisture-absorbing and breathable, the fiber not only inhibits the reproduction of bacteria, but also eliminates sweat odor through neutralization with the acid and alkali in the sweat.

Specification: 1.33dtex×38mm

Applied technology: When blending with other fibers, the recommended proportion is 50%; use reactive dyes in dyeing

Application field: Casual wear, underwear, and bedding

- **Brand:** Miaoka
- **Enterprise:** Shanghai Zhengjia Milkfiber Sci & Tech co., Ltd.

PE (PHBV)/PP Bicomponent Skin Core Composite Fiber

Feature: The fiber contains bio-based ingredients which has long-lasting broad-spectrum bacteriostatic effect without dissolution.

Specification: 2.0dtex×38mm

Applied technology: Mainly used for non-woven hot air cloth, the temperature of the hot air is controlled at 100~120°C.

Application field: socks, sanitary napkins, diapers, and masks

- **Brand:** Bioserica Era
- **Enterprise:** Nanjing Bioserica Era Bacteriostatic Material Technology Co., Ltd.

生物基化学纤维

生物基化学纤维原料来源于大自然，农、林、海洋副产物，是人类实现可持续发展的必由之路之一。

生物基纤维与人体亲和、可生物降解、本质抑菌、加工过程低碳，充分体现了可再生资源的综合利用与现代纤维加工技术的完美融合。

Bio-based chemical fiber is produced with raw materials that come from nature, including agriculture, forestry, and marine by-products, and is one of the methods for mankind to achieve sustainable development. Bio-based fiber is friendly to the human body, biodegradable, intrinsically bacteriostatic, and low-carbon in the processing process, which fully reflects the perfect integration of the comprehensive application of renewable resources and modern fiber processing technology.

抑菌莱赛尔纤维

特点：强力高、吸水性好、回潮率高、抑菌性持久，具有优越的服用性能

规格：1.33dtex×38mm

应用技术：在染色及后整理方面，建议与有色纤维进行混纺，尽量减少后续染整工序，以免影响其抑菌效果

应用领域：高档牛仔服、内衣、高级衬衣、休闲服等服装领域，床品、窗帘、毛浴巾等家纺领域以及面膜、湿巾、卫生巾、尿不湿等非织造领域

品牌：莱赛尔

申报企业：山东金英利新材料科技股份有限公司

三维卷曲 PLA/PTT 双组份高弹性纤维

特点：生物基、弹性好、蓬松透气、阻燃、抑菌、可降解、易清洁

规格：6dtex×64mm

应用技术：在直立棉、絮片生产中，通过与熔点为 140～190℃的低熔点三维螺旋纤维混合梳理，铺网成直立棉或絮片，在 150～220℃下热定型成成品

应用领域：可替代海绵，主要应用于床垫、沙发垫、胸杯、枕头、被子、隔音材料等

品牌：绿绒

申报企业：苏州金泉新材料股份有限公司



Bacteriostatic Lyocell Fiber

Feature: High strength, good moisture absorption, high moisture regain, long-lasting bacteriostatic effect, and superior performance in clothing production

Specification: 1.33dtex×38mm

Applied technology: In terms of dyeing and finishing, it is recommended to blend the fiber with colored fibers to minimize subsequent dyeing and finishing processes, so as not to affect its bacteriostatic effect.

Application field: high-end denim, underwear, high-end shirts, casual wear and other clothing; bedding, curtains, wool bath towels and other home textiles; facial masks, wet wipes, sanitary napkins, diapers and other non-woven products

- **Brand:** Incell
- **Enterprise:** Shandong Jinyingli New Material Technology Co., Ltd.

Three-dimensional crimped PLA/PTT bicomponent high elastic fiber

Feature: The bio-based fiber is elastic, fluffy, breathable, flame retardant, bacteriostatic, degradable and easy to clean.

Specification: 6dtex×64mm

Applied technology: In the production of 3D vertical cotton and wadding, it is combed after blended with three-dimensional spiral fibers with a low melting point of 140~190°C, the net is laid into 3D vertical cotton or wadding, and the finished product is heat-set at 150~220°C.

Application field: It can be applied as an alternative of sponge, mainly in mattresses, sofa cushions, breast cups, pillows, quilts and sound-absorbing materials, etc.

- **Brand:** Lvrong
- **Enterprise:** Suzhou Jinquan New Materials Co., Ltd.

舒感纤维

现代人追求的时尚服装首要元素是吸湿性好、悬垂性好、透气、柔滑飘逸。舒感纤维强化人体亲和，带给消费者舒适的触觉感受，释放人们潜在的自有情感，体现人与自然的和谐。

The main elements of fashion attire pursued by modern people are good moisture absorption, drapability, breathability, smoothness and elegance. Comfort fiber strengthens human body friendliness, brings consumers comfortable feeling in touch, releases people's potential emotion, and reflects the harmony between man and nature.

异组分异规格异收缩棉感聚酯纤维

特点：具有光泽柔和、断裂强度适中、弹性好、柔软、吸湿排汗等特点

规格：197~297tex

应用技术：可直接应用于针织；机织时备轴过程可免浆牵经、无需加捻或浆经处理，分条整经位移量为常规涤纶长丝的 2.5 倍及以上；织造环节应控制张力减小波动，避免纤维拉伤、断头；染整过程需平幅精炼，按“精炼 - 预缩 - 染色 - 定型”工序处理

应用领域：时装、运动装、防寒服、牛仔、衬衫、针织衫、童装、内衣等

品牌：弹力绵

申报企业：徐州斯尔克纤维科技股份有限公司

一步法异形涤锦复合纤维

特点：纤维异形截面可实现防皱、吸湿排汗、干爽舒适功能；其面料具有悬垂性、富有弹性和丰满感、染色后可呈现双色、杂色、幻彩风格

规格：55~78dtex/20F

应用技术：染整工艺参考常规的聚酯纤维和聚酰胺纤维染色方式

应用领域：运动休闲服、装饰布、窗帘布等

品牌：凯泰特纤

申报企业：凯泰特种纤维科技有限公司



Different-component, different-specification, different-shrinkage cotton-like polyester fibers

Feature: It has the characteristics of soft gloss, moderate breaking strength, good elasticity, softness, moisture wicking, etc.

Specification: 197~297tex

Applied technology: It can be directly applied to knitting; the beaming process can be free of warp sizing, no twisting or sizing is required; the split warping displacement is 2.5 times and more than that of conventional polyester filament; the tension should be controlled in the weaving step to avoid fiber strain and breakage; the dyeing and finishing process requires open-width refining in the order of "refining-preshrinking-dyeing-finalizing"

Application field: Fashion, sportswear, winter clothes, denim, shirts, sweaters, children's clothing, underwear, etc.

- **Brand:** Elastic cotton
- **Enterprise:** Xuzhou Silk Fiber Technology Co., Ltd.

One-step special-shaped polyester nylon composite fiber

Feature: The special-shaped fiber cross-section can realize wrinkle resistance, moisture wicking, dryness and comfort; the fabric has drapability, elasticity and plumpness, and can present different styles of double-color, multi-color and varying color after dyeing.

Specification: 55~78dtex/20F

Applied technology: Refer to the conventional dyeing method of polyester fiber and polyamide fiber for dyeing and finishing process

Application field: Sports casual wear, decorative cloth, curtain cloth, etc.

- **Brand:** Kaitai Special Fiber
- **Enterprise:** Kaitai Special Fiber Technology Co., Ltd.

低熔点聚酰胺 6 纤维

特点：具有优异的热粘合性能，可以与其他纤维粘合，环保无异味

规格：22 ~ 220dtex/3-72F

应用技术：织造参考常规聚酰胺纤维；与其他纤维热粘合时控制熔点为 90℃，熔程为 78℃~ 125℃，相关设备如染缸温度、热辊温度、熨烫蒸汽温度需同步设定

应用领域：蕾丝花边、无缝内衣、织带、热熔绕扣线，邦迪线、防钻绒羽绒服面料

品牌：协龙

申报企业：福建漳平协龙高新化纤有限公司

小麦蛋白改性再生纤维素纤维

特点：含多种氨基酸，具有保湿护肤功能，同时释放负氧离子

规格：1.0~1.33dtex/38mm

应用技术：采用混纺纱，两组分三组分均可；染色活性染料，尽量避免强碱

应用领域：针织内衣面料、内衣面料

品牌：小麦蛋白纤维

申报企业：杭州优标科技有限公司

超高收缩聚丙烯腈纤维

特点：纤维收缩率可达到 40 ~ 42%，具有膨体化，增加织物立体感

规格：1.66dtex×38mm

应用技术：可与其他短纤维混纺

应用领域：人造毛皮短绒、高档服装

品牌：昆仑

申报企业：中国石油大庆石化公司腈纶厂

一步法易染阳涤包覆纱

特点：纤维具有很好的上染性，染整后的织物颜色炫丽夺目，光彩照人

规格：170dtex/48F

应用技术：适用于喷气、喷水织机，可作为经纬纱使用

应用领域：女士旗袍、瑜伽服、T 恤、骑行服、舞蹈演出服

品牌：桐昆

申报企业：桐昆集团浙江恒盛化纤有限公司

Polyamide 6 fiber with a low melting point

Feature: The fiber has excellent thermal adhesive properties, and can be bonded with other fibers, being environmentally friendly and odor free

Specification: 22~220dtex/3-72F

Applied technology: Weaving refers to conventional polyamide fibers; when thermal bonding with other fibers, the melting point is controlled at 90°C, and the melting range is 78°C to 125°C. Temperatures of related equipments such as dyeing vat, hot roller and ironing steam need to be set simultaneously

Application field: Lace, seamless underwear, ribbon, hot-melt button thread, bonded thread, anti-drill down jacket fabric

- **Brand:** Xielong
- **Enterprise:** Fujian Zhangping Xielong High-tech Chemical Fiber Co., Ltd.

Wheat protein modified regenerated cellulose fiber

Feature: It contains a variety of amino acids, has moisturizing and skin care functions, and releases negative oxygen ions.

Specification: 1.0~1.33dtex/38mm

Applied technology: It can be blended into bicomponent or tricomponent yarn; for dyeing, use reactive dyes and avoid strong alkalis as much as possible.

Application field: Fabrics for knitted underwear and usual underwear

- **Brand:** Wheat Protein Fiber
- **Enterprise:** Hangzhou Youbiao Technology Co., Ltd.

Ultra-high shrinkage polyacrylonitrile fiber

Feature: The fiber with shrinkage rate that can reach 40 ~ 42% is bulky, increasing the three-dimensional sense of the fabric.

Specification: 1.66dtex×38mm

Applied technology: It can be blended with other short fibers

Application field: Artificial short fur, high-end clothing

- **Brand:** KunLun
- **Enterprise:** Acrylic Fiber Plant of PetroChina Daqing Petrochemical Company

One-step easily dyed cationic polyester covered yarn

Feature: The fiber has good dyeability, and the dyed fabric shows rich and dazzling colors.

Specification: 170dtex/48F

Applied technology: The fiber is suitable for air-jet and water-jet looms, and can be used as warp and weft yarns.

Application field: Cheongsam, yoga clothes, T-shirts, cycling clothes, and dance costumes

- **Brand:** Tongkun
- **Enterprise:** Tongkun Group Zhejiang Hengsheng Chemical Fiber Co., Ltd.

循环再利用化学纤维

循环再生、周而复始。采用更先进技术，对废旧纺织品进行综合利用。循环再利用纤维产业将带动消费的循环，进而刺激生产的循环，最终形成良性互动。

Recycle and start again and again. Regenerated and recycled fibers are produced by adopting more advanced technology to comprehensively utilize waste textiles. The recycling and reuse of the fiber industry will drive the cycle of consumption, thereby stimulating the cycle of production, and ultimately form a virtuous cycle.

循环再利用再生纤维素纤维

特点：植物基再生纤维，产品源自回收衣料以及国际权威认证的种植林木浆。纤维 100% 生物基，可 60 天快速降解；纤维含水率在 11% 左右，透气、吸湿功能良好，可与多种纤维进行混纺，性能优越

规格：1.33dtex×38mm

应用技术：织造、非织造及染色技术可参考常规粘胶纤维

应用领域：应用于植物基纺织服装及无纺用品

品牌：纤生代

申报企业：赛得利集团





Recycling regenerated cellulose fiber

Feature: As a plant-based regenerated fiber, the product is derived from recycled clothing and pulp from planted woods certified by international authorities. The fiber is 100% bio-based, which can be quickly degraded in 60 days; it has a moisture content of about 11% with good breathability and moisture absorption, and can be blended with a variety of fibers, demonstrating a superb performance.

Specification: 1.33dtex×38mm

Applied technology: Refer to conventional viscose fiber for weaving, non-woven and dyeing technology.

Application field: It can be used in plant-based woven clothings and non-woven products.

- **Brand:** Finex™
- **Enterprise:** Sateri Group

原液着色化学纤维

纤维“天生丽质”，无需后道染色，节约能源。原液着色纤维制备的织物颜色鲜艳、色泽均匀、经久耐用、不易褪色，符合时尚潮流中绿色环保的风尚，是时代的新宠儿。

The fiber is a natural beauty, without the need for subsequent dyeing, which saves energy. The fabric prepared by the dope dyed fiber is bright and uniform in color, durable and not easy to fade, it is in line with the green and environmental protection trend of fashion, and is the new star of the times.

原液着色超黑聚酯纤维

特点：色母粒添加量在 12%、15%、18%、20% 条件下可正常纺丝，克服了超黑聚酯长丝织物精炼后表面“发白”现象，其织物色坐标 L 值 ≤ 13 ；表观深度 K/S 值 ≥ 24 （机织物）或 30（针织物）

规格：83.3~333.3dtex/72~96F

应用技术：可以与其他纤维混纺

应用领域：遮光窗帘、旅行箱、电脑包、休闲鞋帽、线带绳索等

品牌：蓝纺

申报企业：浙江华欣新材料股份有限公司

原液着色高蓬松聚酯纤维

特点：原液着色、弹性伸缩率高、蓬松性好、吸水性强

规格：666dtex/192F

应用技术：建议加工温度 230℃ 左右、速度 50cm/min，在无油状态下操作，防止加注的液体或墨水与油剂产生排斥或化学反应

应用领域：笔芯、灯芯

品牌：桐昆

申报企业：桐乡市中洲化纤有限责任公司

原液着色异形截面混纤 BCF

特点：原液着色技术，纤维色彩丰富，刚性适中、蓬松柔软

规格：1020.6 dtex/60F

应用技术：在地毯织造过程中，一般织造的车速控制在 600 ~ 800m/min，同时织机的针、钩和纱线张力轴的张力以及基布的张力应匹配

应用领域：高档地毯

品牌：明特龙

申报企业：江苏凯普特新材料科技有限公司



Dope dyed ultra-black polyester fiber

Feature: The fiber can be spun normally under the conditions of adding 12%, 15%, 18% or 20% masterbatch, which overcomes the problem of "surface whitening" on the ultra-black polyester filament fabric after refining; the fabric color coordinate L value ≤ 13 ; apparent depth K/S value ≥ 24 (woven fabric) or 30 (knitted fabric)

Specification: 83.3~333.3dtex/72~96F

Applied technology: The fiber can be blended with other fibers.

Application field: blackout curtains, suitcases, computer bags, casual shoes and hats, cords and ropes, etc.

- **Brand:** Lanfang
- **Enterprise:** Zhejiang Huaxin New Materials Co., Ltd.

Dope dyed high-fluffiness polyester fiber

Feature: Dope dyed, high elasticity, good fluffiness, and strong moisture absorption

Specification: 666dtex/192F

Applied technology: A processing temperature around 230°C and a speed of 50cm/min are recommended, and the operation should be in an oil-free state to prevent repulsion or chemical reaction between the added liquid or ink and the oil.

Application field: Refills and lamp wicks

- **Brand:** Tongkun
- **Enterprise:** Tongxiang Zhongzhou Chemical Fiber Co., Ltd.

BCF dope dyed special-shaped cross-section blended fiber

Feature: Dope dyeing technology is applied to produce the fiber, and the fiber has rich colors and moderate rigidity, appearing to be fluffy and soft.

Specification: 1020.6 dtex/60F

Applied technology: In the process of carpet weaving, the general weaving speed is controlled at 600~800m/min, and the tension of the needle, hook and yarn tension shaft of the loom should match the tension of the base fabric.

Application field: high-end carpets

- **Brand:** Mingtelong
- **Enterprise:** Jiangsu Kaipute New Material Technology Co., Ltd.

2021/2022

中国纱线流行趋势

CHINA YARNS
FASHION TRENDS



绿色生态
GREEN ECOLOGY

功能赋予
FUNCTION ENDOWING

性能优化
PERFORMANCE OPTIMIZATION

2021 年是实施“十四五”规划的开局之年，全面建设社会主义现代化国家新征程开启之年。历经极不平凡的 2020 年，我国纺织行业协同创新、融通发展。自 2019 年，中国棉纺织行业协会（简称“中棉行协”）启动首届中国纱线流行趋势研究与发布。在 2020 年第二届的纱线流行趋势研究与探讨中，工作组延续“科技、时尚、绿色”的定位要求，推选出了一系列具有市场代表性、技术创新性的纱线新产品，推进纱线品牌建设，共襄产业未来。

纱线作为原料纤维至面料及服装产品的中间环节，除了提供纤维以丰富形式的组合方式，也在其加工工艺中赋予服装面料以差异化的触觉、视觉、功能以及整体风格可能。本次活动收集的创新产品，从一定程度反馈市场情况。经由中棉行协组织行业协会、院校和企业专家，以“缤纷与品质”为本次评选主题，从产品性能、功能赋加、市场需求及视觉时尚等多方面对产品进行综合考量，评选出具有市场代表性、满足消费者及产业需求、引领纱线生产趋势的系列产品。

所归纳的 2021/2022 中国纱线流行趋势产品主要分为绿色生态、功能赋予、性能优化三个大类。其中，各类别下又分别尝试从纱线产品的原料、工艺、功能及品质、时尚属性等，对收集产品进行系列划分和解读。



绿色生态

通过绿色纤维、革新的纺纱工艺以及绿色处理，分别从纺纱原料来源、高效工艺流程设计及绿色生产助剂等角度，涵盖纺纱生产的全流程，实现绿色、生态的生产理念。绿色纤维产品如再生纤维素纤维为主（莱赛尔、粘胶等）的色纺纱产品、再生合成纤维（如聚酯）原液染色纱、以及再生棉（回收旧衣物等），实现多种绿色原料的循环利用；绿色纺纱工艺方面，如针对亚麻纤维的棉纺短流程工艺、针对回收落棉进行的赛络纺形式的粗纱工序改装，从加工流程方面实现可循环与节能等；在绿色处理方面，包括环保植物染料的应用、全流程无荧光剂的精细加工流程等。

The year 2021 is the first year for the implementation of the "14th Five-Year Plan", and for the new journey of building a socialist modernized country in all respects. Throughout an extremely extraordinary year of 2020, China's textile industry has achieved cooperative innovation and integrated development. In 2019, China Cotton Textile Association ("CCTA") has initiated the first session of the China Yarns Fashion Trends 2021/2022 Research and Release. During the second session of the China Yarns Fashion Trends 2021/2022 Research and Discussion in 2020, the working group selected a series of new yarn products characterized by market representation and technological innovation based on the positioning requirements of "science and technology, fashion and green" so as to promote the building of yarn brand and make contribution to the future of the industry.

As an intermediate link from raw fiber to fabrics and garment products, yarn gives garment fabrics the possibility of different touch, vision, function and the overall style in its processing technology in addition to providing a rich combination of fibers. In this activity, the innovative products reflect the market situation to a certain extent. Industry associations, colleges and business experts, under the organization of CCTA, selected a series of products that are representative of the market, meet the demands of consumers and industries and lead the yarn production trend by focusing on the theme of "Colorful and Quality" and comprehensively considering the product performance, function addition, market demand and visual fashion.

The selected products in 2021/2022 China Yarns Fashion Trends are mainly classified into green ecology, function endowing and performance optimization. Under each category as mentioned above, the collected products are classified in series and interpreted from the raw material, technology, function, quality and fashion attribute of the yarn products.

Green ecology

Relying on green fiber, innovative yarn technology, and green treatment, the whole process of yarn production is covered from the perspectives of yarn raw material source, efficient technological process design and green production auxiliary agent, and the green and ecological production concept is realized. The green fiber products, such as dyed yarn products based on regenerated cellulose fiber (Lyocell, viscose, etc.), dyed yarn based on regenerated synthetic colorfiber (such as polyester), and regenerated cotton (recycled clothes, etc.), realize the recycling of various green raw materials. The green yarn technology, such as cotton yarn short-flow technology for flax fiber, and roving flow modification in the form of siro yarn for recycled noil, realizes the recycling and energy saving from processing flow, etc. The green treatment covers the application of environment-friendly vegetable dyes, and the fine processing flow in the whole process without fluorescent agent.

功能赋予

2020 年新冠疫情肆虐，后疫情时代中的消费者更加关注纺织品的舒适感、健康防护性及安全性，以再生纤维素纤维为基础的抗菌功能性纺织品正迎来新的市场机遇。舒适性产品主要包括如下三大类：热湿舒适性以多种天然纤维、功能性化纤以及差异化纱线结构等丰富手段实现；压感舒适性则通过弹性纤维成分的优化配合，此外可染丙纶轻巧，速干，防寒保暖和纯天然的抑菌，为户外运动产品增加了新的原料应用方向；触感舒适产品设计大量高端产品，应用羊绒、绢丝等高品质天然纤维混纺实现纱线体感功能的最优化。大健康背景下的安全防护功能全部集中于抗菌，包括天然抗菌纤维，如麻纤维，天然纤维功能整理，以及功能性抗菌化纤等。

性能优化

在纺纱生产中，原料、纺纱方式及现有加工装备往往会为纱线带来不同的特性及优劣势。为创造及满足更为丰富的消费及使用需求，目前产品展现出三个规律和趋势：首先是突破纱线结构限制，例如针对花式纱在使用耐久性、机械性能存在的问题，设计生产高品质花式纱；此外，是突破纱线采用原料对产品特性的限制，如突破传统纯棉纱外观、手感，利用工艺改良制备低捻超柔纯棉纱等，以及开发锦纶纤维涡流纺纱线，弥补涤纶的吸湿和弹性不足，拓宽市场应用；最后还包括突破加工装备限制，例如开发高支高品质转杯纺纱线、转杯纺纯纺莱赛尔纤维、木棉混纺纱等。

纱线流行趋势特点如下：精品化纯棉纱，如低捻、中空结构、持久抗菌的纯棉纱；多元复合是整体趋势，如绿色再生纤维素纤维与功能性纤维、高品质天然纤维混纺实现功能复合；新型纺纱技术的广泛应用，技术改造创新带来的品种适应性的扩展和优化；纱线时尚领域的拓展，花式纱、色纺纱的应用。希望通过中国纱线流行趋势的延续与发布，使纺纱作为纤维原料的载体，搭建与纺织产品之间的桥梁，通过向差异化材料、加工技术及结构设计，为纺织品提供更多的可能，并形成具有自主设计能力与风格的系列产品及生产企业。



Function endowing

Due to the raging of COVID-19 epidemic in 2020, consumers in the post-epidemic era attached more attention to the comfort, health protection and safety of textiles. Antibacterial functional textiles based on regenerated cellulose fibers are embracing new market opportunities. Comfort products mainly include the following three categories: The thermal-moisture comfort is realized by various means such as natural fibers, functional chemical fibers and differentiated yarn structures. The pressure comfort is optimized by means of the elastic fiber composition; and, the dyeable polypropylene fiber, which is lightweight, quick-drying, cold-proof, warm-keeping, pure natural and antibacterial, adds a new direction of raw material application for outdoor sports products. The touch comfort is designed for a large number of high-end products, and the high-quality natural fibers such as cashmere and spun silk are blended to realize the optimization of yarn somatosensory function. Under the healthy environment, all safety protection functions focus on antibacteria (including natural antibacterial fibers, such as fibrilia), functional finishing of natural fibers, and antibacterial functional chemical fibers.

Performance optimization

In terms of yarn production, raw materials, yarn production methods and existing processing equipment often give yarns different characteristics and advantages & disadvantages. In order to create and meet more abundant consumption and use demands, the current products present three laws and trends: 1) Breaking through the limitation of yarn structure. For example, high-quality fancy yarn is designed and produced by considering the durability and mechanical properties of fancy yarn. 2) Breaking through the limitation on yarn product characteristics due to the application of raw materials. For example, the low-twist pure cotton yarn with super-soft touch is prepared by breaking through the appearance and touch of traditional pure cotton yarn and relying on technology improvement, and the nylon fiber vortex yarn is developed so as to make up for the lack of moisture absorption and elasticity of polyester and broaden the market application. 3) Breaking through the limitation of processing equipment. For example, high-count and high-quality rotor yarn, Lyocell fiber, and kapok blended yarn are developed.

The characteristics of yarns fashion trend are as follows: 1) High-quality pure cotton yarn, such as low-twist, hollow-structured, durable and antibacterial pure cotton yarn. 2) Diversification, which is the overall trend, such as blending of the green regenerated cellulose fiber with functional fiber and high-quality natural fiber to realize functional compounding. 3) Expansion and optimization of variety adaptability attributable to the wide application of new yarn technology and the technological transformation and innovation. 4) Expansion of yarns fashion field, and application of fancy yarn and dyed yarn. It is expected to build a bridge with textile products through the continuation and release of China Yarns Fashion Trends and using the yarn as the carrier of fiber raw materials, provide more possibilities for textiles through differentiated materials, processing technology and structural design, and form a series of products and manufacturers with independent design capability and style.

再生聚酯喷气涡流纺纱

Recycled polyester air-jet vortex spinning



产品规格：100% 再生聚酯纤维（涤纶）

关键词：100% 再生涤纶 + 短流程

推荐理由：本着“绿色、科技、时尚”的产品理念，该产品使用的是可再生涤纶纤维，绿色、环保，对环境污染小。生产期间主要解决了再生涤纶流纺纺纱的工艺难点，实现涡流纺再生涤纶的批量生产，显著提升了再生涤纶产品的抗起毛起球性能，扩大了产品的应用范围。

适用范围：运动面料

代表企业：德州华源生态科技有限公司（品牌——锦密纺）

产学研：与国内高校、科研机构展开了广泛的技术合作，从建厂初与本地高校德州学院开展合作，成为德州学院的实习示范基地，到现在与外省高校东华大学、西安工程大学、江南大学等建立长期稳定的技术合作关系，形成产学研一体化。聘请资深教授、专家为公司技术顾问，参与公司科技技术项目的论证和前景谋划，提高公司核心竞争力。另外，先后与中国工程院院士姚穆达成合作意向，签订技术合作协议，并建立了技术合作平台—德州华源生态科技有限公司院士工作站。

Product specification: 100% recycled polyester fiber (polyester)

Keywords: 100% recycled polyester fiber + short process

Recommendation reasons: In the light of the product concept of “Green Development, Technology and Fashion”, the product comprises recycled polyester fiber, which is sustainable, environmentally friendly and less polluting. During the production, the technical difficulties in recycled polyester vortex spinning have been basically solved, realizing quantity production of the recycled polyester yarn with vortex spinning process, significantly improving the anti-pilling performance of the recycled polyester products, and expanding the application range of products.

Scope of application: Sportswear fabric

Representing enterprises: Dezhou Huayuan Eco-technology Co., Ltd.; Brand – Jinmi Spinning

Industry-university-research: The Company has carried out extensive technical cooperation with domestic universities and scientific research institutions, from the cooperation with the local college, Dezhou University, at the initial stage of plant construction, becoming an internship demonstration base for Dezhou University, to the establishment of long-term and stable technical cooperative relationship with universities outside Shandong Province such as Donghua University, Xi'an Polytechnic University and Jiangnan University, forming an industry-university-research integration. The Company also employs senior professors and experts as technical consultants to participate in the demonstration and prospect planning of the Company's science and technology projects, aiming to improve its core competitiveness. In addition, it has successively reached cooperation intentions with Academician Yao Mu from Chinese Academy of Engineering, signed technical cooperation agreements, and established a technical cooperation platform-Academician Workstation of Dezhou Huayuan Eco-technology Co., Ltd.

再生纤维素纤维转杯色纺纱

Recycled cellulose fiber rotor color-spun yarn



产品规格：100% 环保再生纤维素纤维（粘胶）

关键词：100% 粘胶 + 短流程 + 色纺

推荐理由：该纱线采用色纺纱技术，通过对色打样确定色泽，再在先进的转杯纺设备上通过混色、梳理、混并、成纱等工艺流程纺制而成，此方法符合国家绿色、生态环保可持续发展的要求。转杯纺环保粘胶色纺纱采用的原料是 100% 环保粘胶，环保粘胶源于树木，采用最可持续的木材资源以及生态环保的生产工艺，进行粘胶纤维生产。与传统粘胶相比可以显著降低排放和对水资源的影响。用该纱线制成的服装面料舒适有型，环保天然。面料的轻盈飘逸、光洁滑爽、颜色亮丽等性能也都达到了无与伦比的品质，具有健康、环保的特点，符合大众消费需求。

适用范围：高档的针织面料用纱

代表企业：浙江湖州威达集团股份有限公司（品牌——威达、长欣）

产学研：公司先后与东华大学、浙江理工大学等纺织学院为技术后盾开展合作。为进一步加强企业技术创新能力，有效利用行业资源，公司积极开展同行业间合作创新活动。

Product specification:100% environmentally-friendly recycled cellulose fiber (viscose)

Keywords:100% viscose + short process + colored spinning

Recommendation reasons:Rotor-spinning environmentally-friendly viscose color-spun yarn is applied with color-spun technology, which is spun through first determining the color-by-color proofing, and then carrying out the technological processes such as color mixture, carding, blending and yarn forming in the advanced rotor-spinning equipment. This method meets the requirements of national green, ecological, environmentally-friendly and sustainable development. The raw material used in the rotor-spinning environmentally-friendly viscose color-spun yarn is 100% environmentally-friendly viscose, which is originated from trees, and the viscose fiber is manufactured by using the most sustainable wood and the ecological and environmentally-friendly production technology. Compared with traditional viscose, it can significantly reduce the emission and the impact on water resources. Clothing fabrics made of this yarn are comfortable, stylish, environmentally-friendly and natural. The fabric is incomparably light, clean, elegant, silky and bright in color, and has healthy and eco-friendly characteristics, which meets the needs of mass consumption.

Scope of application:High-end yarn for knitted fabrics

Representing enterprises:Zhejiang Huzhou Weida Group Co., Ltd; Brand - Weida, Changxin

Industry-university-research:The Company has cooperated with textile colleges in Donghua University, Zhejiang Sci-tech University, etc., as the technical support. In order to further strengthen the technological innovation capability of enterprises and make effective use of industry resources, the Company actively organizes cooperative innovation activities in the industry.

醋酸纤维混纺纱

Cellulose acetate blended yarn

产品规格：60% 天丝™ 莫代尔 40% Naia™ 醋酸纤维

关键词：再生纤维素纤维

推荐理由：针对醋酸短纤维的特性，通过改造混开棉设备，创新采用短流程清梳联和柔性生产工艺，克服了因纤维强力低造成的纺纱困难，减少了纤维损伤，获得了较好的成纱质量；根据醋酸纤维柔软速干、抗起球性好的特性，将其与细旦莫代尔纤维进行混纺，开发出了具有柔软舒适、吸湿速干、抗起毛起球功能的纱线，满足了后道加工要求，填补了市场空白。

适用范围：家居服，内衣等

代表企业：山东联润新材料科技有限公司（品牌——联润）

产学研：与国家纺织产品开发中心共建“纺织新材料产品创新中心”和“纺织面料设计人才培训基地”，与天津工业大学共建“纺织新材料、新技术应用研究院”和“大学生实践基地”，与东华大学、青岛大学等国内纺织类高校和科研院所深入交流合作，柔性引进高层次人才担任企业技术顾问，开展项目研究。此外，与以品牌为中心的优势产业链合作，在产品开发、市场营销上，与奥地利兰精、美国伊士曼等国际知名纤维品牌形成战略合作。

Product specification: 60% Tencel™ Modal 40% Naia™ Cellulose acetate

Keywords: Recycled cellulose fiber

Recommendation reasons: Based on the characteristics of acetate staple fiber, the spinning difficulty caused by low fiber strength is overcome by reforming the blending equipment, and adopting innovatively the short-process blowing-carding and flexible production process, reducing fiber damage and obtaining relatively better yarn quality; based on the characteristics of softness, quick-drying and good pilling resistance of acetate fiber, it is spun by blending microdenier Modal fiber, and then a kind of yarn is successively developed with the characteristics of softness, moisture-absorption, quick-drying and good pilling resistance, meeting the requirements of the following processing and fill the market gap.

Scope of application: Loungewear, underwear, etc.

Representing enterprises: Shandong Long Run Textile Co., Ltd.; Brand - Long Run

Industry-university-research: The Company has established the "Textile New Material Product Innovation Center" and "Textile Fabric Design Talent Training Base" with the National Textile Product Development Base, and built "Textile New Material and New Technology Application Research Institute" and "College Students Practical Training Base" with Tiangong University, and has conducted in-depth exchanges and cooperation with domestic textile-competitive universities and research institutes such as Donghua University and Qingdao University, and flexibly introduced high-level talents to serve as enterprise technical consultants to carry out project research. In addition, it cooperates with the advantageous industrial chain centered on brand, and forms strategic cooperation with international famous fiber brands such as Austrian Lenzing and American Eastman in product development and marketing.

指标
Indicators

(1) Fabric Moisture Management Properties As Received
洗涤前织物动态水分传递性能

Performance 性能	Property Indices 性能指数		Test Result 测试结果		Requirement 要求	Conclusion 结论判定
			Average 平均值	Grade 级数		
Absorption- Quick Dry 吸湿速干性	- Wetting Time - 浸湿时间 T(s)	- Top Surface - 浸水面	4.1 s	4 级	≥ 3 级	Pass 符合
		- Bottom Surface - 渗透面	4.3 s	4 级	≥ 3 级	Pass 符合
	- Absorption Rate - 吸水速率 A/(%/s)	- Top Surface - 浸水面	67.3%/s	4 级	≥ 3 级	Pass 符合
		- Bottom Surface - 渗透面	62.6%/s	4 级	≥ 3 级	Pass 符合
	- Maximum Wetted Radius - 最大浸湿半径 R(mm)	- Bottom Surface - 渗透面	20 mm	4 级	≥ 3 级	Pass 符合
	- Spreading Speed - 液态水扩散速度 S (mm/s)	- Bottom Surface - 渗透面	2.7 mm/s	3 级	≥ 3 级	Pass 符合
Absorption- Sweat Releasing 吸湿排汗性	- Wetting Time - 浸湿时间 T(s)	- Bottom Surface - 渗透面	4.3 s	4 级	≥ 3 级	Pass 符合
	- Absorption Rate - 吸水速率 A/(%/s)	- Bottom Surface - 渗透面	62.6%/s	4 级	≥ 3 级	Pass 符合
	- One-way Transport Index - 单向传递指数 O		-69.8	2 级	≥ 3 级	Fail 不符合

(2) Fabric Moisture Management Properties After Wash
洗涤后织物动态水分传递性能

Washing Condition: GB/T 8629 - 2017, Test Program 4N, 5 Cycles, Line Dry
洗涤条件: GB/T 8629 - 2017, 4N 测试程序, 洗涤 5 次, 悬挂晾干

Performance 性能	Property Indices 性能指数		Test Result 测试结果		Requirement 要求	Conclusion 结论判定
			Average 平均值	Grade 级数		
Absorption- Quick Dry 吸湿速干性	- Wetting Time - 浸湿时间 T(s)	- Top Surface - 浸水面	6.3 s	3 级	≥ 3 级	Pass 符合
		- Bottom Surface - 渗透面	6.4 s	3 级	≥ 3 级	Pass 符合
	- Absorption Rate - 吸水速率 A/(%/s)	- Top Surface - 浸水面	68.7%/s	4 级	≥ 3 级	Pass 符合
		- Bottom Surface - 渗透面	67.6%/s	4 级	≥ 3 级	Pass 符合
	- Maximum Wetted Radius - 最大浸湿半径 R(mm)	- Bottom Surface - 渗透面	20 mm	4 级	≥ 3 级	Pass 符合
	- Spreading Speed - 液态水扩散速度 S (mm/s)	- Bottom Surface - 渗透面	2.1 mm/s	3 级	≥ 3 级	Pass 符合
Absorption- Sweat Releasing 吸湿排汗性	- Wetting Time - 浸湿时间 T(s)	- Bottom Surface - 渗透面	6.4 s	3 级	≥ 3 级	Pass 符合
	- Absorption Rate - 吸水速率 A/(%/s)	- Bottom Surface - 渗透面	67.6%/s	4 级	≥ 3 级	Pass 符合
	- One-way Transport Index - 单向传递指数 O		-35.2	2 级	≥ 3 级	Fail 不符合

环保再生棉纱

Environmentally-friendly recycled cotton yarn



产品规格：20-60% 再生棉

关键词：再生棉 + 色纺

推荐理由：循环、再生、低碳、可持续发展已经成为全球性消费共识和趋势，温州天成纺织二十余年来一直致力于纺织材料的可持续发展，并与服装品牌商共同推出绿丝可莱计划，将服装制造过程中的边角料和回收的旧衣物，经过分拣、分离和独特的自主知识产权的纺纱技术及工艺制作成新的纱线，重新回到品牌商的服装中去，完成完美闭环。所生产的色纺纱线不再染色，原色纱线适合任何产品的加工使用，纱线品质媲美原生纱线，生产过程工艺环保，产品通过 GRS 再生认证并可追溯，同时主导制定了多项再生产品的国家、行业和团体标准。

适用范围：牛仔、针织面料、袜纱、手套纱等

代表企业：温州天成纺织有限公司（品牌——绿丝可莱）

Product specification:20-60% recycled cotton

Keywords:recycled cotton + color spinning

Recommendation reasons:Recycling, circulation, low-carbon and sustainable development have become the consensus and trend of global consumption. Wenzhou Tiancheng Textile has been committed to the sustainable development of textile materials for more than 20 years, and has jointly launched the RECYCOLOR Plan with clothing brand owners. The leftover materials during clothing manufacture and second-hand clothes are utilized to produce new yarn through sorting, separating and unique spinning technology and process with independent intellectual property rights, which are sent back to the clothing products of brand owners, forming a perfect closed loop. The produced color-spun yarn is no longer dyed and the unbleached yarn is suitable for the processing and use of any product. The quality of the yarn is comparable to the original yarn. The production process is environmentally-friendly and the product has passed GRS regeneration certification and can be traced back. At the same time, the Company has led the formulation of a number of national, industrial and association standards for recycled products.

Scope of application:Denim, knitted fabric, sock yarn, glove yarn, etc.

Representing enterprises:Wenzhou Tiancheng Textile Co., Ltd.; Brand - RECYCOLOR

高支再生纤维素纤维紧赛纱

High-count recycled cellulose fiber compact Siro-spun yarn

产品规格：100% 莱赛尔，1.33dtex*38mm

关键词：莱赛尔

推荐理由：莱赛尔纤维是绿色纤维，其原料是自然界中取之不尽用之不竭的纤维素，生产过程无化学反应，所用溶剂无毒。而且可以生物降解，对环境和身体健康都有好处。莱赛尔纤维既有棉的“舒适性”，又有涤纶的“强度”、毛织物的“豪华美感”以及真丝的“独特触感”及“柔软垂坠”。而且莱赛尔纤维无论是在干还是在湿的状态下，都极具韧性。莱赛尔制成的产品强度高，色泽明亮，具有柔软、丝滑、悬垂性好、透气性好、吸湿力强等特点。

适用范围：产品适用于针织、梭织、经编和各种混纺织物

代表企业：福建新华源纺织集团有限公司

产学研：为了持续性发展莱赛尔系列纱线产品，新华源集团与辽东学院联合成立“新材料纺织应用研究院”，更加深入地研究和发挥莱赛尔纱线应用优势。

Product specification:100% Lyocell, 1.33dtex*38mm

Keywords:Lyocell

Recommendation reasons:Lyocell fiber is green and its raw material is inexhaustible cellulose in nature. There is no chemical reaction in the production process and the solvent used is nontoxic, besides, Lyocell fiber is biodegradable and beneficial to the environment and health. Lyocell fiber has the “comfort” of cotton, the “strength” of polyester, the “luxurious beauty” of wool fabric and the “unique touch” and “soft drapability” of real silk. Moreover, Lyocell fiber has extreme tenacity both in the dry and wet state. The products made from Lyocell have the features of high strength, bright color, softness, smoothness, good drapability, air permeability, and strong moisture absorption.

Scope of application:The products are suitable for knitted, woven, warp knitted and various blended fabrics

Representing enterprises:Fujian Xinhuiyuan Textile Group Co., Ltd.

Industry-university-research:In order to develop Lyocell yarn products sustainably, Xinhuiyuan Textile Group and Eastern Liaodong University jointly set up "New Material Textile Application and Research Institute" to study and give full play to the advantages of Lyocell yarn application.

指标 Indicators	名称 Name	莱赛尔 60s 紧赛 Lyocell 60s Compact Siro	莱赛尔 80s 紧赛 Lyocell 80s Compact Siro
	重量 CV% Weight CV%	1.0	0.8
	条干 CV% Evenness CV%	11.64	13.42
	-50% 细节 / 千米 -50% snick/km	0	3
	+50% 粗节 / 千米 +50% slub /km	8	25
	+200% 棉结 / 千米 +200% nep /km	28	56
	CVb%	2.9	1.0
	强力 (CN) Strength(CN)	266.9	193.4
	变异系数 CV% Variable coefficient CV%	9.8	10.9
	毛羽 3mm 根数 /100 米 Hairiness 3mm Number of pieces/100m	149	171



再生纤维素纤维纱线

Recycled cellulose fiber yarn

产品规格：100% 环保再生纤维素纤维（粘胶）

关键词：再生纤维

推荐理由：再生纤维素纤维，源自于自然界可循环再生的竹、木、速生林，成才速度快，不占用可耕地资源，吸湿、透气、染色性能优于棉花，是源于天然优于天然的绿色纤维。用它纺纱制成的织物废弃后可自然降解，不会造成白色污染，可实现产品“创新”、“绿色”、“低碳”、“环保”、“时尚”的特点。

适用范围：可用于高档成衣、休闲服、家纺等领域

代表企业：苏州震纶棉纺有限公司（品牌——SZEN）

产学研：与东华大学、苏州大学、江苏工程职业技术学院合作

Product specification: Product specification:100% environmentally-friendly recycled cellulose fiber (viscose)

Keywords:Recycled fiber

Recommendation reasons:Recycled cellulose fiber, originated from bamboo, wood and fast-growing woods which can be recycled in nature with a fast-growing speed, and do not occupy arable land resources, has the characteristics of moisture-absorption, air permeability, and better dyeing property than cotton, and is the nature-originated green fiber superior to natural fiber. The fabrics spun with it can be naturally degraded after being discarded, without causing white pollution, which can realize the characteristics of "innovation", "green development", "low carbon", "environmental protection" and "fashion".

Scope of application:It can be used in high-end ready-made clothes, sportswear, home textiles and other fields

Representing enterprises:Suzhou Zhenlun Cotton Spinning co., Ltd.;Brand - SZEN

Industry-university-research:The Company has cooperated with Donghua University, Soochow University and Jiangsu College of Engineering and Technology.

纯亚麻短流程赛络纱

Pure flax short-process Siro-spun yarn



产品规格：100% 本色脱胶亚麻；赛络纺 13.5 英支

关键词：棉纺短流程

推荐理由：创新使用棉纺短流程工艺进行纯亚麻纱生产，使用脱胶开松亚麻二粗及精落原料，并提前养生预湿增加其可纺性，细纱采用赛络纺工艺提高纱线强力，降低强力不匀率。通过从原料的养生处理、加湿装置改造、设备改造、创新纺纱流程、创新工艺设计，用干法纺纱代替湿法纺纱研发高效短流程纯亚麻纱。相比传统的湿纺纯亚麻生产流程，该生产流程短，万锭用工少，加工方式环保，避免了资源浪费和环境污染，无需采用化学品后整理，降低了能耗和产品成本，减少了生产过程对环境的污染，增加了产品的天然环保特性，提高了产品附加值。该产品工艺属国内首创，整体水平达到国际先进水平。对我国纺织产品打破欧美贸易壁垒，占领海外市场提供了有力保证。据了解，干纺环锭纯亚麻纱目前国内的有三、四家生产企业，年产量大约 5000 吨左右。

适用范围：该纱线既能满足高速喷气织机（车速：520 转 / 分钟）用纱，更可用于低速剑杆织机（车速：280 转 / 每分钟）。

代表企业：河南平棉纺织集团股份有限公司

产学研：与河南省工程学院、中原工学院、天津工业大学、中国纺织大学等院校密切配合，研究出了以纯麻、石墨烯、涤维棉、仿羊绒为代表的系列产品，并投入批量生产。通过与纤维原料厂家和国内国际知名企业、品牌进行合作，不断提高公司产品开发创新能力，拓宽产品销售渠道。

Product specification:100% natural degummed flax; Siro spinning 13.5s

Keywords:Short process for cotton spinning

Recommendation reasons:The innovative short cotton spinning process is adopted to produce pure flax yarn by using degummed and opened flax coarse and refined falling raw materials and conducting advanced healthy processing and pre-wetting to increase its spinnability. The yarn strength of the spun yarn is increased and the unevenness of strength is reduced by adopting Siro-spinning process. Through the healthy treatment of raw materials, modification of humidification device, equipment modification, innovative spinning process and innovative process design, dry spinning is used instead of wet spinning to develop high-efficiency short-process pure flax yarn. Compared with the traditional wet spinning pure flax production process, the production process is a short, less labor-consuming, and environmentally-friendly processing method, avoiding resource wasting and environmental pollution, eliminating the need for after-treatment of chemicals, reducing energy consumption and product cost, reducing the environmental pollution in the production process, increasing the natural environmentally-friendly characteristics of products and increasing the added value of products. This production process is pioneered in China, and reaches the international advanced level overall. It provides a powerful guarantee for China's textile products to break the trade barriers of Europe and America and occupy overseas markets. It is understood that there are currently three or four production enterprises in China for producing dry spinning ring pure flax yarn, with an annual output of about 5,000 tons.

Scope of application:The yarn can not only meet the yarn requirements of high-speed air-jet loom (speed: 520 rpm), but also be applied to low-speed rapier loom (speed: 280 rpm).

Representing enterprises:Henan Pingmian Textile Group Co., Ltd.

Industry-university-research:The Company has cooperated closely with universities and colleges such as Henan University of Engineering, Zhongyuan University of Technology, Tiangong University, and Donghua University, and developed a series of products represented by pure flax, graphene, Diwei Cutton and artificial cashmere, and put them into mass production. Through cooperation with fiber raw material manufacturers, domestic and international well-known enterprises and brands, the Company continuously improves its product development and innovation capabilities and broadens its product sales channels.

Indicators 指标	序号 No.	检验项目 Test item	计量单位 Measuring unit	标准技术要求 Standard technical requirements	实测结果 Test result	单项结论 Sigle conclusion
	1	百米重量偏差 Weight deviation per 100 meters	%	±3	0.74	合格 Satisfactory
	2	百米重量变异系数（CV） Coefficient of variation (CV) per 100 meters weight	%	≤ 3.5	1.83	合格 Satisfactory
	3	单纱断裂强度 Single yarn breaking strength	CN/tex	≥ 8.0	9.37	合格 Satisfactory
	4	单纱强力变异系数（CV） Coefficient of variation (CV) of single yarn strength	%	≤ 18.0	12.75	合格 Satisfactory
	5	条干均匀度变异系数（CV） Coefficient of variation (CV) of evenness	%	≤ 30.0	28.5	合格 Satisfactory
	6	千米细节（+50%） Nep per 1,000 meters (+50%)	个/km Pc/km	≤ 2300	2000	合格 Satisfactory
	7	千米粗节（-50%） Slub per 1,000 meters (-50%)	个/km Pc/km	≤ 3500	3132	合格 Satisfactory
	8	千米棉结（+200%） Cotton knot per 1,000 meters (+200%)	个/km Pc/km	≤ 5000	4100	合格 Satisfactory
	9	纤维含量 Fiber content	%	麻 100% Flax 100%	麻 100% Flax 100%	合格 Satisfactory

循环棉混纺色纺纱

Circulating cotton blended color-spun yarn

产品规格：40% 循环棉 /20% 棉 /40% 原液着色聚酯纤维（涤纶）

关键词：精梳落棉

推荐理由：采用精梳落棉循环利用，变废为宝，实现了“绿色制造”新理念。对工艺流程进行再造，实现了新的纺纱工艺。将赛络纺技术前移至粗纱工序，实现了粗纱 AB 纱的原创技术。对关键工序——梳棉进行改造和工艺研究，改变梳棉机的特点，由落掉短绒改为少落，实现了科技与时尚的有机结合。

适用范围：针织 T 恤、卫衣、运动裤、毛衫、内衣、休闲西装

代表企业：汶上如意技术纺织有限公司

产学研：与青岛大学、红妮集团就《海藻纤维针织纱线研究及产业化》项目进行深度合作，与西南大学就《高浓度阳离子改性剂合成工艺研发及纤维素纤维洁净染色产业化纺纱应用》项目进行联合开发。

认证标准及专利：发明专利《一种新式溢彩竹节纱的加工方法》201410749948.7

Product specification: Dyed polyester fiber with 40% recycled cotton /20% cotton /40% stock solution (polyester)

Keywords: Comber noil

Recommendation reasons: This product conducts the cyclic utilization of noil from combing, turning wastes into wants and realizing the new concept of “green manufacturing”. The new spinning process is realized by reconstructing the process. Siro spinning technology is advanced to the roving process, and the original technology of roving AB yarn is realized. The key process of cotton carding is reformed and studied on its process, and the characteristics of carding machine are changed from dropping out flocks to reducing the dropping of flocks, realizing the organic combination of technology and fashion.

Scope of application: Knitted T-shirt, fleeces, sweatpants, sweater, underwear, and leisure suit

Representing enterprises: Wenshang Ruyi Technology Textile Co., Ltd.

Industry-university-research: The Company has conducted in-depth cooperation with Qingdao University and Hongni Group on “Research and Industrialization of Alginate Fiber Knitting Yarn”, and has jointly developed with Southwest University on “Research and Development of Synthetic Process of High-concentration Cationic Modifier and Industrial Spinning Application of Cellulose Fiber Clean Dyeing”.

Certification, standards and patents: Invention Patent New Processing Method of colorful bunchy yarn (201410749948.7)

抑菌植物染纱

Bacteriostatic vegetable dyed yarn

产品规格：精棉 / 有机棉 / 新型纤维纯纺或混纺

关键词：植物染 + 色纺纱

推荐理由：绿色环保，色牢度达到 4 级以上，对白色念珠菌、大肠杆菌、金黄色葡萄球菌具有抑制作用。

适用范围：童装、内衣

代表企业：德州恒丰纺织有限公司

产学研：与青岛大学、锦柯草木染（上海）纺织科技有限公司、山东省锦润嘉植物染色科技有限公司等合作，形成了完整的工业化产业链。建有山东省植物染工业化研究院，有自己的色纤染色工厂。

Product specification: Refined cotton/organic cotton/new fiber pure-spinning or blending-spinning

Keywords: Vegetable dyed + color-spun yarn

Recommendation reasons: It is green and environmentally-friendly, with color fastness of above level 4, and play a restraining role against Candida albicans, Escherichia coli and Staphylococcus aureus.

Scope of application: Children's wear and underwear

Representing enterprises: Dezhou Hengfeng Textile Co., Ltd.

Industry-university-research: The Company has cooperated with Qingdao University, Jinke Grass and Wood Dyeing (Shanghai) Textile Technology Co., Ltd., Shandong Jinrunjia Plants Dyeing Technology Co., Ltd., etc., forming a complete industrial chain. It also established Shandong Institute of Plant Dyeing Industrialization and its own colored fiber dyeing plant.

指标

检测项目 Test item	测试方法（参数说明） Test method (Parameter Description)	技术要求 technical requirement	测试结果 Test result	判定 Conclusion
纤维含量 (%) Fiber content	FZ/T 01095-2002 GB/T2910.6-2009 GB/T 29862-2013 (结合公定回潮率) (Combined with the public moisture regain)	--	莱赛尔 49 棉 47 氨纶 4 lyocell 49 cotton 47 spandex 4	--
抑菌率 (%) Antibacterial rate	GB/T20944.3-2008 振荡法 Oscillation method	金黄色葡萄球菌 (ATCC6538) ≥ 70 Staphylococcus aureus	金黄色葡萄球菌 (ATCC6538) 81 Staphylococcus aureus	具有抗菌效果 antibacterial effect
		大肠杆菌 (8099) ≥ 70 Escherichia coli	大肠杆菌 (8099) 76 Escherichia coli	具有抗菌效果 antibacterial effect
		白色念珠菌 (ATCC 10231) ≥ 60 Candida albicans	白色念珠菌 (ATCC 10231) > 99 Candida albicans	具有抗菌效果 antibacterial effect

纱线趋势
YARN'S TREND

纯棉无荧光纱

Pure cotton non-fluorescent yarn

产品规格：100% 棉

关键词：无荧光

推荐理由：在传统纺纱中加强原料选择、纺纱过程管理、包装材料控制等，确保纱线中无荧光物质存在，保证婴童服装面料对“0 荧光”的要求。

适用范围：婴童服装面料、高端针织面料、家纺、医卫等

代表企业：利泰醒狮（太仓）控股有限公司（品牌——利泰醒狮）

指标 Indicators	品种 Type		JCF40S/1K (14.6)
	试验项目 Test item	单位 unit	
重量 Weight	平均重量 Average weight	g/100m	1.410
	号数 Number	tex	14.5
捻度 Degree of twist	捻系数 Twist coefficient	/	331
	捻度 Degree of twist	T/10cm	86.5
条干 Evenness	条干 CV% Evenness CV%	%	10.96
	-50% 细节 -50% nep	个 /KM	0
	+50% 粗节 +50% slub	个 /KM	3.0
	+140% 棉结 +140%cotton knot	个 /KM	83
	+200% 棉结 +200%cotton knot	个 /KM	13
强力 USTER TENSOJET 4 Strength USTER TENSOJET 4	强力 CV ≤ Strength CV≤	%	6.7
	平均强力 Average strength	cN	283.3
	断裂强力 Strength at break	cN/tex	19.4
	伸长率 Elongation	%	5.5
	伸长变异系数 Variable coefficient of elongation	%	6.5



Product specification:100% cotton

Keywords:Non-fluorescent

Recommendation reasons:The product strengthens the selection of raw materials, the management of the spinning process, the control of packaging materials in the traditional spinning, ensuring that there is no fluorescent substance in the yarn, and meeting the "Zero fluorescence" requirement of infants and children clothing fabrics.

Scope of application:Infants and children clothing fabrics, high-end knitted fabrics, home textiles, health care, etc.

Representing enterprises:Litai Xingshi (Taicang) Holding Co., Ltd.; Brand - Litai Xingshi

天然舒适保暖混纺纱线

Natural, comfortable and warm blended yarn



产品规格：腈纶 50%/ 莫代尔 40%/ 羊毛（野蚕丝）10%；或腈纶 30%/ 莫代尔 30%/COOLMAX30%: 羊绒（野蚕丝）10%

关键词：热湿舒适

推荐理由：充分利用各混纺纤维的特性，展现不一样的特点，产品独特，天然、舒适、保暖、抗起毛起球。产量：5 吨；利润率：30% 及以上；研发投入比：10% 及以上。联合高校、原料供应商、下游的面料、服装企业共同研发推广。

适用范围：开发系列适合御寒轻薄、舒适保暖内衣。

代表企业：安徽华茂纺织股份有限公司；品牌——乘风牌

产学研：与国内知名高等院校、科研院所如上海东华大学、武汉理工大学、武汉纺织大学、安徽工程大学、江南大学、安徽农业大学等进行联合研究开发，加快推进代表行业先进技术水平的重点攻关项目和课题，围绕核心技术、关键技术进行科学、系统的攻关。与此同时，加大与上下游企业进行合作，尤其是与上游新原料企业的合作与开发，共同开发新产品。

Product specification:Acrylic fiber 50%/ Modal 40%/ Wool (wild silk) 10%; or acrylic 30%/ Modal 30%/ COOLMAX 30%: Cashmere (wild silk) 10%

Keywords:Thermal-wet and comfortable

Recommendation reasons:The product makes full use of the features of various blended fibers to show different characteristics: unique, natural, comfortable, warm-keeping, and anti-pilling. The output is 5 tons; the profit rate is 30% and above; R&D investment ratio: 10% and above. The product is developed and promoted jointly by universities, raw material suppliers, downstream fabrics and clothing enterprises.

Scope of application:The developed series is suitable for coldness-resistant, light and thin, comfortable and warm-keeping underwear.

Representing enterprises:Anhui Huamao Textile Co., Ltd.; Brand - Chengfeng Brand

Industry-university-research:The Company has conducted joint research and development with domestic famous universities and colleges such as Shanghai Donghua University, Wuhan University of Technology, Wuhan Textile University, Anhui Polytechnic University and Jiangnan University, so as to accelerate the key research projects and topics that represent the advanced technology level of the industry, and carry out scientific and systematic research centered on core technologies and key technologies. In the meanwhile, the Company also enhances cooperation with upstream and downstream enterprises, especially with upstream enterprises of new raw materials, to jointly develop new products.



指标

Indicators

紧密赛络纺：腈纶 / 莫代尔 / 野蚕丝
混纺比例：50/40/10
纱支：60 支
Compact Siro spinning: acrylic fiber/Modal/wild silk
Blending ratio: 50/40/10
Yarn count: 60

检测项目 Test item	实测值 Measured value
重量偏差 (%) Weight deviation (%)	-1.1
条干 CV% Weight deviation (%)	10.4
千米细节 -50% Nep per 1,000 meters-50%	0.3
千米粗节 +50% Slub per 1,000 meters+50%	3.0
千米棉结 +200% Cotton Knot per 1,000 meters+200%	7.5
千米棉结 +140% Cotton Knot per 1,000 meters +140%	38.3
平均毛羽 H Average hairiness H	3.4
强力 CV% Average hairiness H	8.8
修正前平均强力 (cN) Average strength before correction(cN)	147.2
修正前最低强力 (cN) Lowest strength before correction (cN)	95.8
伸长率 (%) Elongation (%)	8.9
伸长率 CV% Elongation CV%	9.4
平均捻度 (捻 /10cm) Average degree of twist (twist/10cm)	109.4
捻系数 Twist coefficient	342.5
2mm 毛羽 (根 /10m) 2mm hairiness (piece/10m)	84.0
3mm 毛羽 (根 /10m) 3mmhairiness (piece/10m)	17.0
A3B3C3D2	5.5
A1B1C1D1	162.0

蓄热保暖三包芯混纺纱

Heat-retaining and warm-keeping three-core blended yarn



产品规格：53% 火山岩灰色聚酯纤维（涤纶）/23% 棉 /17% 涤纶长丝 /7% 双氨纶丝

关键词：热湿舒适

推荐理由：应用从火山岩天然矿石中提取的纤维，利用其吸收热力的特性，将蓄热保暖分子有效的注入纱线和服装面料中，从而达到减缓热量流失的功效；面料中含有 30% 及以上火山岩纤维时，可使皮肤温升 1.14℃，达到干爽保暖的效果。采用自主创新的设备装置加工制备，芯纱为非弹长丝 + 双弹氨纶长丝的三包芯特殊结构，是单芯和双芯纱弹性升级版，面料尺寸稳定好、弹性更足更持久，产品利润率在 14% 左右。

适用范围：该弹力产品为牛仔用纱；火山岩纤维非弹纱线可广泛用于机织、针织的运动休闲服装，以及羽绒服、外套等

代表企业：山东岱银纺织集团股份有限公司

产学研：与军事科学院系统工程研究院军需工程技术研究所、西安工程大学、东华大学、天津工业大学、江南大学、武汉纺织大学、广州纺科院等知名院所建立了长期稳定的合作关系，纱线产品为差异化高端牛仔用纱。

Product specification:53% volcanic gray polyester fiber (polyester) /23% cotton /17% polyester filament /7% double spandex filament

Keywords:Thermal-wet and comfortable

Recommendation reasons:The product is made of fibers extracted from volcanic natural ore and applies its feature of heat absorption to effectively inject the heat storage and warm-keeping molecules into yarns and clothing fabrics, so as to achieve the effect of slowing down heat loss; when the fabric contains 30% or more volcanic fibers, the skin temperature can rise by 1.14℃, thus achieving the effect of dryness and warm-keeping. The product is processed and prepared with independent innovative equipment and devices. The core yarn is the special three-core structure of non-filament + double spandex filament, which is an elastic upgraded version of single-core and double-core yarn, reaching the requirements of stable fabric size, sufficient and durable elasticity and realizing the product profit rate of about 14%.

Scope of application:The elastic product is the yarn used in denim ; volcanic fiber non-elastic yarn can be widely used in machine-weaving and knitted sports and leisure clothing, down jackets, coats and so on.

Representing enterprises:Shandong Daiyin Textile Group Co., Ltd.

Industry-university-research:The Company has established long-term and stable cooperation with well-known prestigious institutes such as Institute of Quartermaster Engineering Technology, Institute of Systems Engineering, Academy of Military Science, Xi'an Polytechnic University, Donghua University, Tiangong University, Jiangnan University, Wuhan Textile University, and China Textile Academy in Guangzhou. Its yarn products are differentiated high-end yarn for denim.

保暖中空纯棉纱

Warm-keeping hollow pure cotton yarn



产品规格：100% 棉

关键词：热湿舒适

推荐理由：中空纱线具有纱线内部空隙增大呈中空结构，其吸水速干性能得到改善；空气隔层使得面料热传导率降低，并且从皮肤表面吸收的热量减少，进一步提升了纯棉面料的保温性和接触暖感；中空纱织物料具有重量轻、手感柔和、吸水速干、保暖性好等特点。

适用范围：应用于卫衣、家居服、婴童、内衣针织产品面料

代表企业：魏桥纺织股份有限公司；品牌——魏桥牌棉纱、嘉嘉家纺、向尚运动

产学研：与中国纺织信息中心、国家纺织产品开发中心、中国纺织工程学会以及等机构的合作交流，积极参与国家纺织产品开发中心主导下的“产品技术创新联盟项目”，成功对接了多个产品开发新项目。与东华大学、武汉纺织大学等纺织专业院校签署了产学研合作协议，与青岛大学、天津工业大学、江南大学、苏州大学等纺织院校保持着良好的合作关系，并与赛得利、吉林化纤、中纺绿纤等纤维研发企业，利郎、金太阳、安踏等品牌客户，密切开展上下游企业协作，促进行业协同创新和交流合作。

Product specification:100% cotton

Keywords:Thermal-wet and comfortable

Recommendation reasons:The hollow yarn has a hollow structure with the increased internal gap, and its water-absorption and quick-drying performance are improved; the air buffer reduces the thermal conductivity of the fabric and the heat absorbed from the skin surface, which further improve the warm-keeping and contact warmth of the pure cotton fabric; the hollow yarn fabric has the characteristics of light weight, soft touch, water absorption, quick drying, good warm-keeping and so on.

Scope of application:It is applied to knitted fabrics of fleeces, loungewear, infants and children clothing and underwear

Representing enterprises:Weiqiao Textile Company Limited; Brand - Weiqiao Brand Cotton, Jiajia Home Textile, Xiangshang Sportswear

Industry-university-research:The Company has cooperated and exchanged with China Textile Information Center, National Textile Product Development Base, China Textile Engineering Society and other institutions, actively participated in the “Product Technology Innovation Alliance Project” led by National Textile Product Development Base, and successfully joined several new product development projects. It has signed industry-university-research cooperation agreements with textile colleges such as Donghua University and Wuhan Textile University, and has maintained good cooperative relations with textile-competitive such as Qingdao University, Tiangong University, Jiangnan University and Soochow University. It has also cooperated closely with upstream and downstream enterprises with fiber R&D enterprises such as Sateri, Jilin Chemical Fiber Group Co., Ltd., and Grecell Co., Ltd. as well as brand customers such as Lilang, Golden Sun and Anta, to promote collaborative innovation, exchanges and cooperation in the whole industry.

指标

环形空腔率 Annular cavity rate	27.3%
CM40SK(100%长) +T50D 水溶聚酯纱线指标 CM40SK(100% long) +T50D water soluble polyester yarn	条干 CV%9.30% evenness CV%9.30%
细节 nep	0/1
粗节 slub	2/13
棉结 cotton knot	7/40
CVb%	2.01%
DR%	16.41%
强力 strength	374.9CN
强力 CV% strength CV%	8.0%
伸长率 % elongation %	7.5%

吸湿抑菌亚麻混纺纱

Hygroscopic and bacteriostatic flax blended yarn



产品规格：38% 莱赛尔 /28% 再生纤维素纤维（粘胶）/19% 亚麻 /15% 锦纶

关键词：抑菌 + 抗静电 + 吸湿排汗

推荐理由：巧妙构思采用兰精公司莱赛尔和再生环保粘胶与抑菌抗静电性能优良的亚麻纤维和高强耐磨的锦纶纤维有机结合，拓宽各种纤维性能，以此实现零浪费环保目标。做成的织物具有抑菌抗静电、吸湿排汗、低碳环保、高强耐磨等优良性能，能大大降低对环境的影响。

推出符合理性消费观念的小型系列。运用功能性材料，为单品注入可持续设计特点。目前，生产效率达 98.5% 以上，劳动强度不大，利润率在 15% 左右。

适用范围：广泛应用于针织、机织服装以及家纺面料

代表企业：山东岱银纺织集团股份有限公司

产学研：与军事科学院系统工程研究院军需工程技术研究所、西安工程大学、东华大学、天津工业大学、江南大学、武汉纺织大学、广州纺科院等知名院所建立了长期稳定的合作关系，纱线产品为差异化高端牛仔用纱。

Product specification:38% Lyocell/ 28% recycled cellulose fiber (viscose)/ 19% flax/ 15% nylon

Keywords:Bacteriostatic + antistatic + moisture wicking

Recommendation reasons:The product adopts an ingenious idea of the organic combination of Lenzing's Lyocell, recycled, environmentally-friendly viscose, flax fiber with excellent bacteriostatic and antistatic properties, and reinforced wear-resistant nylon fiber, to expand the properties of various fibers so as to achieve the goal of zero waste and environmental conservation. The produced fabric has excellent properties: It is anti-bacteria, anti-static, moisture wicking, environmentally-friendly, producing low carbon emission, with high strength and wear resistance, and can reduce substantially the impact on the environment.

A series of compact products that meet rational consumption ideas have been launched. The application of functional sport materials infuses the sustainable design features to a single product. Currently, the production efficiency is above 98.5%, the labor intensity is not very high, and the profit rate is about 15%.

Scope of application:The product is widely used in knitted and woven garments and home textile fabrics.

Representing enterprises:Shandong Daiyin Textile Group Co., Ltd.

Industry-university-research:The Company has established long-term and stable cooperation with well-known prestigious institutes such as Institute of Quartermaster Engineering Technology, Institute of Systems Engineering, Academy of Military Science, Xi'an Polytechnic University, Donghua University, Tiangong University, Jiangnan University, Wuhan Textile University, and China Textile Academy in Guangzhou, and its yarn products are differentiated high-end yarn for denim.

抑菌混纺赛络纺纱

Bacteriostatic blended Siro-spun yarn

产品规格：80% 棉 /20% 再生纤维素纤维（安泰贝）

关键词：抑菌

推荐理由：随着社会的发展和科技的进步，人们对生活水平也提出了更高要求，时尚、舒适、功能性面料成为人们关注的焦点。加之新冠疫情的影响，抑菌、抗病毒的面料更加激发了人们对时尚和健康的追求。具有抑菌、抑菌功能的安泰贝产品正切合了人们的消费观。通过注射纺丝技术将活性抑菌物质均匀分散在纤维表面及内部，对细菌、真菌及病毒等微生物具有抑制作用。原料源自木源纤维亲肤、不致敏，安全有效实现抑菌性能，提升穿着体验。

适用范围：各种内衣用料

代表企业：高青如意纺织有限公司；品牌——如意

产学研：常年与武汉纺织大学签订合作协议，产品在欧美市场和日韩市场备受追捧，且交易额逐年提升。



Product specification:80% cotton/20% recycled cellulose fiber (Antaibei)

Keywords:Bacteriostatic

Recommendation reasons:Social and technological advancements have fueled people's desires for higher living standards, and fashionable and comfortable functional fabrics have drawn more attention. Coupled with the impact of the COVID-19 pandemic, bacteriostatic and antiviral fabrics have further stimulated people's pursuit of fashion and health. The bacteria-resistant Antaibei products are in line with people's consumption view. Through the injection spinning technology, the active bacteriostatic substance is evenly distributed on the surface and inside of the fiber to inhibit bacteria, fungus, viruses and other microorganisms. The raw materials, derived from wood fiber, are skin-friendly, non-allergenic, safe and effective to achieve bacteriostatic properties, therefore enhancing the wearing experience.

Scope of application:Various fabrics for underwear

Representing enterprises:Gaoqing Ruyi Textile Co., Ltd.; Brand - Ruyi

Industry-university-research:The company has signed a cooperation agreement with Wuhan Textile University over the years. The products are highly popular in the European, American, Japanese and Korean markets, with transaction volume increasing year by year.



指标
Indicators

品种 (筒纱) Type (cone yarn)	棉 / 安泰贝 80/20 10S Cotton/Antaibei
重量 CV% WeightCV%	0.8
重量偏差 Weight deviation	-0.8
回潮率 % Moisture regain %	5.8
强力 CV% Strength CV%	4
单纱强力 CN Single Yarn Strength CN	862.84
断裂强度 Breaking strength	14.8
伸长率 Elongation	7.6
伸长率 CV% Elongation CV%	5.1
最小强力 CN Minimum strength CN	795.4
毛羽指数 H Hairiness Index H	7
条干 CVb Evenness CVb	2.2
条干 CV% Evenness CV%	9
细节 /Km (-50) Nep/Km(-50)	0
粗节 /Km (+50%) Slub/Km(+50%)	2
棉结 /Km (200%) Cotton Knot(200%)	2
捻度 (T/10Cm) twist(T/10Cm)	50.2
捻系数 Twist coefficient	383.3
捻度 CV% Degree of twistCV%	2.1

吸湿发热抑菌赛络纺纱

Hygroscopic, heating and bacteriostatic Siro-spun yarn

产品规格：40% 功能性再生纤维素纤维（粘胶）/ 30% 功能性腈纶 / 30% 精梳棉

关键词：吸湿发热 + 抑菌

推荐理由：吸湿、发热、抑菌、抗静电等特性使面料具有良好的亲肤性，面料可单染，实现雪花、撞色等色纺效果，满足客户对产品外观的不同需求；产品附加值高；此外，环保特性保障了产品的长久生命力，在产业领域实现可持续发展。年产量 3000 吨左右，利润率 10% 左右。

适用范围：针织保暖内衣，婴幼儿内衣、家居服、床品等

代表企业：杭州永昉纺织有限公司（品牌——沐安娜）

Product specification:40% functional recycled cellulose fiber (viscose)/30% functional acrylic fibers/30% combed cotton

Keywords:Hygroscopic and heating + bacteriostatic

Recommendation reasons:Moisture absorption, heat generation, bacteriostatic, antistatic, and other characteristics make the fabric very skin-friendly.

The fabric can be dyed through a single-bath process to achieve the effect of color spinning such as snowflakes and color contrasting and meet the different needs of customers for the appearance of the products; the product has high added value; In addition, environmentally-friendly features ensure the long-term vitality of products and their sustainable development in the industry. The annual output is about 3,000 tons, with a profit rate of about 10%.

Scope of application:Knitted thermal underwear, infant underwear, lounge wear, bedding, etc.

Representing enterprises:Hangzhou Yongfang Textile Co., Ltd.; Brand - MUANNA

指标
Indicators

检测项目 (计量单位) (样品识别) Test item (measurement unit) (Sample identification)	测试方法 Test method	标准值及允差 (一等品) Standard value and tolerance (First grade)	测试结果 Test Results	判定 Conclusion
起球 (级) Pilling (level)	GB/T4802.1-2008 圆轨迹法起球 600 次压力 780cN Circular trajectory method pilling 600 times pressure 780cN	≥ 3	3-4	符合 Pass
吸湿发热性能 Heat absorption performance	FZ/T 73036-2010 最高升温值 Maximum heating value	$\geq 4^{\circ}\text{C}$	8.7 $^{\circ}\text{C}$	符合 Pass
	FZ/T 73036-2010 30min 内平均升温值 Average heating value within 30min	$\geq 3^{\circ}\text{C}$	3.0 $^{\circ}\text{C}$	符合 Pass
保温率 Insulation rate	GB/T 11048-1989 方法 A 平板式 Method A Flat	保温率 $\geq 30\%$ Insulation rate $\geq 30\%$	保温率 30.63% 克罗值 0.2533clo 传热系数 25.64W/n $^2\cdot^{\circ}\text{C}$ Insulation rate30.63% Crowe value0.2533clo Heat transfer coefficient 25.64W/n $^2\cdot^{\circ}\text{C}$	符合 Pass
抗菌性 Antibacterial	TZ/T73023-2006 金黄色葡萄球菌抑菌率 Staphylococcus aureus inhibition rate	$\geq 80\%$	94.9	符合 Pass
	TZ/T 73023-2006 大肠杆菌抑菌率 Escherichia coli inhibition rate	$\geq 70\%$	86.8	
	TZ/T 73023-2006 白色念珠菌抑菌率 Inhibition rate of Candida albicans	$\geq 60\%$	86.4	



抑菌混毛纱

Bacteriostatic blended wool yarn

产品规格：44% 棉 / 19% 禾素纤维 / 9% 羊驼毛 / 28% 羊毛；或 26% 莫代尔 / 12% 禾素纤维 / 31% 婴驼纤维 / 31% 羊毛

关键词：持久抑菌 + 触感

推荐理由：不同于市场上其它后期所加的助剂、重金属离子或石墨烯材料（不可降解），公司自主研发的禾素纤维天然环保、全生物基可降解纤维、抑菌消臭、抗病毒、透气、保暖、亲肤性好、安全等优点。产品以禾素、莫代尔、羊驼毛等环保纤维为原料，都是取自自然界。通过优化染色工艺和后整理工艺，制备优良的无添加任何功能性助剂从而制的优良的功能性面料。

适用范围：功能性针织毛衫等

代表企业：南京禾素时代抗菌材料科技有限公司；品牌——禾素时代

认证标准及专利：FZ/T 22016-2019 喷毛纱



Product specification:44% cotton/19% Bioserica fiber/9% alpaca fiber/28% wool; or 26% Modal/12% Bioserica fiber /31% juvenile fiber/31% wool

Keywords:Persistent bacteriostatic effect + touch

Recommendation reasons:Unlike other peer products on the market with additives, heavy metal ions or graphene materials (non-degradable), the Company's self-developed Bioserica fiber is a kind of full bio-based degradable fiber, with natural and environmentally-friendly, bacteriostatic, odor eliminating, anti-virus, breathable, warm-keeping, skin-friendly, and safe properties. The product is made of environmentally-friendly fiber materials such as Bioserica, Modal, and alpaca fiber, all of which are originated from the natural world. By optimizing the dyeing process and post-finishing process, an excellent functional fabric is produced without adding any functional additives.

Scope of application:Functional knitted sweaters, etc.

Representing enterprises:Nanjing Bioserica Era Bacteriostatic Materials Technology Co., Ltd.; Brand - Bioserica Era

Certification, standards and patents:FZ/T 22016-2019 Spray fluffy yarn

广东省微生物分析检测中心
GUANGDONG DETECTION CENTER OF MICROBIOLOGY
分析检测结果
ANALYSIS AND TEST RESULT

报告编号 (Report No.): 2020FM26038R01

测试结果如下:

测试微生物	标准空白试样 “0”接触时间 的活菌浓度 (cfu/mL)	标准空白试样 振荡 18h 后 的活菌浓度 (cfu/mL)	抗菌织物试样 振荡 18h 后 的活菌浓度 (cfu/mL)	抑菌率 (%)	标准要求
大肠杆菌 (<i>Escherichia coli</i>) ATCC 25922	2.3×10^4	7.0×10^6	1.1×10^6	84	$\geq 70\%$
金黄色葡萄球菌 (<i>Staphylococcus aureus</i>) ATCC 6538	2.5×10^4	6.3×10^6	1.5×10^4	99	$\geq 70\%$
白色念珠菌 (<i>Candida albicans</i>) ATCC 10231	1.7×10^4	1.1×10^6	5.2×10^4	95	$\geq 60\%$

指标
Indicators

广东省微生物分析检测中心
GUANGDONG DETECTION CENTER OF MICROBIOLOGY
分析检测报告
REPORT FOR ANALYSIS

报告编号
Report No. 2020FM25737R01

样品名称
Name of Sample 莱康时代 莱康抗菌羊毛衫面料

委托单位
Applicant 莱康时代抗菌材料科技有限公司

检测类型
Test Type 菌种检测

单位地址: 广州市光复中路 188 号 4 楼 404 号
Address: Building 40, No.188 Guangfu Zhong Road (Guangzhou), Guangdong, China
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传真: (020)87377668
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网址: www.gdca.com.cn
Website:

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广东省微生物分析检测中心
GUANGDONG DETECTION CENTER OF MICROBIOLOGY
分析检测报告
REPORT FOR ANALYSIS

报告编号: 2020FM25737R01 检测项目: 抗菌性能检测 (GB 20080.1-2013)

送检单位: 莱康时代抗菌材料科技有限公司 送检日期: 2020-08-04

报告日期: 2020-08-10

检测项目: 抗菌性能检测 (GB 20080.1-2013)

检测方法: 菌种检测

检测结果: 符合标准要求

检测单位: 广东省微生物分析检测中心

检测人员: 李秋华 审核: 李秋华 批准: 李秋华

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广东省微生物分析检测中心
GUANGDONG DETECTION CENTER OF MICROBIOLOGY
分析检测报告
REPORT FOR ANALYSIS

报告编号: 2020FM25737R01

检测项目: 抗菌性能检测 (GB 20080.1-2013)

检测方法: 菌种检测

检测结果: 符合标准要求

检测单位: 广东省微生物分析检测中心

检测人员: 李秋华 审核: 李秋华 批准: 李秋华

第 3 页, 共 4 页

纱线趋势
YARN TREND

抑菌混纺纱

Bacteriostatic blended yarn



产品规格：80% 棉 /20% 星卫纤维

关键词：抑菌、杀菌

推荐理由：星卫纤维是运用了银微子独有的穿透性抑菌性能，以涤纶纤维为载体，以专利技术导入而生产而成。星卫纤维的纺织性能跟一般涤纶无异，可与其他纺织原料混纺成不同成份的纱线。星卫纤维的嵌入式专利工艺，在无任何化学或金属离子释出的条件下，制作出高抑菌能力和安全长效的布料，纱线和布料已经多家权威机构检测认证，具有耐高温、耐酸碱、水洗 50 次无释出的特点；同时，抑菌抗病毒，除臭效果好，安全长效。

目前在机生产的星卫纤维分为三组份和二组份配比纱线：毛羽少，面料细腻，滑爽，透气，附加值高。

适用范围：针织服装，内衣，口罩等医疗保健用品

代表企业：德州恒诚仓储物流集团有限公司（品牌——星卫纤维）

Product specification: 80% cotton/20% Xingwei fiber

Keywords: Bacteriostatic and bactericidal

Recommendation reasons: Xingwei fiber is produced by using the unique penetrating bacteriostatic property of silver microparticles, with the polyester fiber as a carrier through patented technology. The textile performance of this fiber is the same as ordinary polyester, and it can be blended with other textile materials into yarns of different components. Xingwei Fiber's patented embedding process produces high bacteriostatic, safe, and long-lasting fabrics without any chemical or metal ion release. The yarn and fabric have been tested and certified by many authoritative organizations and are resistant to high temperature, acid, and alkali, with no liberation after washing 50 times; meanwhile, the bacteriostatic and antiviral material is also safe and long-lasting with good deodorizing effect.

Xingwei fiber currently produced on the machine is divided into three-component and two-component matching yarns: the fabric is low-hairiness, fine, smooth, and breathable, with high added value.

Scope of application: Knitwear, underwear, masks and other medical and health care products

Representing enterprises: Dezhou Hengcheng Storage Logistics Co., Ltd.; Brand-Xingwei Fiber

检验报告
TEST REPORT



报告编号 (No.) BG20002132

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检验结论 Conclusion

检测项目 Items	判定依据 Judgment Basis	结论 Conclusion
1 纤维含量 Fiber content	---	---
2 甲醛含量 Formaldehyde content	GB 18401-2010	符合 Pass
3 pH 值 pH Value	GB 18401-2010	符合 Pass
4 异味 Determination of odour	GB 18401-2010	符合 Pass
5 可分解致癌芳香胺染料(24 种) Banned azo colourants(24 kinds)	GB 18401-2010	符合 Pass
6 耐水色牢度 Colour fastness to water	GB 18401-2010	符合 Pass
7 耐酸汗渍色牢度 Colour fastness to acid perspiration	GB 18401-2010	符合 Pass
8 耐碱汗渍色牢度 Colour fastness to alkaline perspiration	GB 18401-2010	符合 Pass
9 耐干摩擦色牢度 Colour fastness to dry rubbing	GB 18401-2010	符合 Pass
10 *大肠杆菌(8099)抑菌率 Bacteriostatic rate of Escherichia coli(8099)	*GB/T20944.2-2007	具有抗菌效果 has antibacterial effect
11 *肺炎克雷伯氏菌(ATCC 4352)抑菌率 Bacteriostatic rate of Klebsiella pneumoniae	*GB/T20944.2-2007	具有抗菌效果 has antibacterial effect
12 *金黄色葡萄球菌(ATCC 6538)抑菌率 Bacteriostatic rate of Staphylococcus aureus	*GB/T20944.2-2007	具有良好抗菌效果 has good antibacterial effect

中纺标检验认证股份有限公司
中纺标(深圳)检验有限公司
中国商业联合会轻纺消费品质量监督检测中心
国家质检总局授权进出口商品检验鉴定机构

Chinatesta Textile Testing & Certification Services
Tel: 0755-89633313 Fax: 0755-82398109
Add: 6-B/Block B, Donghe Industry Building, Shushen Road, Shatoujiao, Yantian District, Shenzhen 518061, China
地址: 深圳市盐田区沙头角沙湾路东和工业大厦B栋6-B楼 518061

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地址: 深圳市盐田区沙头角沙湾路东和工业大厦B栋6-B楼 518061

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标准值 Requirement	实测值 Results	单项判定 Judgement
10 *大肠杆菌(8099)抑菌率(%) *GB/T 20944.2-2007 Bacteriostatic rate of Escherichia coli(8099)		具有抗菌效果 has antibacterial effect
≥90	98	
分包项目 the subcontract item.		
11 *肺炎克雷伯氏菌(ATCC 4352)抑菌率(%) *GB/T 20944.2-2007 Bacteriostatic rate of Klebsiella pneumoniae(ATCC 4352)		具有抗菌效果 has antibacterial effect
≥90	90	
分包项目 the subcontract item.		
12 *金黄色葡萄球菌(ATCC 6538)抑菌率(%) *GB/T 20944.2-2007 Bacteriostatic rate of Staphylococcus aureus(ATCC 6538)		具有良好抗菌效果 has good antibacterial effect
≥99	>99	
分包项目 the subcontract item.		

抑菌混纺紧赛纱

Bacteriostatic blended compact Siro-spun yarn

产品规格：60% 莫代尔 /40% 恒锦抑菌纤维；赛络紧密纺 40 英支

关键词：抑菌除臭 + 再生

推荐理由：在保证内衣特性柔软、保暖的基础上，结合抗疫情况，注入了抑菌元素。为保证人体健康、安全贡献力量，已实现批量生产。

适用范围：主要用作针织内衣和户外运动服装

代表企业：临邑恒丰纺织科技有限公司（品牌——恒锦）

产学研：与青岛大学、天津大学实现产学研合作

Product specification:60% Modal/40% Hengjin bacteriostatic fiber; compact Siro-spun 40s

Keywords:Bacteriostatic and deodorant + recycle

Recommendation reasons:On the basis of ensuring the softness and warmth of the underwear, bacteriostatic elements are added against the anti-epidemic background, making contributions to health and safety protection, and the product has achieved mass production.

Scope of application:Mainly used for knitted underwear and outdoor sportswear

Representing enterprises:Linyi Hengfeng Textile Technology Co., Ltd.; Brand - Hengjin

Industry-university-research:The Company has realized industry-university-research cooperation with Qingdao University and Tianjin University.

抑菌保暖石墨烯纤维混纺纱

Bacteriostatic thermal graphene fiber blended yarn

产品规格：棉 / 氨纶 / 20%-80% 石墨烯纤维

关键词：抑菌、保暖

推荐理由：将石墨烯改性涤纶纤维与精梳棉混纺通过三道条混、交叉混并的方式增强纤维的混合效果，并条采用石墨烯改性涤纶条包裹棉纤维精梳条，以确保纱线的抑菌效果；优选粗纱定量适当降低粗纱捻系数，增大细纱浮游区纤维的离散程度，增强包芯纱的包覆效果；氨纶长丝采用 4.0 倍预牵伸倍数提高石墨烯混纺纱线回弹效果。

适用范围：机织服装、针织运动领域

代表企业：魏桥纺织股份有限公司；品牌——魏桥、嘉嘉家纺、向尚运动

产学研：与中国纺织信息中心、国家纺织产品开发中心、中国纺织工程学会以及等机构的合作交流，积极参与国家纺织产品开发中心主导下的“产品技术创新联盟项目”，成功对接了多个产品开发新项目。与东华大学、武汉纺织大学等纺织专业院校签署了产学研合作协议，与青岛大学、天津工业大学、江南大学、苏州大学等纺织院校保持着良好的合作关系，并与赛得利、吉林化纤、中纺绿纤等纤维研发企业，利郎、金太阳、安踏等品牌客户，密切开展上下游企业协作，促进全行业协同创新和交流合作。

认证标准及专利：一种石墨烯改性纤维包芯弹力纱线及弹力面料的生产方法



Product specification: Cotton/Spandex/20%-80% graphene fiber

Keywords: Bacteriostatic and thermal

Recommendation reasons: The graphene-modified polyester fiber is blended with combed cotton to enhance the blending effect of the fiber through three-drawing strip mixing and cross-mixing. Graphene-modified polyester slivers are adopted to wrap around the cotton fiber combed slivers to ensure the bacteriostatic effect of the yarn; Roving quantification is optimized to appropriately reduce twist coefficient, the dispersion degree of the fibers in the floating area of the spun yarn is increased to enhance the covering effect of the core-spun yarn; the Spandex filament adopts 4.0 time-pre-draft to improve the rebound effect of graphene blended yarn.

Scope of application: Woven clothing, knitted sportswear

Representing enterprises: Weiqiao Textile Co., Ltd.; Brand - Weiqiao, Jiajia Home Textiles, Xiangshang Sportswear

Industry-university-research: The Company has cooperated and exchanged with China Textile Information Center, National Textile Product Development Base, China Textile Engineering Society

and other institutions, actively participated in the "Product Technology Innovation Alliance Project" led by National Textile Product Development Base, and successfully joined several new product development projects. It has signed industry-university-research cooperation agreements with textile colleges such as Donghua University and Wuhan Textile University, and has maintained good cooperative relations with textile-competitive such as Qingdao University, Tiangong University, Jiangnan University and Soochow University. It has also cooperated closely with upstream and downstream enterprises with fiber R&D enterprises such as Sateri, Jilin Chemical Fiber Group Co., Ltd., and Greccell Co., Ltd. as well as brand customers such as Lilang, Golden Sun and Anta, to promote collaborative innovation, exchanges and cooperation in the whole industry.

Certification, standards and patents:A production method of graphene-modified fiber core-spun elastic yarn and elastic fabric

指标 Indicators

纱线质量指标达到国标优等纱水平；CMC/ 石墨烯 40SK 纱线指标：条干 CV%12.58%；细节 1/56；粗节 16/233；棉结 18/105，CVb% 2.0%；DR%18.0%；强力 245.5CN；强力 CV%7.5%；伸长率 %6.5%；3mm 毛羽 49.0；与常规包芯纱相比较，石墨烯改性纤维包芯弹力纱线具有抑菌、远红外发热、促进微循环、防紫外线等性能。

Quality indicators of the yarn reach the national standard for superior yarn; CMC/graphene 40SK yarn indicators: evenness CV% 12.58%; nep 1/56; slub 16/233; cotton knot 18/105, CVb% 2.0%; DR% 18.0%; strength 245.5CN; strength CV% 7.5%; elongation% 6.5%; 3mm hairiness 49.0; compared with conventional core-spun yarn, the graphene-modified fiber core-spun elastic yarn is bacteriostatic, far-infrared heating, microcirculation-enhancing, and anti-ultraviolet and has other properties.

抑菌 PHBV 混纺紧赛纱

Bacteriostatic PHBV blended compact Siro-spun yarn



产品规格：70% 莫代尔 /30%PHBV；紧密赛络纺 50 英支

关键词：触感舒适 + 抑菌

推荐理由：该纱线采用国际知名兰精公司超细纤维素纤维和以植物淀粉制造的葡萄糖为主要原料的生物质抑菌纤维 PHBV 混纺而成，由该纱线制成的面料手感柔滑，在具备舒适的亲肤感和良好悬垂性的同时又对白色念珠菌、金黄色葡萄球菌和肺炎克雷伯氏菌具有永久高效抑菌效果，符合 AAA 级纺织品抑菌标准。

适用范围：内衣

代表企业：无锡四棉纺织有限公司；品牌——球鹤

产学研：与无锡江南大学和香港理工大学有合作科研项目

Product specification:70% Modal/30% PHBV; compact Siro spinning 50s

Keywords:Comfortable touch + bacteriostatic

Recommendation reasons:The yarn is blended by the ultrafine cellulose fiber of the internationally renowned Lenzing Company and the biomass bacteriostatic fiber PHBV which takes glucose made from plant starch as the main raw material. The fabric made of this yarn feels smooth and has a comfortable and skin-friendly touch, good drapability, as well as a strong and permanent bacteriostatic effect against Candida albicans, Staphylococcus aureus, and Klebsiella pneumoniae. It meets the bacteriostatic standards for AAA textiles.

Scope of application:underwear

Representing enterprises:Wuxi No. 4 Cotton Mill Textile Co., Ltd.;Brand - Qiuhe

Industry-university-research:The Company has cooperative scientific research projects with Wuxi Jiangnan University and Hong Kong Polytechnic University.

指标

条干 CV% Evenness CV%	11.08%
强力 Strength	225cN
细节 nep	0 个 /KM
粗节 slub	12 个 /KM
棉结 cotton knot	24 个 /KM

精梳紧赛纺超柔纱

Combed compact Siro-spun super soft yarn

产品规格：100% 原棉；紧密赛络纺 20 英支、32 英支、40 英支

关键词：低捻、高强

推荐理由：精梳紧赛纺超柔纱低捻高弹，纱线毛羽少，外观干净形态好，技术指标达到乌斯特公报 5% 水平，选用了优质长绒棉、皮马棉和细绒棉混棉，能达到用户需要的不同强力水平，有效解决了针织布面形态不饱和，布感不柔软，布面发硬这一问题，产品年产 4000 吨，市场销售形势好，价格高于同类形纱 20% 左右，利润高出同类纱 15% 以上。

适用范围：适用于高档服装面料

代表企业：扶沟县昌茂纺织有限责任公司（品牌——昌茂）

产学研：与中原工学院，周口师院建立了校企产学研共创基地，下游客户建立了战略合作伙伴

Product specification: 100% raw cotton; compact Siro spinning 20s, 32s, 40s

Keywords: Low twist and high strength

Recommendation reasons: Combed compact Siro-spun super soft yarn has a low twist and high elasticity, low hairiness, clean appearance, and good shape, and its technical indicators reach the level of 5% in the Uster Statistics. It blends high-quality long-staple cotton, Pima cotton and fine-staple cotton, which can reach the different strength levels required by users, thus effectively solving the problems of unsaturated shape, non-softness, and hardness of the fabric. The product has an annual output of 4,000 tons, and the has great sales prospects on the market, with a price 20% higher and profit more than 15% higher than the peer product yarn.

Scope of application: Suitable for high-end clothing fabrics

Representing enterprises: Fugou County Changmao Textile Co., Ltd.; BraChangmao

Industry-university-research: The Company has established school-enterprise industry-university-research co-creation base with Zhongyuan University of Technology and Zhoukou Normal University, and established strategic partnerships with downstream customers.

高支转杯纯棉纱

High-count rotor pure cotton yarn

产品规格：100% 棉；转杯纺

关键词：高支高品质转杯纺纱

推荐理由：挑战转杯纺高支纱线技术瓶颈，突破转杯纺纱的纱支上限，开发高支高品质转杯纺纱线。秉承转杯纺纱粗犷硬朗的风格，同时又具备高支纱的柔软和透气性，面料具有麻料制品的手感，又兼具棉制品的舒适度，适用于高端针织服装面料。

适用范围：高端针织服装面料

代表企业：利泰醒狮（太仓）控股有限公司（品牌——利泰醒狮）

Product specification:100% cotton; rotor spinning

Keywords:High-count high-quality rotor spinning yarn

Recommendation reasons:Challenging the technical bottleneck for rotor-spinning high-count yarn, the high count high-quality high-count rotor-spinning yarn is developed, which breaks through the upper limit of rotor-spinning yarn count. While maintaining the rough and tough style of rotor-spinning yarn, it also has the softness and breathability of high-count yarn. The fabric touches like flax products, and has the comfort of cotton products, making it ideal for fabrics of high-end knitted clothing.

Scope of application:High-end knitted clothing fabrics

Representing enterprises:LiTai XingShi (Taicang) Holdings Co., Ltd.; Brand - LiTai XingShi

性能优化

PERFORMANCE OPTIMIZATION

指标

Indicators

品种 Type		单位 Unit	OEC50S/1K (11.7)	OEC60S/1K (9.7)
试验项目 Test item				
重量 Weight	平均重量 Average weight	g/100m	1.184	1.022
	号数 Number	tex	12.2	10.5
捻度 Weight	捻系数 Twist coefficient	/	478	451
	捻度 Twist	T/10cm	139.8	145.0
条干 Evenness	条干 CV% Evenness CV%	%	16.22	16.72
	-50% 细节 -50% nep	个 /KM PC/KM	137	212
	+50% 粗节 +50% slub	个 /KM PC/KM	116	146
	+140% 棉结 +140% cotton knot	个 /KM PC/KM	5832	5445
	+200% 棉结 +200% cotton knot	个 /KM PC/KM	881	762
强力 USTER TENSOJET 4 Strength USTER TENSOJET 4	强力 CV ≤ Strength CVs	%	11.3	12.4
	平均强力 Average strength	cN	152.1	123.1
	断裂强力 Breaking strength	cN/tex	13.0	12.7
	伸长率 Elongation	%	5.7	5.5
	伸长变异系数 Variable coefficient of elongation	%	9.2	9.8

再生纤维素纤维转杯纱

Recycled cellulose fiber rotor yarn

产品规格：100% 莱赛尔纤维

关键词：莱赛尔 + 转杯纱

推荐理由：莱赛尔纤维源于自然，纤维生产使用环保闭合的生产工艺，所用有机溶剂无毒无害，溶剂达 99.7% 以上循环利用。产品可生物降解，回归自然，美好演绎绿色循环。使用独特的技术路径及精密的过程控制，莱赛尔纤维可以很好地和各类纺织纤维混纺或者通过纯纺交织，创造出不同的面料风格和特性，广泛地应用于各类下游应用领域。纱线具有转杯纺纱线挺括、蓬松且透气性好的特点，也具有莱赛尔纱线的光泽与高强度。

适用范围：牛仔面料，高端男女装，家用纺织品

代表企业：林茨（南京）粘胶丝线有限公司



Product specification: Product specification: 100% Lyocell fiber

Keywords: Lyocell + Rotor yarn

Recommendation reasons: Lyocell fiber originates from nature. The fiber production adopts an environmentally-friendly closed production process, using non-toxic and harmless organic solvents, of which 99.7% or higher can be recycled. The product is biodegradable, and by returning to nature, it beautifully demonstrates a green cycle. Using a unique technical approach and precise process control, Lyocell fibers can be blended with various textile fibers or applied alone to create different fabric styles and characteristics, which are widely used in various downstream applications. The yarn has the crispiness, fluffiness, and good air permeability of rotor-spinning yarn, as well as the luster and high strength of Lyocell yarn.

Scope of application: Denim fabrics, high-end men's and women's clothing, and home textiles

Representing enterprises: Linz (Nanjing) Viscose Yarn Co., Ltd.

绢丝混纺高支纱

Spun silk blended high-count yarn



产品规格：50% 莱赛尔 /25% 棉 /25% 绢丝；紧密赛络纺 100 英支

关键词：超细纤维素纤维 + 绢丝

推荐理由：该纱线采用国际知名兰精公司超细纤维素纤维、棉和天然绢丝蛋白纤维混纺而成，由该纱线制成的面料色泽光亮纯净，具有舒适滑爽、吸湿透气、挺括有型等特点，符合目前轻运动系列的流行趋势。

适用范围：男士 T 恤

代表企业：无锡四棉纺织有限公司；品牌——球鹤

产学研：与无锡江南大学和香港理工大学有合作科研项目

Product specification: Product specification:50% Lyocell/25% cotton/25% spun silk; compact Siro spinning 100s

Keywords:Superfine cellulose fiber + spun silk

Recommendation reasons:The yarn is blended with ultra-fine cellulose fiber from the internationally renowned Lenzing Group, cotton and natural spun silk protein fiber. The fabric made of this yarn is bright and pure in color, comfortable and smooth, moisture-wicking, breathable, crisp and stylish, etc., thus in line with the current trend of light sportswear series.

Scope of application:Men's T-shirts

Representing enterprises:Wuxi No. 4 Cotton Mill Textile Co., Ltd.; Brand - Qiuhe;

Industry-university-research:The Company has cooperative scientific research projects with Wuxi Jiangnan University and Hong Kong Polytechnic University.

再生纤维素纤维锦纶混纺纱

Recycled cellulose fiber nylon blended yarn

产品规格：80% 莫代尔 /20% 锦纶

关键词：舒适 耐磨 功能

推荐理由：结合莫代尔、锦纶的优点，提高产品的服用舒适性、功能性及耐磨性能。锦纶纤维弹性好、蓬松，单独生产成网成条困难，与莫代尔混纺后可纺性提高。并条工序改造，解决锦纶生产中制条成形不良，明显减少成纱疵疵。开发多种不同比例、组份锦纶混纺系列产品，开拓锦纶的使用量。

适用范围：内衣、运动服饰

代表企业：无锡一棉纺织集团有限公司；品牌——TALAK

产学研：设有纺织研究院及研发车间，与东华大学、江南大学、哈工大等院校进行深度合作，拥有一批纺织学科及交叉学科的博士、硕士，以及具有丰富实践经验的技术人员。

Product specification:80% Modal/20% nylon

Keywords:Comfortable, wear-resistant and functional

Recommendation reasons:The yarn combines the advantages of Modal and nylon to improve the comfort, functionality, and wear-resistance of the product. Nylon fiber is fluffy with good elasticity but is difficult to form sliver or web alone in the production process. After blending with Modal, the spinnability is improved. The doubling step sliver process is reformed to solve the poor sliver forming in nylon production and significantly reduce the finished yarn defects. A variety of nylon blended products with different proportions and components are developed to expand the use of nylon.

Scope of application:Underwear, sportswear

Representing enterprises:Wuxi No. 1 Cotton Mill Textile Group Co. Ltd.; Brand - TALAK

Industry-university-research:The Company has a textile research institute and a research and development workshop, and conducts in-depth cooperation with Donghua University, Jiangnan University, Harbin Institute of Technology, and other institutions. It has a group of doctors and masters in textile and interdisciplinary, as well as technical personnel with rich practical experience.



木棉混纺纱

Kapok blended yarn



产品规格：60% 棉 /20% 木棉纤维 /20% 天丝；70% 棉 /30% 木棉纤维；80% 棉 /320% 木棉纤维；

关键词：光泽保暖天然抑菌

推荐理由：木棉纤维光泽好、保暖性好、祛螨防蛀，将木棉纤维与棉或天丝混纺，既可发挥木棉纤维特性，又可达良好的成纱性能指标。产品的市场前景很好，现年产量可达350～450吨，年产能增长率约10%。

适用范围：① 中高档服装。针织内衣、绒衣、袜子、机织休闲外衣、牛仔服装等。
② 家纺面料、床上用品等。

代表企业：忠华集团有限公司；品牌——忠华牌。

产学研：与广东纺织职业技术学院、广州大学服装学院、江南大学、武汉纺织大学等科研单位建立了紧密合作关系。与国内知名牛仔布生产企业形成了长期战略合作伙伴。

认证标准及专利：专利：清梳联设备与木棉混纺方法 CN201910627945.9

Product specification:60% cotton/20% kapok fiber/20% Tencel; 70% cotton/30% kapok fiber; 80% cotton/320% kapok fiber;

Keywords:Glossy, warm-keeping, and naturally bacteriostatic

Recommendation reasons:Kapok fiber is glossy with good warm-keeping, anti-mite and mothproof properties. Blending kapok fiber with cotton or Tencel can not only present characteristics of kapok fiber but also achieve well finished yarn property indicators. The market prospect of the product is very good, with a current annual output of 350-450 tons, and an annual production capacity growth rate of about 10%.

Scope of application: (1) Mid-to-high-end clothing. Knitted underwear, fleece, socks, woven casual outerwear, denim clothing, etc. (2) Home textile fabrics, bedding, etc.

Representing enterprises:Zhonghua Group Co., Ltd.; Brand - Zhonghua brand.

Industry-university-research:The Company has established close cooperation with Guangdong Polytechnic, College of Textile and Garment of Guangzhou University , Jiangnan University, Wuhan Textile University and other scientific research institutes, while also forming a long-term strategic partnership with well-known domestic denim manufacturers.

Certification, standards and patents:Patent: A blowing-carding unit and a kapok blending method

指标
Indicators

检验检测项目（计量单位） [样品识别] Test item (measurement unit) [Sample identification]	测试方法 Test method	标准值及公差 Standard value and tolerance	检验检测结果 Test Results	判定 Conclusion
抗菌效果（AAA 级） Antibacterial effect (AAA grade)	FZ/T73023-2006 附录 D 振荡法 样品经洗涤 50 次 Appendix D Oscillation Method The sample is washed 50 times	金黄色葡萄球菌抑菌率≥ 80% inhibition rate of Staphylococcus aureus ≥80%	96.23%	符合 Pass
		大肠杆菌抑菌率≥ 70% inhibition rate of Escherichia coli ≥70%	86.80%	
		白色念珠菌抑菌率≥ 60% Candida albicans≥60%	88.00%	
防螨性能（趋避率） Anti-mite performance (avoidance rate)	GB/T24253-2009 9.1 趋避法 Avoidance method	趋避率≥ 60% avoidance rate≥60%	趋避率 70.87% avoidance rate70.87%	样品具有防螨效果 The sample has anti-mite effect



段彩段弹混纺花式纱

Segmentally colored and segmentally elastic blended fancy yarn



产品规格：5%-10% 舒弹丝纤维

关键词：生物基弹力短纤

推荐理由：在复合式段彩纱技术上进行纱线创新，将段彩纱生产技术与生物基弹力短纤（舒弹丝）应用相结合，纱身使用棉纤维，段彩处使用生物基弹力短纤，利用两种材质的回弹及染色性能差异，可形成纱线的段彩段弹效果。

适用范围：家纺面料及服装面料

代表企业：魏桥纺织股份有限公司；品牌——魏桥牌棉纱、嘉嘉家纺、向尚运动

产学研：与中国纺织信息中心、国家纺织产品开发中心、中国纺织工程学会以及等机构的合作交流，积极参与国家纺织产品开发中心主导下的“产品技术创新联盟项目”，成功对接了多个产品开发新项目。与东华大学、武汉纺织大学等纺织专业院校签署了产学研合作协议，与青岛大学、天津工业大学、江南大学、苏州大学等纺织院校保持着良好的合作关系，并与赛得利、吉林化纤、中纺绿纤等纤维研发企业，利郎、金太阳、安踏等品牌客户，密切开展上下游企业协作，促进全行业协同创新和交流合作。

认证标准及专利：专利：一种段彩段弹纱线及其生产方法

Product specification: Product specification:5%-10% stretchable silk fiber

Keywords:Bio-based elastic staple fiber

Recommendation reasons:The yarn innovation is carried out based on composite segmentally colored yarn technology, combining segmentally colored yarn production technology with the application of bio-based elastic staple fiber (stretchable silk), using cotton fiber in the yarn body, and bio-based elastic staple fiber in colored segments so that the resilience and the difference in dyeing properties of the two materials can achieve the segmentally colored and segmentally elastic effect of the finished yarn.

Scope of application:Home textile fabrics and clothing fabrics

Representing enterprises:Weiqlao Textile Co., Ltd.; Brand - Weiqlao Brand Cotton, Jiajia Home Textiles, Xiangshang Sportsware

Industry-university-research:The Company has cooperated and exchanged with China Textile Information Center, National Textile Product Development Base, China Textile Engineering Society and other institutions, actively participated in the "Product Technology Innovation Alliance Project" led by National Textile Product Development Base, and successfully joined several new product development projects. It has signed industry-university-research cooperation agreements with textile colleges such as Donghua University and Wuhan Textile University, and has maintained good cooperative relations with textile-competitive such as Qingdao University, Tiangong University, Jiangnan University and Soochow University. It has also cooperated closely with upstream and downstream enterprises with fiber R&D enterprises such as Sateri, Jilin Chemical Fiber Group Co., Ltd., and Greccell Co., Ltd. as well as brand customers such as Lilang, Golden Sun and Anta, to promote collaborative innovation, exchanges and cooperation in the whole industry.

Certification, standards and patents:a kind of segmentally colored and segmentally elastic and its production method

指标 Indicators

纱线质量指标达到国标一等纱水平；CM40SW+（70% 舒弹丝 +30% 细旦涤纶）段彩段弹：纱线重量不匀率 1.8%，捻度不匀率 3.0%，纱线强力 245.7CN，彩长 3—5cm，彩距 40—120cm，给彩量 0.7；舒弹丝 / 细旦涤纶纤维含量 8%

The yarn quality indicators reach the national standard of first-class yarn; CM40SW+ (70% stretchable yarn + 30% microdenier polyester) segmentally colored and segmentally elastic yarn: the yarn weight unevenness rate is 1.8%, twist unevenness rate is 3.0%, yarn strength is 245.7 CN, color segment length is 3-5cm, color segment distance is 40-120cm, color segment quantity is 0.7; the content of stretchable silk/microdenier polyester fiber is 8%

再生纤维素纤维绢丝混纺纱

Recycled cellulose fiber spun silk blended yarn



产品规格：80% 莱赛尔 /20% 绢丝

关键词：触感舒适

推荐理由：莱赛尔是再生纤维素纤维，绢丝是蛋白质纤维，开发莱赛尔与绢丝混纺纱，将两种纤维特性合二为一，成纱具有较高的强力、良好的吸湿性、手感柔软细腻、色泽亮丽，成品服饰面料具有更好的服用性能，改善绢丝褶皱，产品绿色时尚。清花工艺流程改造，采用预混处理，提高纤维混合效果以及可纺性能。优选各道工艺参数，细纱选用配套的皮辊，解决绢丝生产过程中的卷绕问题，络筒优选打结器，提高捻结效率与接头质量。开发多种不同比例、组份绢丝混纺系列产品，满足客户个性化需求。

适用范围：服装、家纺类

代表企业：无锡一棉纺织集团有限公司；品牌——TALAK

产学研：设有纺织研究院及研发车间，与东华大学、江南大学、哈工大等院校进行深度合作，拥有一批纺织学科及交叉学科的博士、硕士，以及具有丰富实践经验的技术人员。

Product specification:80% Lyocell/20% spun silk

Keywords:Comfortable touch

Recommendation reasons:Lyocell is a recycled cellulose fiber, and spun silk is a protein fiber. The Lyocell and spun silk blended yarn is developed to combine the characteristics of the two fibers. The finished yarn has high strength, good moisture absorption, soft and delicate touch and bright color, the produced clothing fabric has better wearability with less wrinkling of spun silk and is green and fashionable. The reform of the cotton-cleaning process adopts pre-mixing treatment to improve the fiber mixing effect and spinnability. The various process parameters are also optimized, selecting matching rollers for spun yarn for the winding problem in the spun yarn production process, and optimizing the knotter for spooling to improve the efficiency of twisting knot and the quality of joints. A variety of spun silk blended products with different proportions and components are developed to meet the individual needs of customers.

Scope of application:Clothing, and home textiles

Representing enterprises:Wuxi No.1 Cotton Mill Textile Group Co. Ltd; Brand - TALAK

Industry-university-research: The Company has a textile research institute and a research and development workshop, and conducts in-depth cooperation with Donghua University, Jiangnan University, Harbin Institute of Technology, and other institutions. It has a group of doctors and masters in textile and interdisciplinary, as well as technical personnel with rich practical experience.

可染丙纶纤维混纺纱

Dyeable polypropylene fiber blended yarn



产品规格：70% 再生纤维素纤维（粘胶）/30% 丙纶纤维；90% 粘胶 /10% 丙纶纤维；95% 粘胶 /5% 丙纶纤维；80% 天丝 /20% 丙纶纤维；紧密纺 30 英支、24 英支、40 英支

关键词：触感舒适、可染丙纶纤维

推荐理由：应用可染丙纶纤维，结合环锭纺、紧密纺技术、细纱集体落纱技术，开生产了丙纶与粘胶、天丝等混纺高端纱线，手感舒爽、吸湿快干、强度高、毛羽少、条干均匀度好，应用其制成的纺织品，其针织物纺织品布面光洁，轻薄、柔软、抗起毛起球性能优异、顺滑、耐磨、亮丽。目前已实现了批量生产，产品利润率达 9.1%。

适用范围：高档 T 恤、运动装、内衣、工装等

代表企业：南通双弘纺织有限公司；品牌——双弘

产学研：与东华大学、江南大学及原料企业、同行行业及下游应用客户开展广泛的合作，协同推进新型纤维材料的应用与推广。

Product specification: Product specification:70% recycled cellulose fiber (viscose)/30% polypropylene fiber; 90% viscose/10% polypropylene fiber; 95% viscose/5% polypropylene fiber; 80% Tencel/20% polypropylene fiber; compact spinning 30s, 24s, 40s

Keywords:Dyeable polypropylene fiber with a comfortable touch

Recommendation reasons:The dyeable polypropylene fiber is used to combine ring spinning, the compact spinning technology, and the spun yarn collective doffing technology, and develop and produce the high-end blended yarn with polypropylene, viscose, and Tencel. It has comfortable touch, moisture-absorption, quick-drying, high strength, less hairiness, and great evenness. The textile produced is light, soft,, smooth in surface, great wear-resistant, with excellent anti-pilling performance and bright color. Mass production has been achieved, with a product profit rate of 9.1%.

Scope of application:High-end T-shirts, sportswear, underwear, workwear, etc.

Representing enterprises:Nantong Double Great Textile Co., Ltd.; Brand - Double Great

Industry-university-research:The Company has carried out extensive cooperation with Donghua University and Jiangnan University as well as raw material companies, peer industries, and downstream application customers to promote the cooperative application and popularization of new fiber materials.

Indicators
指标

品 种 Type	条干 cv% Evennesscv%	-50% 细节 -50% Nep	+50% 粗节 +50% Slub	+200% 棉结 +200% Cotton knot	毛羽 H Hairiness H	强力 CN Strength CN
粘胶 / 丙纶 95/5 30 支 Viscose/ polypropylene 95/5 30s	11.09	0	5	21	5.93	317.5
粘胶 / 丙纶 90/10 24 支 Viscose/ polypropylene 90/10 24s	10.37	0	8	23	6.28	354.5
粘胶 / 丙纶 70/30 24 支 Viscose/ polypropylene 90/10 24s	11.12	0	10	31	5.43	355.5
天丝 / 丙纶 80/20 40 支 Tencel/ polypropylene80/20 40s	12.28	1	13	29	4.25	227.9



化纤油剂趋势

CHEMICAL FIBER OILS TREND

化纤油剂的发展趋势及进展

Development Trend and Progress of Chemical Fiber Oils

天津工业大学 王春红团队

Wang Chunhong's Team from Tiangong University

2020 年，新冠疫情在全球范围内蔓延，加剧了世界经济形势的严峻性和复杂性，加上原油市场波动、国际贸易壁垒加重，我国化纤行业面临极大的挑战，供需矛盾凸显。然而，随着我国国内的疫情得到有效的控制，经济缓慢复苏向好，化纤行业生产正在逐步恢复，且化学纤维在口罩、防护服以及人工心肺循环中的中空纤维膜等领域需求量增大，因此化纤行业的经济增长依然可期。2020 年 1-10 月我国化纤产量为 4984.52 万吨，对比 2019 年同比增长 0.26%。



In 2020, the COVID-19 pandemic spread all over the world, aggravating the severity and complexity of the world economy. Coupled with the fluctuation of the crude oil market and the aggravation of international trade barriers, China's chemical fiber industry is facing great challenges, with the prominent contradiction between supply and demand. However, with the effective control of the pandemic within China, the slow economic recovery is improving, the production of chemical fiber industry is gradually recovering, and the demand for chemical fiber in masks, protective clothing and hollow fiber membranes required by the artificial cardiopulmonary circulation system is increasing, so the economic growth of chemical fiber industry can still be promising. From January to October 2020, China's chemical fiber output was 49.8452 million tons, with a year-on-year increase of 0.26%.

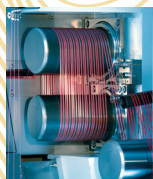


图 1 化纤油剂在化纤生产中的作用

Figure 1 Role of chemical fiber oil in chemical fiber production

化纤油剂在化学纤维生产过程中具有举足轻重的作用。化纤油剂的作用是解决化纤生产加工过程中的一些难题（如图 1 所示），如调节纤维摩擦特性、防止或消除静电积累、赋予纤维平滑柔软等特性、提高纤维抱合力、保护纤维免受损伤、减少毛丝及断头等，使纤维适应纺丝、拉伸、纺纱、织造等工序的要求。如果没有化纤油剂的加入，化学纤维生产加工将不能顺利进行。化纤油剂通常由平滑剂、乳化剂、抗静电剂和调整剂等组分调配而成。平滑剂在 50 年代以矿物油为主，后期逐渐开发使用了脂肪酸酯、环氧乙烷 / 环氧丙烷等加成聚合物；近年来，随化纤行业的技术进步，新型化纤油剂的配方性能也得到了进一步的提升，一些油剂产品体现出低摩擦、超耐热、易润湿等特点。

1. 传统化纤油剂的国内发展趋势

随着社会的发展及人类生活水平提高，对化纤的需求量越来越大，对品种和性能的要求越来越高，化纤行业的研发力度逐年增大。为了努力摆脱国内化纤行业对进口油剂的依赖，针对超高速、多品种和高性能化学纤维的生产，国内化纤油剂的研制力度也逐年增大。目前来说，在涤纶 DTY 油剂方面，国内品牌目前占领绝对市场，杭州传化化学有限公司是主要供应商。国产的涤纶短纤油剂逐步占领国内市场，然而高端的涤纶 FDY、涤纶 POY、涤纶工业丝等高速纺油剂还主要依赖进口。

在超高速拉伸的涤纶 FDY 方面，高速纺丝含油率一般为 0.6%-1.2%。高速纺丝油剂需要具备优异的润湿性、抗飞溅性、抗静电性和耐热性。国内各大涤纶长丝生产企业使用的 FDY 纺丝油剂品牌仍然以进口油剂为

Chemical fiber oil plays an important role in chemical fiber production. The function of chemical fiber oil is to solve some difficult problems in the process of chemical fiber production and processing (as shown in Figure 1), such as adjusting fiber friction characteristics, preventing or eliminating static electricity accumulation, give fiber smooth and soft characteristics, improving fiber cohesion, protecting the fiber from damage, reducing hairiness and breakage, and adapting fiber to filament spinning, stretching, yarn manufacturing, weaving and other processes. Without the addition of chemical fiber oil, the production and processing of chemical fiber will not proceed smoothly. Chemical fiber oil is usually prepared by the smoothing agent, emulsifier, antistatic agent and regulator. Mineral oil mainly acted as the smoothing agent in the 1950s, and later the addition polyester was developed and used gradually such as aliphatic ester, ethylene oxide/propylene epoxide; in recent years, with the technical progress of the chemical fiber industry, the formulation performance of new chemical fiber oil has been further improved, and some oil agent products have the characteristics of low friction, superheat resistance and easy wetting.

1. The domestic development trend of traditional chemical fiber oil

With the development of society and the improvement of human living standards, the demand for chemical fiber is increasing, and the demand for its variety and performance is getting higher. The research and development efforts in the chemical fiber industry are increasing year by year. In order to get rid of the dependence of domestic chemical fiber industry on imported oil agents, the research and development of domestic chemical fiber oil are intensifying year by year for the purpose of production of ultra-high-speed, multi-variety and high-performance chemical fibers. At present, domestic brands occupy the absolute market in terms of dacron DTY oil agents, and Hangzhou Transfar Chemicals Co., Ltd. is the main supplier. Domestic dacron staple fiber oil agents gradually occupy the domestic market, but high-end dacron FDY, dacron POY, dacron industrial yarn and other high-speed spinning oil agents mainly rely on imports.

In the aspect of ultra-high-speed stretching dacron FDY, the oil content of high-speed spinning is generally 0.6%-1.2%. High-speed spinning oil agents need to have excellent wettability, splash resistance, antistatic property and heat resistance. The brands of FDY spinning oil agents used by major dacron filament manufacturers in China rely mainly on imports, including Japanese brands of Takemoto Oil & Fat Co., Ltd. and Matsumoto Yushi-Seiyaku Co., Ltd., as well as German brands of DAKO and Double S brands. At present, the dacron FDY spinning oil agents developed by Tiangong University has been verified by the market to meet the spinning requirements. The fiber produced with the oil agents has excellent spinnability, and the full package rate and fiber physical indicators are comparable to those of imported oil agents; in terms of weaving, FDY fiber spun with "Tiangong Brand" oil agents has excellent weaving performance. In addition, Zhejiang Transfar Co., Ltd., Zhejiang Huangma Chemical Industry Group Co., Ltd. and Zhejiang Tongkun Group started the research and development of domestic high-speed spinning oil agents. In April, 2020, Tongkun Group launched the major project of "Zhejiang Hengxiang New Materials", utilized the core technology of chemical fiber textile oil agents mastered by Tongkun Group, made effort to eliminate the high restraints of foreign industrial technologies, and filled the domestic gap, realizing the complete replacement of imported chemical fiber textile oil agents and getting rid of the monopoly control of western countries.

主，包括日本竹本和松本品牌以及德国达柯和双 S 品牌。目前天津工业大学研制的涤纶 FDY 纺丝油剂，经过市场验证，已能够满足纺丝的要求，利用其油剂生产的纤维可纺性优良，满卷率和纤维物性指标与进口油剂相当；织造方面，使用“天纺”油剂纺制的 FDY 纤维具有优良的织造性能。另外，浙江传化有限公司、浙江皇马化工集团有限公司、浙江桐昆集团等都开始了国产高速纺丝油剂的研发。2020 年 4 月，桐昆集团开启“浙江恒翔新材料”重大项目，利用桐昆集团所掌握的化纤纺织油剂核心技术，致力于跨过国外行业技术高门槛，填补国内空白，实现对进口化纤纺织油剂的全替代，摆脱西方国家垄断控制。

为了保证涤纶短纤在后续开松、梳理、牵伸、加捻等纺织加工过程中的顺利进行，需要降低纤维与机械摩擦所累积的静电，所以对涤纶短纤油剂的抗静电性、上油率和油膜稳定性等方面要求较高。上海多伦化工有限公司开发的涤纶短纤维油剂 (CN111218817A) 达到国内领先水平。天津工业大学纺织助剂有限公司所生产的环保型 TDSL-2005B/C 涤纶短纤油剂，经过棉纺厂试用，完全能满足纺织各道工序生产要求，具有较好的平滑性、抱合性、高含油率、稳定的成品质量和后加工性能，所制备的纺织品能够满足纺织品出口欧洲的环保要求。在涤纶工业丝油剂方面，国产工业丝油剂存在耐热性差、结焦严重、挥发烟雾大和气味刺鼻等问题，因此发展与进口工业丝油剂媲美的产品迫在眉睫。金浦新材料股份有限公司近期发明了一种高温油剂可用于涤纶工业丝的制备。天津工业大学周存课题组开发了一种以植物油和合成脂肪酸酯为主的高性能帘子线油剂 (CN103161068A)。

另外，差别化纤维和高性能纤维包括异型纤维、超细纤维、中空纤维、碳纤维、玻璃纤维等特种纤维，对这些特种化纤油剂的要求更高且具有特殊要求，主要依赖进口。对于差别化纤维，差别化油剂除了保证纤维的正常纺丝外，还可以针对后续的加工过程中赋予纤维一定的特殊性能，使产品的特殊性能更突出。高性能碳纤维就是典型的例子：由于碳纤维生产过程中的特殊性，需要油剂具有极高的耐热性以及均匀附着性，以减少碳纤维的表面缺陷和改善力学性能不稳定的现象。日本竹本油脂和三菱化学株式会社开发了适用于碳纤维前体用油剂，日产的碳纤维性能全球顶尖也是依赖于先进油剂的开发 (CN109563680B、CN111139555A)。国内的中复神鹰碳纤维有限责任公司、威海新元化工有限公司、江苏恒神股份有限公司、中国石油天然气股份有限公司等公司也在大力开发新型的高性能纤维油剂，突破日本对于优质碳纤维的垄断 (CN110725025A、CN107075789B、CN106544760B、CN107190514B)。油剂国产化不仅仅是国内企业的需求，更是国家的战略需求，从而解决特种纤维生产中的“卡脖子”难题。

传统化纤油剂的发展除了要求油剂能够满足更高要求的平滑、抱合、耐热和抗静电效果以适应高速、高效、短流程、大容量的现代化纤生产要求外，还需要适应下游更高的织造速度和生产效率，因此传统化纤油剂助剂的质量、技术及品种等方面均需要继续提升，同时增加国内的油剂研发力度，逐步替代进口油剂产品。

In order to ensure the smooth progress of dacron staple fiber in the subsequent textile processing such as opening, carding, drafting and twisting, it is necessary to reduce the static electricity accumulated by friction between fiber and machinery, so that there are high requirements in terms of antistatic property, oiling rate and oil film stability of dacron staple fiber oil agents. The dacron staple fiber oil agents (CN111218817A) developed by Shanghai Duolun Chemical Co., Ltd. has reached the top level in China. The environmentally-friendly TDSL-2005B/C dacron staple fiber oil agents produced by Tianjin Industry University for the Textile Auxiliaries Co., Ltd. has been tested by cotton mills, and can fully meet the production requirements of various textile processes. It has good smoothness, cohesion, high oil-water ratio, stable quality of finished products and post-processing performance. The prepared textiles can meet the environmental protection requirements for textiles exported to Europe. In terms of dacron industrial yarn oil agents, domestic industrial yarn oil agents have some problems such as poor heat resistance, serious coking, large volatile smoke and pungent smell, thus existing extreme urgency to develop products comparable to imported industrial yarn oil agents. Nanjing Petro-Chemical Co., Ltd. recently developed a kind of high-temperature oil agent for the preparation of the dacron industrial yarn. The research group of Zhou Cun, Tiangong University has developed a kind of high-performance tire cord oil agent (CN103161068A) based on vegetable oil and synthetic fatty acid ester.

In addition, differentiated chemical fibers and high-performance fibers include special fibers such as profiled fibers, superfine fibers, hollow fibers, carbon fibers, glass fibers. There are higher and special requirements to special fiber oil agents which mainly rely on imports. In terms of differentiated fibers, the differentiated oil agents not only ensure the normal fiber spinning, but also inject certain special performances in the subsequent processing process, which makes the special performances more outstanding. High-performance carbon fiber is such a typical example: due to the particularity of the carbon fiber production process, the oil agents shall have high heat resistance and uniform adhesion, so as to reduce the surface defects of carbon fiber and improve the unstable mechanical properties. Japan Takemoto Oil & Fat Co., Ltd. and Japan Mitsubishi Chemical Corporation have developed a kind of oil agent suitable for carbon fiber precursors, and Japanese carbon fiber has world-class performance, which also depends on the development of advanced oil agents (CN109563680B, CN111139555A). Domestic enterprises such as ZhongfuShenyang Carbon Fiber Co., Ltd., Weihai New Era Chemical Co., Ltd., Jiangsu Hengshen Co., Ltd. and PetroChina Company Limited are also vigorously developing new high-performance fiber oil agents to break through Japan's monopoly on high-quality carbon fibers (CN110725025A, CN107075789B, CN106544760B, CN107190514B). Localization of oil agents is not only the demand of domestic enterprises, but also the strategic demand of China, so as to solve the bottleneck of the production of special fibers.

The development of traditional chemical fiber oil agents not only requires the oil agents to meet higher requirements of smoothness, cohesion, heat resistance and antistatic effect to reach the requirements of modern chemical fiber production with high speed, high efficiency, short process and large capacity, but also needs to adapt to higher weaving speed and production efficiency in the downstream industrial chain. Therefore, the quality, technology and variety of the auxiliaries of traditional chemical fiber oil agents need to be continuously improved, while the research and development efforts in domestic oil agents shall be increased to gradually replace imported oil agents.

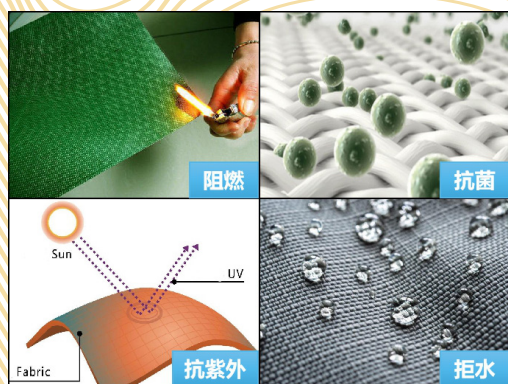


图 2 近年来常见的功能化化纤材料

Figure 2 Common functionalized chemical fiber materials in recent years

2. 功能性化纤油剂的开发与国内外研究进展

众所周知，化纤织物从原料生产到织造过程都会使用大量油剂，油剂的存在在后续织物染整过程中会影响染色性能，因此化纤织物在后整理中需要进行除油除污。从另一个角度思考，化纤油剂可以附着于化纤表面，因此许多化纤生产厂商利用这个特性，使纤维获得某种特殊功能，开发附加值高、功能新颖的化纤品种，以获得更广阔的市场。油剂的功能化成为了化学油剂一个重要的发展方向。近年来常见的功能化化纤材料如图 2 所示。

国外以日本和德国的公司为代表，研发了多种功能化的油剂产品。例如，日本松本公司制备了一种高透水性及透水耐久性的化纤油剂 (JP2009223870A)，另外还开发了多种阻燃、杀菌、抗污、抗病毒等添加剂产品；日本竹本公司的 Delion-4000-90 油剂能赋予纤维优良的吸水性能，Delion-4010-6029A 油剂能赋予纤维杰出的拒水性能；德国双 S (Schill+Seilacher) 公司开发了添加到纺丝油剂中 AFROTIN TBN 的杀菌剂，以及 UKANOL ES 的含磷阻燃剂。美国道康宁公司利用抗菌油剂以及阴离子表面活性剂，制备了具有抗菌效果的抗菌纤维。

近年来，国内的高校与公司也进行了一系列功能化油剂的开发，例如，东华大学开发了一种用于纤维领域的改性阻燃油剂 (CN102691213A)，使 8.5% ~ 15% 硅磷复合阻燃剂与平滑剂、乳化剂、集束剂和抗静电剂加热共混，

2. Development and research progress of functional chemical fiber oil agents at home and abroad

As is known to all, chemical fiber fabrics consume a large amount of oil agents from raw material production to the weaving process, and the oil agents will affect the dyeing performance in the subsequent dyeing and finishing process, so chemical fiber fabrics need to be degreased and decontaminated in the after-finishing process. From another perspective, chemical fiber oil agents can be attached to the surface of chemical fiber, so many chemical fiber manufacturers make use of this feature to make fiber obtain some special functions, and develop chemical fibers with high added value and novel functions, so as to obtain a wider market. The functionalization of oil agents has become an important development direction of chemical oil agents. Functional chemical fiber finishes and chemical fiber categories are shown in Figure 2.

Foreign companies, represented by those in Japan and Germany, have developed a variety of functionalized oil agent products. For example, Japan Matsumoto Yushi-Seiyaku Co., Ltd. has prepared a kind of chemical fiber oil agent with high water permeability and durability (JP2009223870A), and has also developed a variety of additive products with functions of flame retardant, sterilization, anti-pollution and anti-virus; Delion-4000-90 oil agent of Japan Matsumoto Yushi-Seiyaku Co., Ltd. can give fiber excellent water absorption performance, and Delion-4010-6029A oil agent can give fiber excellent water resistance performance; Germany S(Schill+Seilacher) Company has developed the bactericide AFROTIN TBN used to add into spinning oil agents and the phosphorus-containing flame retardant UKANOL ES. Dow Corning Company of America prepared antibacterial fiber with antibacterial effect by using antibacterial oil agents and anionic surfactants.

In recent years, domestic universities and companies have also developed a series of functionalized oil agents. For example, Donghua University has developed a kind of modified flame-retardant oil agent used in the fiber field (CN102691213A), which is prepared by the procedure that 8.5-15% silicon-phosphorus composite flame retardant is heated and blended with the smoothing agent, emulsifier, bundling agent and antistatic agent. The polyester fiber prepared by the modified flame-retardant oil agent is transparent and light, meets the requirements of environmental protection, and has high-strength fireproof and flame retardant performance and excellent waterproof performance. Sinopec Yizheng Chemical Fiber Co., Ltd. has developed a kind of anti-ultraviolet aramid fiber (CN106592216A). It is prepared by the procedure that benzimidazole anti-ultraviolet absorbents are used to replace acrylonitrile anti-ultraviolet absorbents, triazine anti-ultraviolet absorbents and hindered amine anti-ultraviolet absorbers, and are uniformly blended with spinning oil agents, and then the mixture is sprayed on the surface of aramid fiber to obtain ultraviolet-resistant aramid fiber, which solves the problems of poor ultraviolet-resistant performance and easy oxidative degradation under ultraviolet light of para-aramid fiber.

Functionalized oil agents are conducive to shorting the preparation process of functionalized textiles, reducing the cost and achieving the upgrade of functionalized textiles. For example, when using flame-retardant filament to prepare firefighter uniforms with excellent flame-retardant performance: flame-retardant filament can be directly prepared into the flame-retardant fabric, without degreasing and dyeing, as well as flame-retardant coating treatment or coating thickness reduction, which makes firefighter uniforms lighter under flame-retardant conditions, facilitates firefighting operations and promotes the upgrading of firefighter uniforms. In order to realize

得到改性阻燃油剂。这种改性阻燃油剂制备的聚酯纤维透明质轻、符合环保要求，具有高强度的防火阻燃性能和卓越的防水性能。中国石化仪征化纤有限责任公司开发了一种抗紫外线芳纶纤维 (CN106592216A)，将苯并咪唑类抗紫外线吸收剂、取代丙烯腈类抗紫外线吸收剂、三嗪类抗紫外线吸收剂和受阻胺类抗紫外线吸收剂等吸收剂，与纺丝油剂均匀混合，采用喷施的方式喷涂在芳纶纤维表面，得到抗紫外线芳纶纤维，解决了对位芳纶纤维抗紫外线性能差、在紫外光下易氧化降解等问题。

功能化油剂有利于缩短功能化纺织品的制备流程，降低成本并且实现功能化纺织品的产品提升。举例来说，以阻燃长丝制备阻燃性能优良的消防服，阻燃长丝可以直接制备成阻燃织物，无需去油以及染色，可以不进行阻燃涂层处理或者减少涂层厚度，使消防服在满足阻燃条件下更加轻便，方便消防作业，促进消防服的更新换代。为了从多途径实现功能化纺织品的开发，功能化油剂的研发是必不可少的。然而，功能化油剂的使用意味着在后续流程中不一定会使用除油剂去除织物产品上残留的油剂，因此纺丝油剂对化纤的影响需要进一步研究。Nguyen 等人报道了在纺丝油剂中添加阴离子聚合物接枝改性可增强聚酯纤维的生物相容性和细胞粘附性，以用于医疗用途，同时也证实了纺丝油剂在长时间储存中会导致聚酯纤维表面降解，弹性模量降低，从而使原有的生物相容性等功能性退化。Dastjerdi 等人提出纺丝油剂的存在为微生物的快速繁殖提供了富集培养基，亲水性也促进了微生物的生长，并且减弱了抗菌物质的释放，可通过改变聚硅氧烷处理控制抗菌物质的释放效果与时长，降低纤维表面亲水效果。化学油剂除了影响功能化作用，同时对纤维的力学性能和染色性能都有很大的影响，这都是技术人员在后续功能化油剂开发中需要考虑的因素。

3. 环保型化纤油剂的开发与进展

绿色是永续发展的必要条件和人民对美好生活追求的重要体现，绿色发展注重的是解决人与自然和谐共生问题。中国化学纤维工业协会注重化纤行业绿色发展，大力推动绿色纺织品，促进企业进行“绿色纤维”产品认证，实现纺织各个流程的绿色加工。化纤油剂所面临的三大环保问题包括油剂原料的环保性、油剂所影响的化纤环保性以及废弃油剂的绿色化处理。

针对油剂原料问题，上海中孚特种油品有限公司和常州市灵达化学有限公司分别开发了环保型的涤纶和腈纶纺丝油剂 (CN109722889A、CN103174021A)，用量最大的平滑剂原料都来源于植物油，属于可再生资源，在生产过程中对环境造成的不利影响较小；在使用过程中基本无毒、无害；废弃以后能在自然条件下较易降解，不对环境造成新的污染。日本和德国等国外公司也推出了各类可降解的化纤油剂。

针对使用油剂后所生产的化学纤维及后续产品，油剂中含有甲醛、APEO、PFOS、PFOA、致癌芳香胺等物质会残留到纤维及织物表面，从而导致人体健康受到危害。国家已经颁布各种法令禁用此类有毒物质，

the development of functionalized textiles in various ways, the research and development of functionalized oil agents are indispensable. However, the use of functionalized oil agents means that degreasing agents may not be used to remove residual oil agents on textile products in the subsequent process, so that the influence of spinning oiling agents on chemical fiber needs further study. Nguyen et al. have reported that the addition of anionic polymer graft modification into spinning oil agents could enhance the biocompatibility and cell adhesion of polyester fibers for medical use. At the same time, they have also confirmed that spinning oil agents will lead to degradation of polyester fiber surface and decrease of elastic modulus during long-term storage, which will cause the degeneration of the original biocompatibility and other functions. According to Dastjerdi et al., spinning oil agents provide an enrichment medium for the rapid propagation of microorganisms, and the hydrophilicity also promotes the growth of microorganisms and weakens the release of antibacterial substances. The release effect and duration of antibacterial substances can be controlled by changing polysiloxane treatment, so as to reduce the hydrophilic effect on the fiber surface. Chemical oil agents can not only affect the functionalization, but also have a great impact on the mechanical and dyeing properties of fibers. All of these factors need to be considered for technicians in the subsequent development of functionalized oil agents.

3. Development and progress of environment-friendly chemical fiber oil agents

Green is a necessary condition for sustainable development and an important manifestation of human beings' pursuit of a better life. Green development focuses on solving the problem of harmonious coexistence between human and nature. China Chemical Fiber Association focuses on the green development of the chemical fiber industry, vigorously promotes the development of green textiles, drives enterprises to carry out "green fiber" product certification, and realizes green processing of various textile processes. Three environmental problems faced by chemical fiber oil agents include environmental protection of oil agent raw materials, environmental protection of chemical fiber affected by oil agents and green treatment of waste oil agents.

In terms of oil agent raw materials, Shanghai Zhongfu Special Oil Products Co., Ltd. and Changzhou Lingda Special Fibre Co., Ltd. respectively developed environment-friendly dacron and acrylic fiber spinning oil agents (CN109722889A, CN103174021A). The smoothing agent raw materials with the maximum consumption are all from vegetable oils, which are renewable resources and have a slight adverse impact on the environment in the production process; it is basically non-toxic and harmless in the using process; the waster can be easily degraded under natural conditions without causing new pollution to the environment. Foreign companies from Japan, Germany and other countries have also promoted various degradable chemical fiber oil agents.

In terms of the chemical fibers and subsequent products produced using oil agents, the substances such as formaldehyde, APEO, PFOS, PFOA and carcinogenic aromatic amines contained in the oil agents will remain on the surfaces of fibers and fabrics, causing harm to human health. China has promulgated various laws and regulations to ban the use of such toxic substances, such as APEO, diisobutyl phthalate, polycyclic aromatic hydrocarbons. Various surfactant substitutes with less pollution and no pollution need continuous study and discovery.

The use of spinning oil agents in production and processing will generate oil agent wastewater



图3 纺织废水处理前后对比图

Figure 3 Comparison of textile wastewater before and after treatment

例如烷基酚聚氧乙烯醚、邻苯二甲酸二异丁酯、多环芳烃化合物等。各种污染程度较小以及无污染的表面活性剂替代产物需要持续探究与发现。

生产加工中使用纺丝油剂会产生油剂废水（如图3所示），主要来自于纺丝工段、后处理工段及油剂调配工段。纺丝油剂废水的BOD/COD通常小于0.3，属于难生物降解废水，而且废水中富含磷酸酯盐等阴离子表面活性剂和其它非离子表面活性剂，在曝气过程中容易产生大量泡沫，废水中的少量防腐剂和抑菌剂也可能对生化系统产生抑制作用。油剂废水处理比较艰难，现在单一的生物处理方法（厌氧和好氧结合）、膜分离方法（包括微滤，超滤，纳滤和反渗透等）以及化学处理法（选择合适的化学药剂将乳化油的稳定状态打破，使其油水分离）对油剂废水的处理均没有良好的效果，油剂废水需下大功夫综合处理方可达标排放。

随着人们对绿色环保意识的加深，在绿色纤维油剂助剂、绿色表面活性剂、绿色染料等绿色化学品方面，我们需要加大创新力度，提高高校、研究院和企业的自主研发能力，推动企业的绿色转型和高质量发展，有利于纺织行业的可持续性发展。

4、发展展望

未来化纤纺丝油剂的发展主要在于三个层面，首先是常规化纤油剂的进一步研发，适应化纤纺丝工艺的高速化发展。其次是研制出更有针对性的高性能化纤油剂，实现赋予普通化学纤维特殊功能的效果，开发阻燃、抗菌、拒水、排汗透湿、抗病毒、抗紫外等具有功能性的化学纤维，促进差别化纤维及高性能特种纤维的多样化发展，提高化纤的技术含量与附加值。最后，推进绿色纤维的发展和全纺织产业链的绿色化进程，更加注重在整个化纤生产周期中对人体和生态环境的影响，发展绿色纤维油剂，积极响应绿色发展的国家号召。



(as shown in Figure 3), which is mainly from the spinning section, post-treatment section and oil agent preparation section. The BOD/COD of spinning oil agent wastewater is usually below 0.3, which is difficult to biodegrade. Moreover, the wastewater which is rich in anionic surfactants such as phosphate salt and other nonionic surfactants will easily generate a large number of foams during aeration., and a small amount of preservative and bacteriostat in the wastewater may also inhibit biochemical systems. It is difficult to process oil agent wastewater, and the present single biological treatment methods (anaerobic and aerobic combination), membrane separation methods (including microfiltration, ultrafiltration, nanofiltration and hyperfiltration, etc.) and chemical treatment methods (selecting appropriate chemical agents to break the stable state of emulsified oil and separate its oil from water) have not reached good effect on the treatment of oil agent wastewater. Oil wastewater can be discharged only after the environmental standards are reached through comprehensive treatment.

With the deepening of our awareness of green environmental protection, we need to intensify innovation in green chemicals such as green fiber oil agent additives, green surfactants and green dyes, improve the independent research and development capabilities of universities, research institutes and enterprises, and promote the green transformation and high-quality development of enterprises, thus contributing to the sustainable development of the textile industry.

4. Development prospect

The future development of chemical fiber spinning oil agents mainly includes three aspects. Firstly, further research and development of conventional chemical fiber oils will be conducted, so that it can adapt to the high-speed development of the chemical fiber spinning process. Secondly, it is necessary to develop more targeted high-performance chemical fiber oil agents to achieve the effect of ordinary chemical fibers with special functions, and develop functionalized chemical fibers featuring fire resistance, bacteriostasis, water resistance, perspiration, moisture permeability, antiviral property, ultraviolet resistance, etc., so as to promote the diversified development of differentiated fibers and high-performance special fibers and improve the technical content and added value of chemical fibers. Finally, it is essential to promote the development of green fiber and the greening process of the whole textile industry chain, attach more importance to the impact on the human health and ecological environment in the whole chemical fiber production cycle, and develop green fiber oil agents, actively responding to the national call for green development.

下游趋势

DOWNSTREAM FORECAST

让时尚“更绿色”

“Greener” Fashion

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Progress and Trend of Research on Fiber-based Energy Materials for E-textiles



让时尚 “更绿色” “Greener” Fashion

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人类社会的发展促成了环境问题的产生，同时环境问题也左右着人类社会的发展。在时尚行业中，绿色设计理念涉及服装面料的设计、服装生产过程中的技术运用、服装的可回收以及以服装为载体进行的绿色设计理念推广。

绿色设计近年成为了国际设计界趋势，该理念源于工业时代环境污染问题愈发严重，人们在满足了基本的衣食需求后，开始思考人类活动对环境的影响。同时，随着资源的不断开采，资源匮乏、环境污染等问题越来越影响人们的生活，绿色设计理念应运而生，服装行业也开始肩负起保护环境、节约资源的道德要求和社会责任。

在纺织服装产业链上从纤维、纱线、面料到成衣，每个环节都在消耗地球资源，同时产生污染排放。其中纤维、纱线、面料等制造过程中的污染得到了社会的广泛重视，产业链企业亦不断研发新的科技产品尝试减少环境污染。但很多人不知道的是，在服

The development of human society induces environmental issues, and at meanwhile, environmental problems also restrict the development of human society. In the fashion industry, the concept of green designing involves the design of clothing fabrics, the application of technology in the process of clothing production, the recycling of clothing and the promotion of green designing concept with clothing as the carrier.

Green design has become an international trend in recent years. The idea stems from the industrial era when increasingly serious environmental pollution problems rendered people to think about the impact of human activities on the environment after their basic food and clothing supplies were satisfied. Meanwhile, with the continued exploitation of resources, problems such as short resources and environmental pollution have increasingly affected people's lives, and then the concept of green designing came into being. The clothing industry starts to shoulder the moral requirements and social responsibilities of protecting the environment and saving resources.

In the textile and clothing industry chain, every link from fiber, yarn, fabric to ready-made clothing is consuming the earth's resources, and at the same time produces pollution emissions. Among them, the pollution in the manufacturing process of fiber, yarn, fabric, etc. has been paid wide attention by society, and enterprises in the industrial chain are constantly developing new scientific and technological products to try to reduce environmental pollution. But many people may not know is that a large number of waste fabrics generate in the process of clothing production and use, of which only a small proportion will be recycled, while a large proportion will be burned or buried. A large proportion of buried waste fabrics are difficult to degrade, which will bring great pressure to the earth's environment.

From the perspective of designing, reducing the waste in the process of clothing production and application is becoming a common trend by taking into account from the designers. As a common problem in fashion design, the waste of fabrics is generally divided into two categories: one is the waste of fabrics before clothing consumption, which appears in the manufacturing process of fibers, yarns, fabrics and clothing; the other is the waste of fabrics generated after the commercialization of clothing, which comes from the waste generated after consumers consume textiles and clothing.

Nowadays, the "zero waste" clothing designing in the fashion industry is interpreted from the perspective of sustainability, and its concerns include minimizing the waste of clothing materials before consumers obtain the clothing, so as to realize the sustainability of clothing development and production process, extending the service life of clothing, and reducing the consumption of clothing without affecting consumers' wearing perceptions.

Improving the utilization rate of fabrics focuses on using fabrics as much as possible in the production process, which includes how to conduct slicing and layout reasonably when designers design samples. The "zero waste" design in the fashion designing technique can effectively solve the problem of wasteful materials in the fashion production process. The history of "zero waste" design can be traced back to the early stage of human civilization, when people's lives are limited by material resources and technologies, so that the concept of achieving the best use is reflected in all aspects of their lives. In this era when human technological development is enough to conquer nature, the emergence of "zero waste" explains a new way that human beings try to live in harmony with nature in this new era.



图 1 三套“零浪费设计” / 设计师 郑小鹏

Figure 1 Three “zero waster” designs

装的生产和使用过程中，会产生大量的废弃织物，其中只有少部分回收利用，大量的被焚烧或填埋，被填埋的废旧纺织品有大量的难以降解的纤维，这将给地球的环境带来很大的压力。

从设计的角度减少服装制造和使用过程中的浪费，是有责任感的设计师不断思考和探索的方向。面料浪费作为时装设计中常常出现的问题，其浪费一般分为两种类别，一种是服装消费前面料的浪费，这些浪费出现在纤维、纱线、织物和服装的制造过程中；另一类浪费则是服装商品化后面料的浪费，此种浪费来源于消费者消费纺织服装后的浪费。

当今时装界对“零浪费”服装设计的诠释都是从可持续的角度出发的，其关注的问题包括一件衣服到达消费者手上之前最大限度的减少布料的浪费，以此来实现服装开发生产过程的可持续性；延长服装的使用寿命，在不影响消费者穿着感受的同时，减少消费者的服装消耗量。

提高面料使用率注重在生产过程中面料尽可能多地使用，这就包括设计师在设计样板时如何合理地分片、排板。服装设计手法中的“零浪费”设计，可以有效解决服装生产过程中的废料问题。“零浪费”设计的历史可以追溯到人类文明产生初期，受到物质资源及技术的限制，“物尽其用”在生活的各个方面都有体现。而在这个人类技术发展足以征服自然的时代，“零浪费”的出现，诠释着新时代人类尝试与自然和谐共处的新方式。

图 1 中，三套服装的上衣部分均为“零浪费”板型设计，通过对有限空间的无限分割，对面料原始的形态进行不同角度的几何分割并重组，延伸出其各自独特的款式，探讨一片面料分割的无限可能。（图 2 至图 4）如此几何形的裁剪，使服装样板不再受以往凹凸不平的束缚，可以近乎百分之百对面料的使用，对于挽救普通服装裁剪中废弃的 15%-20% 的面料有着极大的参考价值。而如此几何形分割并重组出来的服装款式，对比寻常的服装并不显得突兀，均能正常穿着，可见其设计的可行性。

多用性服装通过一件服装的不同穿着方式，或者服装与其他物品之间的转换，使产品具备更多的应用场景。消费者作为服装的“再设计者”，根据自己的喜好对服装进行二次设计，将穿着的过程与设计相结合，能够让消费者进一步体会和展现服装，使服装在人体上呈现更多视觉观赏性和多形式的变化。

In Figure 1, the tops of the three dresses are all “zero-waste” pattern design. By infinitely dividing the limited space, the original square shape of the fabric is geometrically divided and reorganized from different angles, extending their unique styles to explore the infinite possibility of dividing a piece of fabric. (From Figure 2 to Figure 4) With such geometric cutting, the clothing pattern is no longer bounded by the previous unevenness, and the fabric can be used nearly 100%, which has great reference value for saving 15%-20% of the discarded fabrics in the ordinary clothing cutting. And compared with the ordinary clothing, the clothing styles with such kind of geometric division and reorganization are not odd and can be worn normally, which shows the feasibility of its design.

Multi-purpose clothing ensures products with more application scenarios through the different wearing ways of a piece of clothing or the transformation between the clothing and other items. Consumers, as “designers” of clothing, carry out the secondary design of clothing according to their own preferences, and combine the process of wearing with design, which can enable consumers to further experience and show clothing, and make clothing impact the visual effect and many forms of change.

Multi-purpose designing is a design method to prolong the life cycle of clothing, which includes two levels of “multiple forms” and “multiple-purpose”. Multiple forms mainly show the transformation between clothing, emphasizing the variability of clothing modeling; “multiple-

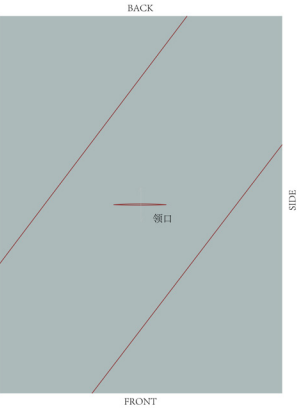


图 2 款式一样板
Figure 2 Pattern 1

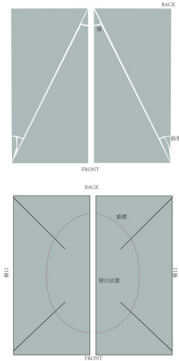


图 3 款式二样板
Figure 3 Pattern 2

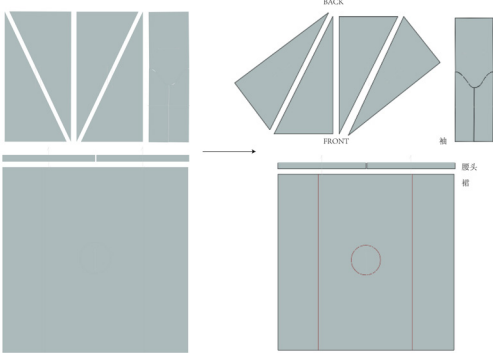


图 4 款式三样板
Figure 4 Pattern 3



图5 “多用途”服装设计 - 设计图 / 设计师 林中华

Figure 5 “Multiple-purpose” clothing design—design drawing / designer Lin Zhonghua

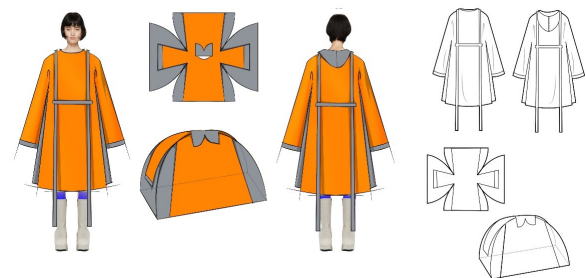


图6 “多用途”服装设计 - 设计图 / 设计师 林中华

Figure 6 “Multiple-purpose” clothing design—design drawing / designer Lin Zhonghua

多用途设计是延长服装生命周期的设计方法，包含“多形式”与“多用途”两个层次。多形式主要表现为服装与服装之间的转换，强调服装造型的多变性；多用途指“一服多用”，主要表现为服装与非服装之间的转换，强调服装的功能性。

图5是两件礼服裙合一的套装。款式一是条腰部可拆卸组合的休闲裙套装，也可将裙摆设计的隐藏开口打开，套在颈部，变成具有古典风格的礼服式连衣裙。服装在不同场景下的切换，可以在节约材料的同时，增添服装的趣味性，并通过人与服装之间的交互性，提升着装体验。

图6是一件可以变身为帐篷的户外服。帐篷的平面结构特点与十字形服装结构相似，通过拉链的辅助作用实现服装与帐篷间的转换。这套设计意在通过设计手段使服装与生活物品间自由转换，常见的类似设计还有服装和包间的转换、服装与围巾间的转换等。使用场景的增多，也提升了服装的使用率。

服装的可持续设计，除了控制生产过程中污染物的排放、提升材料的可回收性，还可以通过提高面料的使用率以及延长产品使用周期实现“可持续”。“零浪费”设计可以减少废料的产生，从而减少生产过程中对环境的污染；多用途设计使服装充分发挥其多变性，增加其使用频率和寿命。除此之外，“模块式设计”、旧衣改造等设计方法都是设计师解决环境问题的尝试。“可持续”设计方法符合当下社会发展趋势，具有广阔的发展前景。

纺织服装是人类生活中最基本的用品，面对日益恶化的环境，作为服装设计师，我们有责任和义务提升设计的“可持续性”。通过改变设计环节的传统思维方式，利用合理有效的设计使产品符合可持续发展的理念。

purpose” refer to “one suit for multiplepurposes”, which mainly shows the transformation between clothing and non-clothing, emphasizing the functionality of clothing.

Figure 5 is a suit with two dresses in one. The first style is a casual skirt suit with a detachable waist.It can also be a formal dress with classical style by opening the hidden opening designed in the skirt's hemline and putting it around the neck. The switching of clothing in different scenes can not only save materials, but also increase the funky of clothing, so as to enhance the dressing experience through the interaction between people and clothing.

Figure 6 shows an outing costume that can be transformed into a tent. The plane structure of tent is similar to the cross-shaped clothing structure, and the transformation between clothing and tent is realized with the aid of zipper. This design aims to make the clothing and living goods change freely through design means. Common similar designs include the transformation between clothing and private rooms, and the transformation between clothing and scarves. With the increase of usage scenarios, the utilization rate of clothing is also improved.

To achieve “sustainable clothing design”, in addition to controlling the emission of pollutants in the production process and improving the recyclability of materials, we can make efforts to increase the utilization rate of fabrics and prolong the service life of products. The “zero waste” design can reduce waste materials, thus reducing the environmental pollution in the production process; multi-purpose design offers clothing variability, and increases its use frequency and service life. In addition, design methods such as “modular design” and old clothing renovation are all attempts by designers to solve environmental problems. The “sustainable” design method conforms to the current social development trend with vast development prospects.

Textile and clothing are the most basic articles in human life. In the face of environmental problems,, as fashion designers, we have the responsibility and obligation to enhance the “sustainability” of designing. By changing the traditional way of thinking in the design process, we are able to create reasonable and effective design to realize the compliance of products in line with the concept of sustainable development.



图7 “多用途”服装设计 - 成品 / 设计师 林中华

Figure 7 “Multiple-purpose” clothing design-finished product / designer Lin Zhonghua



探索藏于面料中的创新主张——

以优衣库“LifeWear 服适人生”科学理念体系为例

Explore Innovative Ideas Hidden in Fabrics—

Take UNIQLO's Scientific Concept System of "LifeWear" as an Example

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席卷全球的新冠疫情使得国际政治形势经济环境也如二次元那般出人意料，人们需要重新界定责任，重新构建创新协同、产能共享、供应链互通的新型产业创新生态，提高纺织行业的抗冲击能力。我们的“双循环”正是对应世界变化的反应，两个循环之间看似是壁垒阻隔不利，但也是保持健康机制的过滤手段。“双循环”无非是标准的跨越，要充分发挥我国超大规模市场优势和持续升级换代的内需潜力，构建国内国际双循环相互促进的新发展格局。拓展升级内需和扩大开放使得国内大循环越顺畅，越有利于形成参与国际合作和竞争的新优势。对于品牌企业来讲，无论是提升价值链层次树立品牌价值，还是技术升级改造；亦或是对于已经具备优势的产业或产业链环节，进行进一步的优势强化，加快智能化、数字化转型，肯定离不开全球化，但是当前国际供应链格局正在重构，纺织产业在高性能纤维、高端制造等方面在疫情面前需要再平衡。“快时尚”品牌以其核心优势“快速”和“时尚”，迅速拓展并占领市场。其面料从服用、装饰的环保、安全、健康的理念出发，将舒适性、功能性和保健性以时尚化、便利化产品面目紧跟潮流，快速更新呈现。



The COVID-19 pandemic sweeping across the world has made the international political situation and economic environment as unexpected as the ACGN (the abbreviation of Anime, Comic, Games and Novels). People need to redefine their responsibilities, and rebuild a new industrial innovation ecology with innovative collaboration, capacity sharing and supply chain interconnectivity, so as to improve the anti-impact ability of the textile industry. Our “Dual Circulation” is just the response to the changing world. It seems that the barriers between the dual circulation are unfavorable, but there is also the filtering means to maintain the healthy mechanism. The “Dual Circulation” is nothing more than surmounting standards, and requires giving full play to China’s super-large-scale market advantages and the domestic demand potential of continuous upgrading, and build a new development pattern in which domestic and international double circulation promotes each other. The expansion and upgrading of domestic demand and the opening up facilitate a smoother major domestic circulation so that the new advantages in participating in international cooperation and competition can be further formed. In terms of brand enterprises, globalization is indispensable for enhancing the value chain level to establish brand value, upgrading and modifying technologies, further strengthening advantages or accelerating the transformation of intelligence and digitalization against the industries or industrial chain links that have already have advantages. However, the current pattern of the international supply chains is being reconstructed, and the textile industry needs to be rebalanced in terms of high-performance fibers and high-end manufacturing. With its core advantages of “fast” and “fashion”, “fast fashion” brand has rapidly expanded and occupied the market. Starting from the concepts of environmental protection, safety and health for clothing and ornaments, the fabrics will keep up with the trend and achieve updating and publication by promoting fashionable and convenient products with comfortable, functional, and



在产品企划与研发方面，为了捕捉最新的流行趋势，就需要对接外循环，如在潮流前沿巴黎、米兰、伦敦、纽约设立机构研究世界范围内的最前端的时尚潮流、科学技术和概念模式，随后以这些信息为基础通过产品企划策划、比较、优化、决策各个销售季的主体概念。之后，设计师按照该主体概念开展实施工作，进入内循环商品化流程。

纺织企业首先是一个科技公司，应该具有生物研究所的专利、艺术画廊的审美、人文机构的关怀，将科学、艺术、生物、人文关联起来。

快时尚品牌“优衣库”现在愈来愈像科技公司，从思想前瞻到技术储备，将企业从注重产品的创新与品质功能改善提升到与时代同进步的高度。2003年优衣库和东丽创建“次世代原料开发团队”，双方开始为理想而奋斗，为一个虚拟目标而努力，为“想象中”的产品共同攻坚。2006年，两家公司为了共同目标从自身优势专业出发建立了一种“虚拟公司”的共生关系：优衣库负责构想企划，东丽负责研发生产，优衣库营销和销售，两家公司不循常规的虚拟构想又完美互补的实践合作，无疑是创新之举。“优衣库模式”因地制宜，除满足新体系结构提品质、增品种、创品牌的需求外，持续的原始创新能力及创新体系的构建将随着以互联网为基础的数字经济时代的到来而加速。



health-care properties.

In terms of product planning and R&D, in order to capture the latest fashion trends, it is necessary to connect with the external circulation, such as setting up institutions in cities standing at the fashion frontier such as Paris, Milan, London and New York to study the world's leading fashion trends, science and technology and conceptual models, and then carry out the planning, comparing, optimizing and deciding of the subject concepts of each sales season through product planning based on this information. And then, designers carry out the implementation work according to the subject concepts so as to enter the commercialization process of the internal circulation.

Textile enterprises are firstly science and technology companies. They shall have the patents of biological research institutes, the aesthetics of art galleries and the care of humanistic institutions, and shall connect and link science, art, biology and humanities.

UNIQLO, a fast fashion brand, is now more and more like a science and technology company. From thinking foresight to technology reserve, enterprises are promoted from focusing on product innovation and the quality and function improvement to achieving the age progress and the lifestyle revolution. In 2003, UNIQLO and Toray established the "Next Generation Raw Material Development Team". Both sides began to strive for ideals and a virtual goal, and they also jointly overcome difficulties to create "imaginary" products. In 2006, the two companies established a symbiotic relationship of "virtual company" for their common goal from their own advantages: UNIQLO was responsible for conception and planning as well as marketing and sales while Toray was responsible for R&D and manufacturing. The unconventional virtual conception of the two companies achieves perfect and complementary practical cooperation, which is undoubtedly an innovation. "UNIQLO Model" adapts to local conditions, making efforts to improve the quality, increase varieties and create brands for innovative system structure. Besides, the construction of the continuous original innovation ability and innovation system will accelerate with the arrival of the digital economy era based on the Internet.

Humans have been using technical products to extend the possibility of the human body. Clothing, as the closest product to the body, is undoubtedly the extension of human skin. Science has also accelerated the contemporary evolution of living



人类一直在用技术产品延伸身体的可能性，服装作为最贴近身体的产品，无疑是人类的皮肤的延伸。科学也加快了生物当代进化。皮肤是人体最外层的器官也是面积最大的器官，皮肤起到对人体的保护、调节、控制等作用，通过丰富敏锐的传感功能调节并适应环境的变化。面料的创新需要向“皮肤”学习，围绕人服务于人的观点逐渐成为市场热点，技术的创新点。功能上吸湿，就会形成速干成效，于是人们的欲望化作需求，耐脏就需要杀菌抑菌、防火便需阻燃、抗静电、怕晒就需防紫外线等。形态上超细纤维应运而生，视觉及功能上高仿真系列产品趋之若附。让面料成为人类的“外层皮肤”也将成为研发思路与创新主张。

艺术和科学看似两个主题，其本质是共通的。作为世界文创桥梁，“优衣库”是一个很好的科学和艺术结合的一个品牌。面料设计与生产技艺，材料创新密切相关。就像优衣库 LifeWear 的两大关键词，“Art”和“Science”，所描述的那样，需要二者相互结合，来形成平衡的，具有美感的功能性美学。优衣库 UT 系列精选源自全球流行文化，艺术、音乐、影视、动漫的丰富内容，以服装为载体，彰显审美品位，表达专属情怀，开启年龄无界、活力无界、场合无界的生活创造力。在自然和城市中穿梭，人们需要风和日丽的形象，在雨淋日晒的变换中穿梭自如。面料科技和创新所带来的功能性美学，体现在生活中给穿着者带来无界感。

things. Skin is the outermost organ of the human body and also the largest organ in the area. Skin plays a role in protecting, regulating and controlling the human body, and conducts self-adjustment and adapts to environmental changes through rich and keen sensing functions. The innovation of fabrics needs to learn from “skin”. The view of people serving people has become the hotspot in the market with the continuous technologies. Moisture absorption in function will result in a quick-drying effect, so people's desire turns into demand: Dirt resistance requires sterilization and bacteriostasis; fireproofing requires flame retardant and antistatic function; sunblock requires UV resistance. Morphologically, the superfine fiber came into being, and a series of visual, functional and high-stimulated products become populous. The R&D and innovative ideas will focus on making fabrics become the “outer skin” of human beings.

Art and science seem to be two different themes, but their essence is common. As a bridge of cultural creation in the world, UNIQLO is a brand combining science and art. Fabric design is closely related to production skills and material innovation. Just like the two keywords of UNIQLO “LifeWear”- “Art” and “Science”, their combination shall be realized to form a balanced and aesthetic functional aesthetics. UNIQLO UT series features rich content from global popular cultures, art, music, film and television, and animation, with clothing as the carrier, highlighting aesthetic taste, expressing exclusive feelings, and opening up life creativity with the unbounded ages, vitalities and occasions. To shuttle back and forth between nature and cities, people need a beautiful and bright image, so they can shuttle freely in various weather conditions. The functional aesthetics brought by fabric technology and innovation is reflected in bringing unbounded sense to the wearer in life.



优衣库高级轻型羽绒系列

五大功能 一件囊括

轻 · 暖 · 便携 · 防水 · 防静电

① 1 指防静电平纹面料，防静电1000伏特静电电压，防静电系数达到1000伏特静电电压，防静电系数达到1000伏特静电电压。
② 2 指防静电平纹面料，防静电1000伏特静电电压，防静电系数达到1000伏特静电电压，防静电系数达到1000伏特静电电压。
防静电平纹面料防静电系数达到1000伏特静电电压，防静电系数达到1000伏特静电电压，防静电系数达到1000伏特静电电压。

尊重人性。用中国人话来说，它打破富贵贫贱这种界限，它是不分阶级，不分种族，不分宗教，甚至不分年龄。它就是一种理念，对自然的爱护，对人类的尊重。在人们印象中冬天保暖就是厚重，但如今过往臃肿的形象已经悄然改变，人们期望冬天里的服装如同自身的皮肤让人温暖，而不是累赘，此时纺织企业能够洞悉人性对自身不受约束的自由渴望，这种对人性的尊重又将是面料研发思路与创新主张。“优衣库”与东丽公司研发的“轻若无物”AIRism 面料便是知悉人性范例。剖析其技术原理，它使用了比发丝更纤细的超细涤纶纤维面料，多边形截面纱线的特殊编织结构带来强大吸汗速干性能，高科技智能面料有效发散身体闷热感，超细纤维面料营造出柔滑触感。这类注定写进服装技术进化史的产品，不断渗透进大众生活，正是技术进步驱动下人性的再次解放，让所有人时刻保持舒适。

面料创新的人性尊重也是对人类生活生存环境的尊重，即离不开可持续发展。以“环保、自然、可循环”为理念的面料几乎已经被所有具有世界影响力的国际品牌所尊奉和采用。同时尊重消费者的易护理的功能纤维、防护性强的功能面料和抗菌功能的面料，将成为后疫情时代研发回归自然、平静舒适和具有安全感的趋势。

时间会附加给一件衣服面料独特的质感和故事，其语言和逻辑，也给了我们一个新的视角，通过优衣库的“LifeWear 服适人生”科学理念体系，我们将能体味并探索藏于面料中的创新的科学、艺术、生物主张及细节里的人文关怀。



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Chinese people believe that respecting human nature can break the boundary between wealth and poverty, regardless of class, race, religion or even age. It is an idea, love for nature and respect for human beings. People always think that keeping warm in winter means wearing heavy clothes but now the bloated image in the past has quietly changed. People expect clothes in winter to be warm like their own skin, instead of burdens. At this time, textile enterprises can capture human nature's desire for unfettered freedom, and this respect for human nature will be the R&D and innovative ideas. The AIRism fabric developed by UNIQLO and Toray Company are examples of capturing human nature. Through the analysis of its technical principle, it is found that it uses ultra-fine dacron fiber fabric that is slimmer than hair, the special weaving structure of polygonal cross-section yarn realizes strong sweat absorption and quick-drying performance, and high-tech intelligent fabrics can effectively dispel the sultry feeling of the body; the ultra-fine fabric creates a soft touch. This kind of products, which are destined to be written into the evolutionary history of clothing technology, constantly penetrate into people's lives, and it is the re-liberation of human nature driven by technological progress that keeps everybody comfortable at all times.

The respect for humanity in fabric innovation also reflects humans beings' respect for the living environment, that is, we cannot be separated from sustainable development. The fabric with the concept of "environmental protection, nature and recycling" has been respected and adopted by almost all international brands with world influence. At the same time, the easy-to-care functional fibers, high-protective functional fabrics and antibacterial functional fabrics that respect customers will become the trend of product research and development with respects to nature returning, calmness and comfort, and security in the post-pandemic era.

Time will endow a piece of clothes with a kind of unique texture and stories, and its language and logic will also provide us a new perspective. Through UNIQLO's scientific concept system of "LifeWear", we will be able to appreciate and explore the innovative scientific, artistic and biological ideas hidden in fabrics, as well as the humanistic care reflected in the details.



牛仔面料的消费趋势与创新需求

Denim Fabric—Consumption Trend and Demand for Innovation

广东前进牛仔布有限公司

Guangdong Advance Denim Co., Ltd

王宗文 张世娟

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随着经济的发展和时代的进步，在多元文化背景的影响下，人们对于面料的要求不仅仅局限于基本的需求，而更加注重穿着的舒适性和功能性等，“以人为本”的发展趋势，围绕着人的舒适、健康以及对生态环境友好的理念。随着国内外消费者环保健康舒适生活理念的提升，结合市场经济战略的推进与发展，牛仔服装消费将更加多元化、高端化、品牌化，市场发展空间巨大。

With the development of the economy and the progress of the times, under the influence of multicultural background, our requirements for fabrics are not limited to basic needs, and we also pay more attention to the comfort, functionality, and other aspects of wearing. The development of the “people-oriented” trend centers on the concept of people’s comfort, health and friendly ecological environment. With the promotion of the concepts of environmental protection, health and comfortable life by consumers at home and abroad, combined with the promotion and development of market economy strategy, the consumption of denim clothing will be more diversified, high-end and branding, with a huge market development space.

Therefore, in the process of modern fabric design, designers need to incorporate rich cultural connotations, up-to-date fashion concepts, and functional new green materials to lead the continuous innovation of fabrics, so as to meet people’s requirements of comfort, functionality and health, and greatly improve people’s quality of life.

I. Unboundedness

Traditional denim fabrics are interwoven with pure cotton coarse yarn and raw-white pure-cotton weft yarn in the form of 3/1 twill weave. Compared with other casual clothes, the style design of denim clothes made has not changed much in the past century. It is the after-finish process of innovation that realizes that denim clothing has been standing at the fashion frontier, and the washing water process, as an essential step of the after-finish process, determines the added value of denim clothing and is the most important part to ensure the quality and style of denim clothing. After the water washing process (physical washing and chemical washing), denim clothing will cause different damages to the fibers in the yarn, affecting the comfort and functionality of the fabric. However, in order to highlight its style, functionality and comfort, different kinds of fibers will be mixed into the fabric so as to break through the aesthetic boundaries of the original denim fabric, thus further realizing restructuring and regeneration. In order to break through the limited application of denim yarn due to the water washing process in the production of traditional denim clothing, rich varieties of natural fiber, regenerated cellulose fiber and functionalized differential fiber are adopted to enrich the variety of denim fabrics, endowing the fabric with various functionalities or multiple performances, and

因此，在现代面料设计的过程中，设计师需要融入丰富的文化内涵、与时俱进的时尚理念以及功能性绿色环保的新材料，引领面料持续不断的创新，从而满足人们穿着的舒适性、功能性和健康要求，并大大提高人们的生活品质。

一、无界

传统牛仔面料是采用纯棉粗支纱线与本白纯棉纬纱以 3/1 斜纹组织交织而成，制成的牛仔服装与其它休闲服装相比，百年来在款式设计上并没有太大变化，使其不断走上时尚前沿的是创新的后整理工艺，而洗水工艺作为后整理工艺的一个重要步骤，决定牛仔服装的附加值的高低，是保证牛仔服装品质与风格中最重要的部分。牛仔服装在经过洗水（物理洗、化学洗）工艺后，对纱线中的纤维会造成不同损害，影响面料的舒适性、功能性等，但是为了突出牛仔服装的风格、功能性和舒适性等，面料中会混入不同种类的纤维，突破原有的牛仔面料的审美界限，并进一步重组和再生。打破传统牛仔服装因洗水工艺的影响而限制牛仔纱线的运用，从而采用品种丰富的天然纤维、再生纤维素纤维、功能性差别化纤维等，丰富牛仔面料的品种，赋予面料多种多样的功能性或者多种性能并存，同时采用不同纱线品种，如花式纱线、毛圈纱等，使牛仔面料的风格焕然一新，突出多元化元素结合。因此，牛仔面料一直处于发展之中的状态，“无界”即是当下之“界”，界限的定义变得愈发模糊和不重要，使得科技与自然生态环境相融合，在人与自然和谐、以人为本的现代生活方式中，努力将科技与技术融入其中，始终围绕着人的舒适、健康以及对生态环境的保护而不断开发创新的面料产品；年轻文化更新升级，最终在多元空间下形成融为一体的奢华有趣效应。

二、科技与功能性面料的发展趋势

新材料以科技为支撑显示出强大的生命力与诱惑力，消费者对高科技、功能性面料的需求成为面料的一种发展趋势。随着高科技时代的到来和人们消费理念的改变，当今消费者在注重美观、流行潮流和文化的同时，还追求面料的科技与功能性方面的叠加性能，从而满足消费者对复合性能面料的需求。

目前对于功能性的纤维主要体现在化学纤维中，如聚酯纤维、聚酰胺纤维、聚氨酯弹性纤维等，通过科

at the same time, different yarn varieties are adopted, such as fancy yarns and looped yarns, so as to renew the style of denim fabrics and highlighting the combination of diversified elements. Therefore, denim fabrics have been in a developing state, and “unboundedness” is the current “boundary”. The definition of the boundary becomes increasingly vague and unimportant, which achieves the integration of science and technology and natural ecological environment. The modern lifestyle centering on the harmony between man and nature and the people-oriented concept, has been injected with technologies and techniques so as to constantly develop innovative fabric products with the theme of human comfort, health and ecological environment protection; the youth culture is updated and finally, a kind of luxurious and interesting effect is formed integrally in the pluralistic space.

II. Development trend of technology and functional fabrics

Supported by science and technology, new materials show great vitality and allure, and consumers' demand for high-tech and functional fabrics has become a development trend of fabrics. In the high-tech era, with the change of people's consumption concept, the present consumers pay attention to aesthetics, fashion trends and culture, and at the same time, they pursue the superimposed performance of technology and functionality in fabrics, so as to meet consumers' demand for composite performance fabrics.

At present, the fiber functionality is mainly reflected in chemical fibers, such as polyester fiber, polyamide fiber, polyurethane elastic fiber. By scientific and technological innovation, the modification in the fiber production endows fibers with composite functions such as the antistatic property, ultraviolet resistance, bacteriostasis, warm keeping, moisture absorption, flame retardance. The kind of single functional fiber is evolved to a kind of composite functional fiber, thus meeting the multi-directional functional needs of consumers for clothing fabrics and reaching the needs of comfort, safety and convenience from the inside out.



学、技术的创新，在纤维生产中进行改性，从而赋予纤维防静电、抗紫外、抑菌、保暖、吸湿、阻燃等复合功能，从单一的功能性纤维演变成复合功能性纤维，从而满足消费者对服装面料多方向的功能性需求，达到由内而外的舒适、安全保障、打理便捷性的需求。

随着科技的发展，人们对服装面料进行智能化开发，通过特殊工艺，使面料可以根据外界条件的变化来调节服装穿着的舒适性和外观风格的改变，如改变温度、湿度、外观色彩等，使面料的多元化发展符合人们对服装个性化的要求。面料作为连接身体与环境之间的媒介，通过对面料进行处后理，赋予其能够监测人体生理和环境的一些性能指标，对数据进行分析并通过面料自我调节达到智能调控作用，服装也可以根据人的情绪，改变服装的颜色或者释放香气等，智能服装面料慢慢从“以人为本”的理念，穿着舒适性、智能调控的发展趋势，满足人们对智能服装面料的需求，提高市场竞争力。

三、生态与绿色的发展趋势

随着消费者生活理念的改变和大健康的需求，对服装面料的追求不仅仅在其款式上，更多的注重面料的舒适、健康、绿色环保。从而使更多的天然纤维、功能性再生纤维素纤维、可生物降解纤维被复合运用到面料中，打造“以人为本”的穿着理念、人与自然和谐发展的生态环境。这种绿色环保的新型面料采用环境友好的原料制成，从而达到穿着的舒适性和对人体健康及对环境无害。

天然纤维具有其独特的性能，如棉纤维具有良好的自然之感、穿着舒适，生态环保特点；羊绒纤维具有良好的保暖、柔软、光滑、重量轻等特性，被称为纤维中的“软黄金”，是其它纤维无法比拟的，同时运用麻纤维、羊毛、蚕丝等天然纤维，使面料充分体现天然纤维本身优良的性能并结合创新的理念达到“以人为本”的生活理念，面料穿着舒适性的同时也能达到生态环保的效果。虽然牛仔服装需要经过一系列的洗水工艺处理，对纤维及其面料的性能会带来影响，但消费者对穿着的舒适性及其环保性要求越来越高，因此对牛仔服装的生产工艺进行创新改进，能够将大量的天然纤维运用到牛仔服装上，达到穿着的舒适性和健康环保。

天然纤维虽然生态环保，但具有功能性有限。因此，纤维素纤维的发展不仅具有天然纤维的性能，更多的创新凸显在功能性上，如：变相智能调温粘胶纤维、抗菌纤维、阻燃纤维、天丝、莫代尔、竹纤维等，牛仔面料

With the development of science and technology, clothing fabrics are developed intelligently. Through a special process, fabrics can adjust the comfort of clothing and change the appearance style according to the changes of external conditions, such as changing temperature, humidity, appearance color, so that the diversified development of fabrics meets people's requirements for clothing personalization. As the medium connecting the body and the environment, by the after-processing of the fabrics, the processed fabrics can obtain some performance indicators to monitor human physiology and environment, analyze the data and play the role in the intelligent control and adjustment by its the self-adjustment. Clothing can also change the colors of clothing or release aroma according to people's emotions. Smart clothing fabrics meet people's demand for smart clothing fabrics and improve market competitiveness, relying on the "people-oriented" concept, and the development trend of wearing comfort and intelligent control.

III. Ecological and green development trends

With the change of consumers' life concepts and the demand for great health, the pursuit of clothing fabrics is not only reflected in its styles, but also pays more attention to the comfort, health and environmental protection of fabrics. Therefore, more natural fibers, functional regenerated cellulose fibers and biodegradable fibers are applied compositely to the fabrics, creating a "people-oriented" wearing concept and an ecological environment in which man and nature develop harmoniously. This kind of new green fabric is made of environment-friendly raw materials, which is comfortable to wear and harmless to human health and the environment.

Natural fiber has its unique properties. For examples: cotton fiber has a good sense of nature, with comfortable, eco-friendly characteristics; cashmere fiber has the good properties warm keeping, softness, smoothness and lightweight, which is called "soft gold" among various fibers, and is incomparable with other fibers. At the same time, natural fibers such as fibrilla, wool and natural silk are added to endow the fabric with the excellent performance of natural fibers and achieve the "people-oriented" life concept combined with innovative ideas. The fabric is comfortable to wear and can also achieve ecological and eco-friendly effects. Although denim clothing needs to be subject to a series of water washing processes, which will have an impact on the properties of fibers and fabrics, consumers have higher requirements for wearing comfort and the environmentally-friendly property. Therefore, by innovating and improving the production process of denim clothing, a large number of natural fibers can be applied to denim clothing to achieve the wearing comfort, healthy and environmentally-friendly property.



运用该类的纤维，赋予牛仔面料具有抗菌、阻燃、保暖、抗紫外等性能，满足日常穿着对服装面料功能性的要求，并且达到生态环保的穿着舒适性，同时该牛仔服废弃后易回收、易降解，循环再生，将牛仔面料的发展与生态环境相结合，达到绿色环保。

牛仔面料运用功能性的涤纶、锦纶、腈纶等化学纤维，使面料具有优异的吸湿排汗、抗菌、抗紫外、保暖等功能，满足人们日常穿着对功能性的需求，但是功能性的纤维不容易降解，目前可通过回收再利用生产涤纶，但是使用量较少，大量的废旧纺织品废弃后，不易降解造成生态环境的污染，因而生物降解的功能性纤维的研究成为发展趋势，因此牛仔面料需要采用功能性可全降解的纤维制成，达到生态环保的效果。

四、总结

高端化、多功能、舒适健康、绿色环保是牛仔面料发展的新趋势。开发不同于传统牛仔面料手感、风格的面料，既能满足国内消费者的需求，也能在国际面料竞争中占据一定的竞争力，功能性叠加、舒适健康的牛仔面料也符合消费者对服饰提出的新要求，并随着人们的环保意识的加强，对生产牛仔面料的环节中，从原料到牛仔面料成品的加工过程也符合环保的要求，甚至提出更高的要求，废弃后能够快速降解，不对环境造成污染，达到“以人为本”的生活理念。



Although natural fiber is eco-friendly, its functionality is limited. Therefore, the development of cellulose fiber not only has the performance of natural fiber, but also has more innovations in functionality, such as variable-phase intelligent temperature-regulating viscose fiber, antibacterial fiber, flame retardant fiber, Tencel, Modal, bamboo fiber. The denim fabrics use these fibers, endowing the denim fabrics with antibacterial, flame retardant, warm-keeping, anti-ultraviolet and other properties, meeting the functional requirements of daily wear for clothing fabrics, and achieving eco-friendly wearing comfort. At the same time, the wastes of denim clothing are easy to recycle, degrade and recycle, which combines the development of denim fabrics with the ecological environment, thus achieving green and environmentally-friendly requirements.

Denim fabrics use functional chemical fibers such as dacron, nylon, acrylic fiber, which endow the fabrics with excellent functions of moisture absorption, perspiration, antibiosis, ultraviolet resistance, warm keeping, etc., and meet people's daily wear requirements for functionality. However, functional fibers are not easy to degrade, and now dacron can be produced by recycling functional fibers, which just accounts for a small proportion. After a large number of waste textiles are abandoned, they are not easy to degrade and cause pollution to the ecological environment, so that the research on biodegradable functional fibers has become a development trend, and denim fabrics need to be prepared by adopting functional and fully degradable fibers to achieve the eco-friendly effect.

IV. Conclusion

High-end, multi-functional, comfortable, healthy, green and environmentally-friendly properties are the new trends of denim fabric development. The development of fabrics with the feel and style different from traditional denim fabric can not only meet the needs of domestic consumers, but also help possess certain competitiveness in international fabric sector. Functionally superimposed, comfortable and healthy denim fabrics also meet the new requirements of consumers for clothing. With the strengthening of people's awareness of environmental protection, the process of producing denim fabric, from the processing of raw materials to finished denim fabric, also meets the requirements for environmental protection, and even higher requirements will be put forward to achieve the "people-oriented" life concept. For example, it is required that wastes should be quickly degraded without causing pollution to the environment.



冬季竞技运动纺织品趋势与研发创新

Trends of Winter Competitive Sports Textiles and Related Research & Development Innovation

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现代竞技体育的成功,除了运动员个人的天赋、努力、训练、营养、心理等关键因素外,装备也至关重要。随着训练手段的日渐科学化,每个选手的个人潜力已经被开发到了极限,高水平的竞技运动员之间的成绩差距往往微乎其微。在此背景下,科学技术被不断融入体育运动的发展过程,越来越多的运动员希望穿着高科技比赛装备,以期在比赛中取得优势。自上世纪末以来各国均在积极推动本国的体育事业发展,科技投入也越来越大,各种新材料、新设计、新产品不断涌现;随着北京成功申办2022年冬奥会,适用于冬季竞技运动的高科技纺织品也逐步在国内引发研究热潮。综合调研并掌握这些国内外的研究动向有助于我们把最新的、最先进的科技成果运用到冰雪项目中,实现我国跻身世界冰雪运动强国的目标。

The success of modern competitive sports is inseparable from equipment in addition to the key factors such as personal talent, effort, training, nutrition and psychology of the athlete. With the increasingly scientific development of training methods, the individual potential of each athlete has been developed to the limit, and the performance gap between high-level competitive athletes is often minimal¹. Under this background, science and technology have been continuously integrated into the development process of sports, and more and more athletes hope to wear high-tech competition equipment in order to gain an advantage in the competition. Since the end of the last century, all countries have been actively promoting the development of their own sports, and the investment in science and technology has been increasing, and various new materials, new designs and new products have been emerging; with Beijing's successful bid for the 2022 Winter Olympics, high-tech textiles suitable for winter competitive sports have gradually triggered a research boom in China. Comprehensive investigation and grasping of these domestic and foreign research trends will help us apply the latest and most advanced scientific and technological achievements to ice and snow sports, and achieve our goal of becoming a powerful nation in ice and snow sports in the world.

In recent years, advanced technologies in the fields of fluid mechanics, materials science, bionics, medicine, psychology, and computer technology have been continuously integrated into the research and development process of winter competitive sports textiles. These "high-tech textiles" have played a positive role in improving athletes' performance, protecting athletes' bodies, avoiding sports injuries and assisting body recovery, and improving the intensity of opposability and enjoyment of the competition. This paper will summarize the following aspects separately.

1. Resistance reduction

The resistance generated during movement is an important factor affecting athletes' performance. To double the speed of an athlete requires quadruple the resistance to overcome. In winter competitive sports including skiing, speed skating and sledding, the aerodynamic research on textiles has been carried out abroad for many years. Studies have shown that the surface morphology of the fabric, the location of the seams/buttons and the air



图 1 跳台滑雪、速滑和滑降三种不同速度的冬季项目比赛

Figure 1 Ski jumping, speed skating and downhill skiing at three different speeds in winter sports

近年来，冬季竞技运动纺织品的研发过程中不断融入了流体力学、材料学、仿生学、医学、心理学、计算机技术等领域的先进技术，这些“高科技纺织品”对于提高运动员成绩，保护运动员身体，避免运动损伤和辅助身体恢复，提高比赛的对抗强度和观赏性，起到了积极的作用。本文将从以下几个方面分别进行综述。

1. 减阻

运动过程中产生的阻力是影响运动员成绩的重要因素，运动员的速度增加两倍需要克服四倍的阻力。包括滑雪、速滑和雪橇等在内的冬季竞技项目，针对纺织品的空气动力学研究已在国外开展了多年。研究表明，织物的表面形态、接缝系扣部位和透气性均会对织物的空气动力性能有影响。Chowdhury 等人证实裸露的光滑圆柱体比起粗糙的织物表面具有更大的空气阻力；Brownlie 等人发现透气性不同的滑雪服引起的阻力变化为 5~7% 左右。顶尖运动员之间的成绩差距非常微小，所以正确的选择面料对于运动员利用装备优势而言显得尤为重要。尽管外界对于运动员在比赛中使用高科技运动装备来提高成绩的做法存在很大争论，运动员的装备也受到比赛管理机构——国际雪联 (FIS) 和国际滑联 (ISU) 的高度监管；但在规定的范围内，各国仍积极对服装进行特殊的减阻处理，希望进一步提高运动员成绩的空间（图 1）。

早在 1996 年，体育用品公司巨头耐克 (NIKE) 就开始研究运动类减阻服装，耐克运动研究实验室 (NSRL) 的科学家与空气动力学家们通力合作，于 2000 年悉尼奥运会推出了第一代 Nike Swift 田径服装，随即又投入了 2002 年盐湖城冬奥会速滑队使用中。2014 年索契冬奥会，体育用品厂商安德玛 (Under Armour) 和航空军火巨头洛克希德·马丁公司联合研发了美国速滑队的赛服——Mach 39。该套赛服使用了“传递模压法” (flow molding) 来在衣服表面塑造出大量细小的凸起。经过洛马公司 300 小时的风洞测试表明，这些凸起能够有效的改变运动员身体周围的气流从而减少阻力、提升速度。另外，在 Mach 39 赛服的背部脊柱部位还设计有用于释放身体热量的开放性网格布，而大腿和腋下的特殊织物则能够减少 65% 的运动摩擦，能让运动员将更多的能量用在冲刺，而不是抵消衣服摩擦。



permeability all affect the aerodynamic performance of the fabric. Chowdhury et al. proved that the exposed smooth cylinder has greater air resistance than the rough fabric surface; Brownlie et al. found that the resistance change caused by ski suits with different air permeability is about 5 to 7%. The performance gap between top athletes is very minimal, so the correct choice of fabrics is particularly important for athletes to take advantage of equipment. Although there is a lot of controversy about athletes' use of high-tech sports equipment in competitions to improve their performance, athletes' equipment is also highly regulated by the competition management agencies, International Ski Federation (FIS) and International Skating Union (ISU); however, within the prescribed scope, countries are still actively implementing special resistance reduction treatments on ski or skate suits, hoping to further improve the space for athletes' performance (Figure 1).

As early as 1996, sporting goods company giant NIKE began to research sports resistance-reducing suits. Scientists from NIKE Sports Research Laboratory (NSRL) and aerodynamicists worked together to launch the first generation of Nike Swift track and field suit in the 2000 Sydney Olympics and then it was put into use by the speed skating team in the 2002 Salt Lake City Winter Olympics. At the 2014 Sochi Winter Olympics, sporting goods manufacturer Under Armour and the aviation arms giant Lockheed Martin jointly developed the American speed skating team's suit, Mach 39. The suit uses "flow molding" to shape a large number of small bumps on the surface of the suits. A 300-hour wind tunnel test conducted by Lockheed Martin shows that these bumps can effectively change the airflow around the athlete's body to reduce resistance and increase speed. In addition, the back spine of the Mach 39 suit is also designed with an open mesh to release body heat, and the special fabrics on the thighs and underarms can reduce 65% of sports friction, allowing athletes to use more energy for sprinting instead of offsetting suit friction.

In the 2018 Pyeongchang Winter Olympics, Under Armour continued to provide equipment for the American speed skating team, aiming to further improve the athletic performance of these top athletes. The new suit continues the pit texture structure of the fabric, and eliminates the back ventilation holes. Through the combination of three different fabrics, the wind resistance can be reduced through the optimal combination; one of the newly adopted fabrics, H1 fabric, is the most aerodynamic



图 2 2018 Under Armour 速滑队赛服及 H1 面料部位

Figure 2 2018 Under Armour speed skating team suit and the part of H1 fabric

2018 年平昌冬奥会，Under Armour 继续为美国速滑队提供比赛装备，旨在进一步提高这些已经名列前茅的运动员的竞技表现。新赛服延续了面料的凹坑纹理结构，取消了背部通风孔，经由三种不同的面料搭配，可以最优化的组合降低风阻；其中新采用的一款面料——H1 面料，是 Under Armour 号称有史以来生产的最具空气动力学性能的织物，为略微粗糙的尼龙氨纶质地，表面具有的凹坑纹理结构类似于高尔夫球的表面，可以干扰了气流，从而减少了快速移动时的尾流阻力。由于运动员的运动轨迹只涉及左转弯，新赛服还大胆的采用了从左腿到右肩的不对称接缝设计，以减少褶皱，降低风阻（图 2）。

将具有凹坑结构的面料运用在速度类比赛服中，以减少风阻，提高竞技表现是现在运动减阻的主流研究方向；除速滑外，跳台滑雪，高山滑雪和雪车等冬季比赛项目也有相关应用。此外，如自行车、游泳等速度类项目也是减阻纺织品的研究热点。

2. 压缩

压缩衣最初应用于医学领域，主要用于治疗淋巴水肿等疾病，后来随着梯度压缩概念的提出与研究发展，逐步扩展到了体育方向。压缩衣的工作原理是通过梯度压缩加快血液循环提高肌群活力、减少乳酸堆积，对于关键运动肌群起到包裹和支撑的作用，降低肌肉的震动，因此可以在一定程度上节省消耗体能，保持运动能力，使得运动更加持久。研究还发现中度紧身束缚不仅可以在运动中缓解疲劳，对运动性肌疲劳有一定作用，且在运动后还有辅助肌肉快速恢复的功能。此外，压缩装备还有锁住汗水、帮助稳定体温、保持干爽等作用。

由于冬季运动的环境复杂，比起单纯压缩衣的商业品牌如 Skins、2XU、CW-X、Compressport 等，宣称融合了仿生学科技的瑞士品牌 X-Bionic 则更具科技感，也更加被运动员所青睐，该品牌多年来服务了全球三十多个国家队伍，一直是瑞士滑雪队的赞助商（图 3）。

fabric ever produced by Under Armour. It is a slightly rough nylon spandex texture with a dimple texture surface similar to the surface of a golf ball, which can interfere with the air flow, thereby reducing the wake resistance when moving fast. Since the athlete's motion trails only involve left turns, the new suit also boldly adopted asymmetrical seam design from the left leg to the right shoulder to reduce wrinkles and wind resistance (Figure 2).

The use of fabrics with dimple structure in speed competition suits to reduce wind resistance and improve athletic performance is the mainstream research direction of sports resistance reduction; in addition to speed skating, there are also related applications in winter competitions such as ski jumping, alpine skiing and bobsleigh and tobogganing. Moreover, speed sports such as bicycles and swimming are also research hotspots in resistance reduction textiles.

2. Compression

Compression garments were originally used in the medical field, mainly for the treatment of diseases such as lymphedema. Later, with the emergence and development of the concept of gradient compression, compression garments gradually expanded to the direction of sports. The working principle of the compression garment is to speed up blood circulation through gradient compression, increase muscle group vitality, reduce lactic acid accumulation, which plays a role in wrapping and supporting key sports muscle groups, and reduce muscle vibration. Therefore, it can save energy consumption to a certain extent, maintain athletic ability, and make exercise more durable. Studies have also found that moderate tightness restraint can not only relieve fatigue during exercise, but also have a certain effect on exercise-induced muscle fatigue, and it also has the function of assisting muscles in rapid recovery after exercise. In addition, compression equipment also has the effect of locking in sweat, helping to stabilize body temperature, and keeping dry.

Due to the complex environment of winter sports, compared with commercial brands of simple compression garments such as Skins, 2XU, CW-X, Compressport, the Swiss brand X-Bionic, which claims to incorporate bionic technology, has a more technological sense and is more popular with athletes. The brand has served more than 30 national teams around the world for many years and has always been the sponsor of the Swiss ski team (Figure 3).

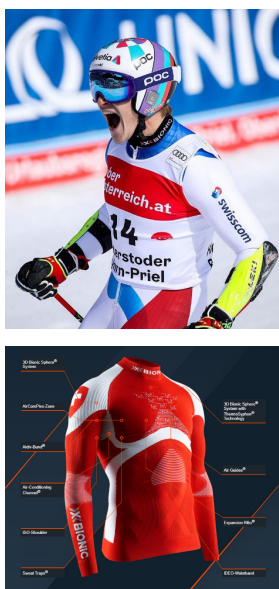


图 3 身着 X-Bionic 滑雪内衣的瑞士滑雪队和 X-Bionic 滑雪内衣产品图

Figure 3 The Swiss ski team wearing X-Bionic ski underwear and the product picture of X-Bionic ski underwear

当速干概念在运动服装领域流行了几十年后，研究却发现人体在运动时，有 97% 的能量用来维持体温保持在 37℃ 体温，而只有 3% 的能量用于肌肉。于是人们将目光放在如何运用外力将体温维持在 37℃，从而能让更多的能量用来提升运动表现。X-Bionic 的设计理念便源于此，在间歇式紧身压缩（X-IMPACT）的基础上结合了三维球面恒温控制技术（3D-Bionic Sphere），其母公司 X-Technology 在全球注册了近 800 项专利，力求通过服装装备实现体温调节释放人体能量储备。该款仿生压缩衣产品为融合了十几种针法的立体针织结构，其织造工艺非常具有代表性。

X-Bionic 的核心设计之一——3D-Bionic Sphere，在胸前、后背和腋下最易出汗的位置为立体编织的“U 型管槽”结构。在运动过程中，当体温升高，人体出汗时，汗液被吸收并锁进“U 型管槽”中，在穿越“U 型管槽”的过程中汗液会带走多余热量，并在外层表面蒸发，为皮肤表面降温，同时一些水分变冷凝结，会重新被皮肤吸收。而在寒冷的条件下，“U 型管槽”内的空气又形成了保暖空气层，阻止身体热量丧失（图 4）。

X-Bionic 的另一项核心设计——X-IMPACT，不同于其他品牌的压缩衣具有良好的压缩效果时却妨碍了血液循环，以其独创的间歇式压缩设计，通过纱线的松紧组合，拉开压缩间距，稳固肌肉的同时可以通过毛细血管改善了血液循环。

2020 年，X-Bionic 升级了原有的 3D-Bionic Sphere 设计，全新的 ThermoSyphon（热能虹吸智能控温技术）虽然仍旧沿用了三维立体针织结构（图 5），但孔洞系统更加弯曲复杂以扩展蒸发表面，且提升了组织结构的稳定性以满足运动拉伸，并额外内置特殊 Y 形结构，加快冷热转化效率。就性能而言，新版设计提升了 95% 热量传输性能、30% 额外蒸发面积、66% 湿气传输率。

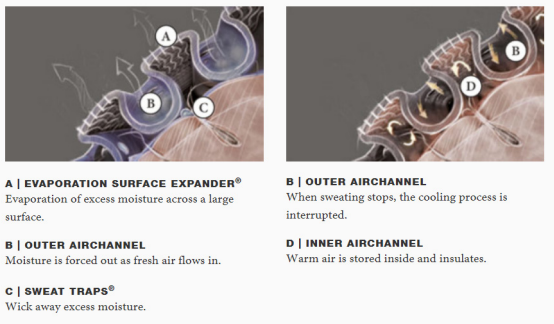


图 4 X-Bionic 的 3D-Bionic Sphere 原理

Figure 4 X-Bionic's 3D-Bionic Sphere principle

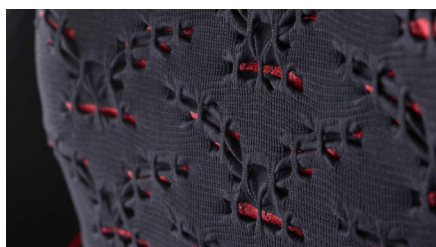


图 5 全新的 Thermo Syphon 三维立体针织结构

Figure 5 The new Thermo Syphon three-dimensional knitted structure

When the quick-drying concept has been popular in the field of sportswear for decades, studies have found that 97% of the energy of the human body is used to maintain body temperature at 37°C when exercising, while only 3% of the energy is used for muscles. Therefore, people focus on how to use external force to maintain body temperature at 37°C, so that more energy can be used to improve sports performance. X-Bionic's design concept just originated from this, combining three-dimensional spherical constant temperature control technology (3D-Bionic Sphere) on the basis of intermittent tight compression (X-IMPACT). Its parent company X-Technology has registered nearly 800 patents worldwide, and strives to achieve body temperature regulation through suits and equipment to release human energy reserves. This bionic compression garment product is a three-dimensional knitted structure that incorporates more than a dozen needle methods, and its weaving process is very representative.

One of X-Bionic's core designs, 3D-Bionic Sphere, is a three-dimensional woven "U-shaped tube groove" structure on the chest, back and underarms where sweat is most likely to occur. In the process of exercise, when the body temperature rises and the human body sweats, the sweat is absorbed and locked in the "U-shaped tube groove". In the process of passing the "U-shaped tube groove", sweat will take away excess heat and evaporate on the outer surface to cool the skin surface. At the same time, some moisture will be cooled and condensed and will be absorbed by the skin again. In cold conditions, the air in the "U-shaped tube groove" forms a layer of warm air to prevent the loss of body heat (Figure 4).

X-Bionic's another core design, X-IMPACT, which is different from other brands of compression garments when they have good compression effects but hinder blood circulation, stabilizes muscles and improves blood circulation through capillaries with its original intermittent compression design to stretch the compression interval through the combination of yarn tightness.

In 2020, X-Bionic upgraded the original 3D-Bionic Sphere design. Although the new Thermo Syphon (thermal siphon intelligent temperature control technology) still uses the three-dimensional knitted structure (Figure 5), the hole system is more curved and complicated to expand the evaporation surface, and the stability of the texture structure is improved to meet the movement stretch, and a special Y-shaped structure is additionally built in to accelerate the efficiency of cold and heat conversion. In terms of performance, the new design improves 95% heat transfer performance, 30% extra evaporation area, and 66% moisture transfer rate.

压缩衣的发展历史较短，压缩机理还有待进一步完善。目前研发力量也主要掌握在欧美日少数几家品牌中，国内尚未建立独立的研发体系，开发自有品牌。此外，如：X-Bionic、UYN 等具有复杂的一体成型立体结构的压缩衣需要先进的织造工艺水平，同样限制了我国压缩紧身装备的开发。

3. 防护

冬季运动项目中，由于装备、场地和天气的极端性和不确定性，运动员的损伤概率增加，以 2018 年平昌冬奥会为例，运动员受伤率达到 12.6%。个人防护设备在职业运动中越来越重要，为了保证运动员的安全，FIS 和 ISU 在相关规定中都会明确要求运动员佩戴护具（高山滑雪项目的运动员必须佩戴背部护甲）或者穿着具有具有防护功能的赛服（短道速滑的赛服必须具备防切割功能，图 6）。因此，服装装备除了要帮助运动员提高竞技成绩的同时，还应能在训练比赛中保护运动员的身体安全，相应的所使用的纺织品应具备坚韧耐磨、防切割防割，甚至是抗冲击的性能。

短道速滑是我国冬季运动中的优势项目，在赛服的研发上也颇具优势。2018 年的平昌冬奥会上，由安踏集团为中国短道队提供的赛服“雷霆之星”首次亮相。这款赛服采用超高分子量聚乙烯（Dyneema）超强纤维为主体材料，其比强度是钢的 15 倍，且密度低，复合氨纶弹性丝，以四面弹织造技术得到的面料结构密实，轻质有弹性，防切割性能达到 EN388 Level4，优于 ISU 标准要求。相较以往的赛服，新赛服由于面料的革新可以使用单层面料制作，突破传统的双层结构的设计理念，减轻比赛服自重性，比传统赛服重量轻 30%，减少运动员体能消耗，且全身使用新型防切割材料也大大地提高运动员的安全性。

图 6 短道速滑项目装备说明
Figure 6 Short-track speed skating equipment description



The development history of compression garments is relatively short, and the compression mechanism needs to be further improved. At present, research and development strength is mainly concentrated in a few brands in Europe, America and Japan. An independent research and development system has not been established in China to develop its own brands. In addition, X-Bionic, UYN and other compression garments with complex integrated three-dimensional structures require advanced weaving technology, which also limits the development of compression tights and equipment in China.

3. Protection

In winter sports, due to the extremes and uncertainties of equipment, venues and weather, athletes' injury probability has increased. Taking the 2018 Pyeongchang Winter Olympics as an example, the athletes' injury rate reached 12.6%. Personal protective equipment is becoming more and more important in professional sports. In order to ensure the safety of athletes, FIS and ISU will clearly require athletes to wear protective gear (the athletes in alpine skiing must wear back armor) or wear a protective suit (short-track speed skating suits must have anti-cutting function, Figure 6) in relevant regulations. Therefore, in addition to helping athletes to improve their competitive performance, suits and equipment should also be able to protect the athletes' physical safety during training and competitions. The corresponding textiles used should be tough, wear-resistant, cut-resistant, and even impact-resistant.

Short-track speed skating is a dominant event in China's winter sports, and it also has considerable advantages in the development of competition suits. At the PyeongChang Winter Olympics in 2018, the suit "Thunder Star" provided by ANTA Group for the Chinese short-track team made its debut. This suit uses ultra-high molecular weight polyethylene (Dyneema) super fiber as the main material, which has a specific strength of 15 times that of steel and a low density. Composite spandex elastic yarn, whose fabric is obtained by four-sided elastic weaving technology, has a compact structure, light weight and elasticity, and its anti-cutting performance reaches EN388 Level 4, which is better than the ISU standard. Compared with the previous competition suits, the new ones can be made of single-layer fabrics due to the innovation of fabrics, breaking through the traditional double-layer structure design concept, reducing the

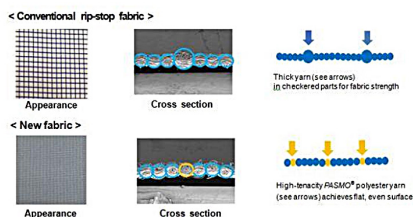


图 7 帝人抗撕裂面料

Figure 7 Teijin Frontier tear-resistant fabric



图 8 道康宁“DEFLEXION”S 系列间隔织物

Figure 8 Dow Corning “DEFLEXION” S series spacer fabric

2019 年帝人公司（Teijin Frontier）发布了一款新型抗撕裂的面料（图 7），准备投入 2021 年的户外运动市场。帝人宣称该款面料以细旦高强度聚酯纤维 PASMO 为原料，采用了全新的纱线排列和编织密度，所得面料外观平整，表面均匀，质地柔软，耐磨性和抗撕裂性高，非常适合运动和户外服装。

护具作为冬季运动的重要装备大多与纺织品相结合使用。随着传统的海绵材料逐渐被淘汰，类似 D3O、Poron 的新材料不断涌现，抗冲击纺织品也在不断的创新发展——三维间隔织物，其质轻柔软，具备较好的支撑性能，有一定的抗冲击能力。美国道康宁（Dow Corning）公司开发过一种“DEFLEXION”减震材料，其中的 S 系列为有机硅掺杂聚酯类间隔织物（图 8），具有高度灵活的开放式透气结构，TP 系列为。平时表现为织物，柔软易弯折；但当受到在撞击时，有机硅分子会在撞击点聚集在，使织物坚硬，并起着护甲的作用。

间隔织物还经常被选用与抗冲击材料复合使用制造护具，以增加护具的透气性和舒适性（图 9）。

4. 可穿戴

可穿戴技术始于 20 世纪 60 年代的美国，由美国麻省理工学院（MIT）媒体实验室提出，是一种出于对于人体健康的干预和改善的创新技术。随着体育运动的兴起，可穿戴技术积极融入其中，成为现代运动服功能性研究的一个热点方向，通过与服装相连的传感器，比如：心率带、智能跑鞋等，可以直接测量人体的包括心率、血压、体温和呼吸等一些重要参数。随着纺织品导电印刷技术的提升和电子计算机技术的革新，电器元件体积越来越小，功能更为完善，可穿戴技术开始被运用到竞技体育中。1983 年，芬兰奥卢大学发明了第一台无线心率遥测仪，科研人员第一次利用可穿戴技术来监控运动训练过程，该设备为运动强度的评定提供了一种新方法，同时也开启了训练监控方法的变革。

weight of the competition suits, which is 30% lighter than the traditional ones, and reducing athletes' physical consumption. Moreover, the use of new anti-cutting materials throughout the body also greatly improves the safety of athletes.

In 2019, Teijin Frontier released a new type of tear-resistant fabric (Figure 7), ready to enter the outdoor sports market in 2021. Teijin Frontier claims that this fabric is made of fine-denier high-strength polyester fiber PASMO, and uses a new yarn arrangement and weaving density, so that the obtained fabric has a smooth appearance, uniform surface, soft texture, high abrasion resistance and tear resistance, which is very suitable for sports and outdoor clothing.

Protective gear as an important winter sports equipment is mostly used in combination with textiles. With the gradual elimination of traditional sponge materials, new materials like D3O and Poron continue to emerge, and impact-resistant textiles are under constant innovation and development, for example, three-dimensional spacer fabrics, which are light and soft, have good supporting properties, and have certain impact resistance. American Dow Corning has developed a "DEFLEXION" shock-absorbing material, the S series of which is an organosilicon-doped polyester spacer fabric (Figure 8), which has a highly flexible open air-permeable structure. The TP series is usually a fabric, which is soft and easy to bend; but when it is under hit, the organosilicon molecules will gather at the impact point, making the fabric hard and acting as an armor.

Spacer fabrics are often used in combination with impact-resistant materials to make protective gear in order to increase the air permeability and comfort of the protective gear (Figure 9).



图9 Dainese gilet Wave 1 Back Protector, 其中白色区域为三维间隔织物

Figure 9 Dainese gilet Wave 1 Back Protector, the white area of which is the three-dimensional spacer fabric

4. Wearable

Wearable technology, which began in the United States in the 1960s and was proposed by the Media Lab of Massachusetts Institute of Technology (MIT), is an innovative technology for intervention and improvement of human health. With the rise of sports, wearable technology has been actively integrated and has become a hot topic in the functional research of modern sportswear. Through sensors connected to clothing, like heart rate belts, smart running shoes, etc., it is possible to directly measure some important parameters of the human body, including heart rate, blood pressure, body temperature and breathing. With the improvement of textile conductive printing technology and the

技术发展持续至今，无独有偶。2017 年三星荷兰分公司研发了一款名为 SmartSuit 的智能训练服 (图 10)，并赞助了两名荷兰短道速滑运动员 Sjinkie Knegt 和 Suzanne Schulting 进行监测训练，目标是帮助他们夺得平昌冬奥会金牌。这款智能训练服始于 2017 年 3 月，由三星研发人员、运动员、教练员和人体运动学家共同创造，在 8 月开发出第一套原型后随即投入使用。研发团队认为，滑行中最重要的参数是运动员的位置，包括瞬间的姿态、高度、速度等，为了精准且时时监测，三星开发了一款配备 5 个传感器的训练服，这些传感器可以将人体动力学数据和位置以数据、图标和视频的方式向 Galaxy S8 和 Tab S3 传输，即便运动员的滑行时速达到 50km/h 依旧信号稳定。该训练服穿着感受与普通训练服无异，但教练可以一目了然的掌握运动员的训练状态，并时时发送信息以令其调整位置。除此之外，这款智能训练服还能够追踪运动员的身体各项指标，以改善健康状况。

类似的，来自芬兰冬季运动可穿戴设备商家 SKIIOT 提供了脚踝穿戴的滑雪分析仪 (图 11)。产品带有七个传感器，与运动和网络应用程序相结合，用户可以在整个赛道上获得可靠的雪温测量值，以及有关滑雪性能，周围条件和技术的任何观察结果。该品牌与长距离越野滑雪的领先团队之一 Ragde Eiendom 团队合作。

高科技纺织品对冬季竞技运动意义非凡，目前的研究热点多集中于提高运动表现、协助肌肉运动、减震防护等方向，基于运动生物力学、仿生学和计算机科学的新材料、新技术、新产品层出不穷。未来的发展方向在单纯纺织品的基础上必然走向多元化，适用于竞技运动的高科技纺织品必将兼具舒适性、功能化和智能化多方位于一体，从训练比赛到休息恢复，全面预防运动损伤，提升运动员竞技水平。



图 10 Sumsang Smart Suit

Figure 10 Sumsang Smart Suit



图 11 SKIIOT 脚踝穿戴的滑雪分析仪

Figure 11 SKIIOT ankle wearable ski analyzer

innovation of electronic computer technology, electrical components are getting smaller and smaller, and their functions are more complete. Wearable technology has begun to be used in competitive sports. In 1983, the University of Oulu in Finland invented the first wireless heart rate telemeter. It is the first time for researchers to use wearable technology to monitor the process of sports training. This device provides a new method for the assessment of exercise intensity and at the same time initiates a revolution in training monitoring methods.

Technological development continues to this day without a coincidence. In 2017, Samsung Netherlands developed a smart training suit called Smart Suit (Figure 10), and sponsored two Dutch short-track speed skaters Sjinkie Knegt and Suzanne Schulting for monitoring training, with the goal of helping them win the gold medal in the Pyeongchang Winter Olympics. This smart training suit started in March 2017 and was jointly created by Samsung research and development staff, athletes, coaches and kinesiologists. After the first prototype suit was developed in August, it was put into use. The research and development team believes that the most important parameter in skating is the athlete's position, including instant posture, height, speed, etc. For accurate and constant monitoring, Samsung has developed a training suit equipped with 5 sensors, which can transmit human kinetics data and position to Galaxy S8 and Tab S3 in the form of data, icons and videos, even if the athlete's skating speed reaches 50km/h, the signal is still stable. The wearing experience of this training suit is the same as that of ordinary training suits, but the coach can grasp the athletes' training status at a glance and constantly send information to make them adjust their positions. In addition, this smart training suit can also track various physical indicators of athletes to improve their health.

Similarly, SKIIOT, a Finnish winter sports wearable device manufacturer, provides an ankle wearableski analyzer (Figure 11). The product comes with seven sensors, combined with sports and web applications, and users can obtain reliable snow temperature measurements across the entire track, as well as any observations about ski performance, surrounding conditions and technology. This brand works with the Ragde Eiendom team, one of the leading teams in long-distance cross-country skiing.

High-tech textiles are of great significance to winter sports. Current research hotspots mostly focus on improving sports performance, assisting muscle movement, shock absorption and protection. New materials, new technologies and new products based on sports biomechanics, bionics and computer science are emerging one after another. The future development direction will inevitably move towards diversification based on pure textiles. High-tech textiles suitable for competitive sports are an integration of comfort, functionalization, and intelligentization from training and competition to rest and recovery, thereby preventing sports injuries in an all-round way and improving the athletes' competitive level.



一次性卫生用非织造材料的研究进展

Research Progress in Non-woven Materials for Disposable Hygiene Products

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一次性卫生用品也称吸收性用即弃产品，其英文名为“Absorbent Disposable Products”或“Hygiene products”，包括女性卫生用品（卫生巾、卫生护垫、卫生栓）、婴儿纸尿裤或婴儿尿片、和成人失禁用品（成人纸尿裤、护理垫）等。一次性卫生用品是随着现代社会的不断进步和人民生活水平不断提升应运而生的产物，也是在大规模生产技术推动下的成果。一次性卫生用品的诞生和快速发展改变了无数老幼妇孺的生活，影响了整个 20 世纪人类文明的进程。

近十几年来，一次性卫生用品国内市场快速发展，各类产品从无到有，生产力水平和消费水平均持续增长，市场渗透率不断上升。2019 年，面对国内外风险水平提高的市场大环境，中国一次性卫生用品市场依旧保持上升趋势，总市场规模相较 2018 年增长了 3.4%，达到约 1165.3 亿元。由于我国正面临严重的人口老龄化问题，成人

Disposable hygiene products are also called absorbent disposable products, and their English names are “Absorbent Disposable Products” or “Hygiene products”, including feminine hygiene products (sanitary napkins, sanitary pads, and tampons), baby paper diaper pants or baby diapers, and adult incontinence products (adult paper diaper pants and nursing pads), etc. Disposable hygiene products are the result of the continuous progress of modern society and the continuous improvement of people's living standards, as well as the result was driven by mass production technology. The birth and rapid development of disposable hygiene products have changed the lives of countless old and young people as well as women and children, and have affected the whole process of human civilization in the 20th century.

In the past ten years, the domestic market for disposable hygiene products has developed rapidly. All kinds of products have emerged from nothing, the productivity level and consumption level have continued to grow, and the market penetration rate has continued to rise. In 2019, in the face of the market environment with increasing risk levels at home and abroad, China's disposable hygiene product market still maintained an upward trend. The total market size increased by 3.4% compared with 2018, reaching approximately RMB116.53 billion. As China is facing a serious aging problem, adult incontinence products as a “new star” in the disposable hygiene product market are increasingly accepted by people, becoming the fastest-growing consumer products in the disposable hygiene product market. In the past five years, the compound annual growth rate of adult incontinence products has reached 15.5%, while the compound annual growth rates of feminine hygiene products and baby paper diaper pants/pads are about 3.1% and 8.8% respectively, which means that China's adult incontinence product market is embracing excellent development opportunities. At the same time, the domestic market for feminine hygiene products and baby paper diaper pants/pads is becoming saturated. How to improve the added value of product functions and meet the needs of individualization and high-quality needs to be further improved.

The disposable hygiene product usually consists of a surface layer, a flow guiding layer, a liquid-absorbing core layer and a bottom layer, as shown in Figure 1. The surface layer, and the flow guiding layer are usually composed of non-woven materials. However, as the core layer of the disposable hygiene product,

失禁用品作为一次性卫生用品市场中的“新星”也越来越被人们所接受，成为一次性卫生用品市场中增速最快的消费品。近五年来，成人失禁用品的复合年均增长率达到15.5%，而女性卫生用品和婴儿纸尿裤 / 垫的复合年均增长率分别约为 3.1% 和 8.8%，意味着中国成人失禁用品市场正在迎来绝佳的发展机遇。与此同时，国内女性卫生用品和婴儿纸尿裤 / 垫市场趋于饱和，如何提升产品功能附加值，满足个性化、高品质需求有待进一步提高。

一次性卫生用品通常由表面层、导流层、吸液芯体层和底层组成，如图 1 所示。其中表面层、导流层一般由非织造材料构成。而吸液芯体作为一次性卫生用品的核心作用层，通常为绒毛浆纤维和高吸水树脂颗粒（如图 2 所示）混合后包覆于无尘纸或薄型非织造材料而形成的复合材料。上述的各层非织造材料中所用的纤维多为合成纤维如聚丙烯（PP）、聚乙烯（PE）、双组份 ES 纤维、以及天然或再生纤维如棉纤维、黏胶纤维等，因而在成本、卫生性和安全性等方面均有较大优势。目前一次性卫生用品常用的非织造材料制备工艺包括纺粘、热风熔喷工艺，传统非织造成型工艺和技术能够满足当前一部分消费者对产品的需求，但大健康环境下人们生活水平日益提升，对产品的功能性和高质量的需求不断提高。

随着国内外非织造技术几十年以来的不断发展，一次性卫生用非织造材料升级换代，新产品层出不穷，在纤维原料、生产工艺、外观形态等方面展现出多方面的创新成果，以满足吸收性用即弃产品对材料透气、快速吸湿、透湿、防倒流性以及皮肤接触舒适性的要求。

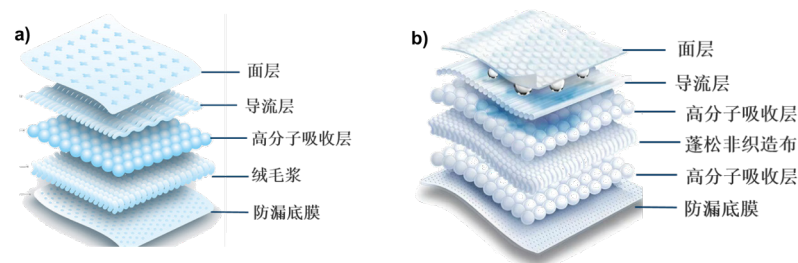


图 1 一次性卫生用品结构示意图 a) 传统纸尿裤结构示意 b) 双 SAP 复合芯体纸尿裤结构示意

Figure 1 Schematic structural diagram of the disposable hygiene product a) The structure of the traditional paper diaper b) The structure of the double SAP composite core paper diaper

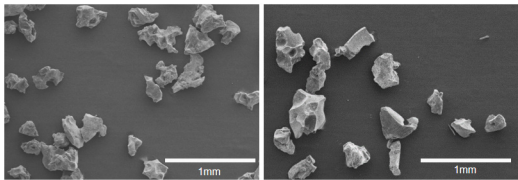


图 2 高吸水树脂颗粒电镜图

Figure 2 Electron micrograph of hyper-absorbent resin particles

the liquid-absorbing corelayer is usually a composite material formed by mixing fluff pulp fibers and hyper-absorbent resin particles (as shown in Figure 2) which are coated on dust-free papers or thin non-woven materials. The fibers used in the layers of non-woven materials mentioned above are mostly synthetic fibers such as polypropylene (PP), polyethylene (PE), two-component ES fibers, and natural or regenerated fibers such as cotton fibers, viscose fibers, etc. Therefore, they have great advantages in cost, hygiene, safety, and other aspects. At present, the commonly used non-woven material preparation processes for disposable hygiene products include spunbonded and hot-air melt-blown processes. Traditional non-woven forming processes and technologies can meet the current needs of some consumers for products. However, people's living standards in a healthy environment are improving day by day, and their demands for product functionality and high quality continue to increase.

With the continuous development of non-woven technology at home and abroad for decades, non-woven materials for disposable hygiene products have been upgraded, and new products have emerged one after another. They have demonstrated various innovations in fiber raw materials, production processes, appearances, and shapes to meet the requirements of absorbent disposable products for material ventilation, rapid moisture absorption, moisture permeability, anti-backflow, and skin contact comfort.

1 New raw materials and new structures of non-woven materials for disposable hygiene products

1.1 New raw materials

The silk fiber is a high-grade textile fiber raw material. The fiber is smooth, thin and soft, and has good compatibility with human skin. Its friction stimulation coefficient with human skin is only 7.4%, and it has good safety and environmental protection. Therefore, silk has good application potential in the research and development of surface layer non-woven materials for disposable hygiene products and can be used in the development of high-grade paper diaper pants, sanitary napkins, and pads with health care functions. Wang Ya combined hot-air bonding and spunlace entanglement technology to prepare a silk/ES blended non-woven fabric that meets the requirements of hygiene roll material tensile properties, air permeability, water penetration time, and reverse osmosis. The upper layer of the material is stapled silk fibers, the lower layer is ES hot-air non-woven fabric, and the two layers are entangled by spunlace reinforcement technology. Based on the research of silk/ES blended non-woven fabric, Chen Jingjing developed a silk/ES blended non-woven fabric with semi-open cell structure by changing the number of meshes of the curtain in the spunlace reinforcement process, which optimizes the material tensile performance, air permeability, and water permeability, and increases the variety of surface non-woven fabric materials.

Screening new fiber raw materials to be used in non-woven materials, and selecting the optimized material structure and process technology is one of the direct methods to improve the performance of disposable hygiene products. Ke Junmu used HDPE and PP as the main raw materials, supplemented by functional raw materials ethylene-octene block copolymer, titanium dioxide, and antioxidants, through blending and melt extrusion process to obtain the skin-core composite fiber with HDPE as the skin layer and modified PP as the core layer, and combined hot-air non-woven

1 一次性卫生用非织造材料的新原料与新结构

1.1 新原料

蚕丝纤维是一种高档的纺织纤维原料，纤维平滑、细而柔软，与人体皮肤的相适性能良好，与人体皮肤的摩擦刺激系数仅为 7.4%，并且具有良好的安全性和环保性，因此蚕丝用于研发一次性卫生用品的表面层非织造材料具有良好的应用潜力，可开发具有保健功能的高档纸尿裤、卫生巾和护垫等产品。王娅结合热风黏合和水刺缠结技术制备了一种满足卫生用卷材拉伸性能、透气性能、透水时间和反渗量要求的蚕丝 / ES 混纺非织造布，材料上层为蚕丝短纤维，下层为 ES 热风非织造布，两层通过水刺加固技术缠结在一起；陈晶晶在蚕丝 / ES 混纺非织造布的研究基础上，改变水刺加固工艺中托网帘的目数开发出了一种具有半开孔结构的蚕丝 / ES 混纺非织造布，优化了材料的拉伸性能、透气性和透水性，增加了面层非织造布材料的品种多元性。

筛选新型纤维原料应用于非织造材料中，并选用优化的材料结构和工艺技术是提高一次性卫生用品产品性能的直接方法之一。柯俊沐以 HDPE 和 PP 为主要原料，辅以功能性原料乙烯-辛烯嵌段共聚物、二氧化钛和抗氧化剂，通过共混、熔融挤出工艺制得皮层为 HDPE，芯层为改性 PP 的皮芯型复合纤维，并结合热风非织造技术和 3D 立体压辊压制成具有凹凸结构的 3D 立体压纹热风 PP/HDPE 非织造材料，与平纹热风非织造材料相比，材料的纵向断裂强力提高了 6.0%，横向断裂强力提高了 13.0%，断裂伸长率和刚柔度有所下降，但平均吸液率、持液率、液体平面扩散性能显著提高；齐晶晶设计通过改变常规 ES 纤维卷曲程度的方法制备同时具有热风和 SSS 纺粘非织造布特点的卫生用面层材料，实验对比证明，当纤维卷曲为 8.5 个 /25mm 的时候，使用该纤维原料结合最佳工艺参数下的热风非织造技术可以制得舒适度更高的面层非织造布。

一次性卫生用品的市场竞争中，产品的成本可以在极大程度上决定其在价格竞争中的优势。为降低一次性卫生用品的制造成本，Grace Kakonke et al，使用鸡羽毛纤维作为非织造材料生产中的廉价原料，与漂白棉纤维混纺并通过针刺加固技术制成纤维网，同时采用吸收剂作为涂层材料，增加该针刺非织造材料的液体吸收性能，与传统一次性卫生用品中吸收芯体相比，新型非织造材料吸液芯体具有更高液体吸收能力。钱程通过对非织造材料中的木浆纤维原料进行氢氧化钠处理的方式，增加了非织造布芯材的吸液量，可减少芯体材料中超吸水树脂颗粒 SAP 的添加量，从而降低产品制造成本。

1.2 新结构

目前关于一次性卫生用品非织造材料结构的研究多集中在纸尿裤导流层非织造材料和吸收芯层非织造材料上。导流层位于纸尿裤面层与吸收芯层之间，起到加速液体扩散、穿透、减少液体回渗的作用，可通过控制导流层非织造布纤维的细度、卷曲度、亲水性；纤网空间的排列结构、蓬松度、加固方式等方法进行设计，以获得更优的产品性能。王欢根据导流层作用的机理分析，设计了一种复合导流层材料，包括纤维定向排列结构的常规导流层和纤维杂乱随机排列的阻尼层，常规导流层增加液体在纤网中的扩散，阻尼层具有一定透水性，能够防止液体渗透过快而来不及在导流层中扩散，这种新式结构可以引导液体在导流层材料中沿纵方向扩散，并与竖直方向的渗透达到

technology and 3D three-dimensional press rolls to form a 3D three-dimensional embossed hot-air PP/HDPE non-woven material with uneven structure. Compared with plain-weave hot-air non-woven materials, the longitudinal breaking strength of the material is increased by 6.0%, and the transversal breaking strength increased by 13.0%. Elongation at break and stiffness and flexibility decreased, but the average liquid absorption rate, liquid hold-up rate, and liquid plane diffusion performance are significantly improved. Qi Jingjing prepared a hygiene surface layer material with the characteristics of both hot-air and SSS spunbonded non-woven fabric by changing the crimp degree of the conventional ES fiber. The experimental comparison proved that when the fiber crimp is 8.5×/25mm, combined with the optimum process parameters of hot-air non-woven technology, the fiber raw material can be used to make surface layer non-woven fabric with a higher comfort level.

In the market competition of disposable hygiene products, the cost of the product can determine its advantage in price competition to a great extent. To reduce the manufacturing cost of disposable hygiene products, Grace Kakonke et al used chicken feather fiber as a cheap raw material in the production of non-woven materials, blended with bleached cotton fiber and made a fiber web through needle-punch reinforcement technology, and used absorbent as the coating material to increase the liquid-absorbing performance of the needle-punched non-woven material. Compared with the absorbent core of the traditional disposable hygiene products, the new non-woven material absorbent core has a higher liquid absorbing capacity. Qiancheng increased the liquid absorption of the non-woven core material by treating the wood pulp fiber raw material in the non-woven material with sodium hydroxide, which can reduce the addition of hyper-absorbent resin particles SAP in the core material, thereby reducing the product manufacturing cost.

1.2 The new structure

At present, the research on the structure of non-woven materials for disposable hygiene products mostly focuses on non-woven materials respectively in the flow guiding layer and the absorbent core layer of paper diaper pants. The flow guiding layer is located between the surface layer and the absorbent core layer of the paper diaper pants, which has the effect of accelerating liquid diffusion, penetration, and reducing liquid

平衡。沈嘉俊等人提出一种导槽技术，在吸收芯体的热风棉中设置导槽以替代导流层，对比常规具有导流层的纸尿裤，导槽技术的应用可以减少纸尿裤的制造成本，并且纸尿裤成品具有吸液速率快、液体扩散长度长、液体回渗量小的优点。

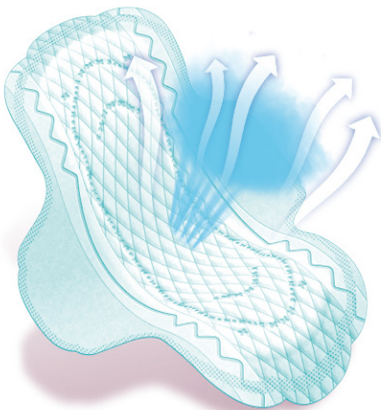
吸收芯层是纸尿裤技术的核心，为了满足消费者舒适性的要求，吸收芯层非织造布结构的开发需要在满足吸液要求的前提下往窄、薄、轻的方向进行。李国标设计了一种“三明治”型吸收芯层，由吸水纸、SAP、非织造布、SAP、吸水纸五层结构组成，可比常规 SAP/ 绒毛浆吸收芯层减少 40.95% 的厚度，并且充分吸液后表面平整，不会出现普通纸尿裤结团隆起的现象。

2 一次性卫生用非织造材料制备技术

2.1 一次性卫生用品非织造材料生产工艺

传统的一次性卫生用非织造材料可分为短纤维非织造布和长丝非织造布两类。短纤一次性卫生用非织造布的生产工艺主要为水刺非织造技术和热风非织造技术，其中水刺非织造布可用作卫生巾和纸尿裤吸收芯体的包裹层，但生产成本高的问题对其应用产生了一定限制；热风非织造布由于具有蓬松和柔软的特点，所以主要应用于一次性卫生用品的面层，满足人们对贴肤材料柔软舒适的要求。长丝一次性卫生用非织造布的生产工艺主要为纺粘非织造技术和熔喷 / 纺粘复合非织造技术，其中纺粘非织造布耐摩擦性能好、起毛少，更多的应用于一次性卫生用品的面层和底层，但是在柔软性更好的热风非织布应用兴起之后，纺粘非织造布应用于面层大量减少；熔喷 / 纺粘复合非织造布有多种（SMS、SMMS、SSMMS 等，S 表示纺粘层，M 表示熔喷层），具有良好的防侧漏效果以及力学性能，但受成本限制，目前一般只应用纸尿裤的防侧漏隔边处。

静电纺丝技术是一种静电喷射拉伸纺丝技术，是制备纳米纤维的一种方法，制备的纳米纤维膜具有比表面积大、孔隙率高，且结构、尺寸、形貌可控，应用前景广阔。ES Bokova et al, 在室温条件下结合静电纺丝技术和“Nanospider”技术，混合聚丙烯酸、聚乙烯醇和聚乙二醇为纺丝液，成功纺出纤维直径为 120 至 400 nm 的非织造纤维膜，其具有高于产业用非织造产品的亲水性和吸湿性，在一次性卫生用品中具有一定的应用潜力，但静电纺丝材料的大规模生产是该技术面临的瓶颈问题。



re-infiltration. It can be designed by controlling the fineness, crimpness, and hydrophilicity of the non-woven fabric of the flow guiding layer, as well as the arrangement structure, bulkiness, and reinforcement of the fiber web space to obtain better product performance. Based on the analysis of the mechanism of the flow guiding layer, Wang Huan designed a composite flow guiding layer material, including a conventional flow guiding layer with oriented arrangements of fibers and a damping layer with random arrangements of fibers. The conventional flow guiding layer increases liquid diffusion in the fiber web. The damping layer has a certain degree of water permeability, which can prevent the liquid from permeating too fast to diffuse in the flow guiding layer. This new structure can guide the liquid to diffuse in the flow guiding layer material in the longitudinal direction and balance with the vertical direction of penetration. Shen Jiajun et al. proposed a guide groove technology in which guide grooves are provided in the hot-air cotton of the absorbent core to replace the flow guiding layer. Compared with conventional diaper pants with flow guiding layers, the application of the guide groove technology can reduce the manufacturing cost of paper diaper pants. In addition, the finished paper diaper pants have the advantages of fast liquid absorption, long liquid diffusion length, and small liquid re-infiltration.

The absorbent core layer is the core of paper diaper pants technology. To meet consumer comfort requirements, the development of absorbent core non-woven fabric structure needs to be narrow, thin, and light under the premise of meeting liquid absorption requirements. Li Guobiao designed a "sandwich" type absorbent core layer, which is composed of five layers of absorbent paper, SAP, non-woven fabric, SAP, and absorbent paper, which can reduce the thickness by 40.95% compared with the conventional SAP/fluff pulp absorbent core layer, and after full suction, the surface is smooth, and there will be no clumping and bulging of ordinary paper diaper pants.

2 Preparation technology of non-woven materials for disposable hygiene products

2.1 Production process of non-woven materials for disposable hygiene products

Traditional non-woven materials for disposable hygiene products can be divided into staple fiber non-woven fabrics and filament non-woven fabrics. The production processes of staple fiber non-woven fabrics for disposable hygiene products are mainly spunlace non-woven technology and hot-air non-woven technology. The spunlace non-woven fabric can be used as the wrapping layer of the absorbent core of sanitary napkins and paper diaper pants, but the production cost is high, which causes certain restrictions on its application. Due to its fluffy and soft characteristics, hot-air nonwoven fabrics are mainly used in the surface layer of disposable hygiene products to meet people's requirements for soft and comfortable skin. The production processes of filament non-woven fabric for disposable hygiene are mainly spunbonded non-woven technology and melt-blown/spunbonded composite non-woven technology. The spunbonded non-woven fabrics have good friction resistance and less fluffing and are usually used in the surface layer and bottom layer of disposable hygiene products. However, after the application of more flexible hot-air non-woven fabrics, the application of spunbonded non-woven fabrics in the surface layer has been greatly reduced. There are many types of melt-blown/spunbonded non-woven fabrics (SMS, SMMS, SSMMS, etc., where S stands for spunbond layer, and M stands for the melt-blown layer), which has good side

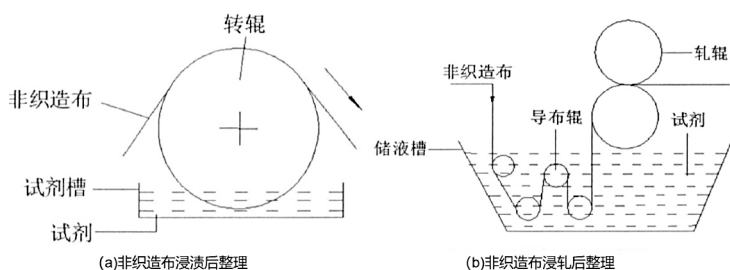


图 3 非织造布后整理工艺示意图

Figure 3 Schematic diagram of non-woven fabric finishing process

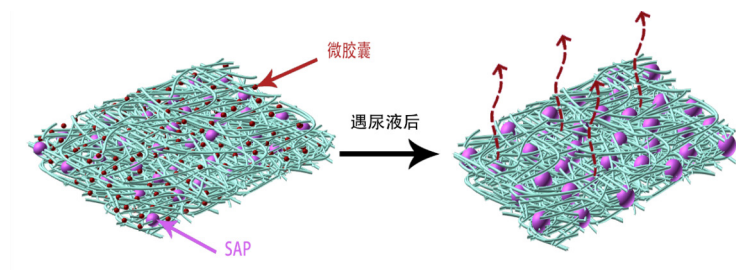


图 4 芯体遇尿液释香过程示意图

Figure 4 Schematic diagram of the aroma release process when the core is brought into contact with urine

2.2 一次性卫生用品非织造材料后整理技术

后整理技术可以通过较为简单的方式赋予纺织材料崭新的功能性，拓展产品应用领域，给消费者带来更佳的使用体验，是提高一次性卫生用品功能性的途径之一，一次性卫生用非织造布后整理一般采用浸渍法和浸轧法，如图 3 所示。Mariana Pohlmann et al，以黄油和香精等亲脂性物质为芯材，采用微胶囊技术合成具有护肤、杀菌和消炎等功能的微胶囊，并证明该微胶囊可通过喷洒或浸渍的方式对女性卫生巾的面层非织造布进行后整理，可帮助平衡女性外阴处微生物菌群，提高女性卫生用品的使用安全性。Sibel Kaplan et al 研究发现，可以使用肉桂醛、香叶醇和苯乙醇等天然抗菌剂对一次性卫生产品的面层进行抗菌后整理，仅会造成材料吸液性能略微下降，而不降低一次性卫生用品的其他应用性能指标。除上述对一次性卫生用品进行的抗菌、亲肤改性外，将遇湿释香型芳香微胶囊整理至吸收芯层非织造材料中，当芯体遇尿液时，芳香微胶囊释放香气掩盖排泄物气味，也是一种可行方案，如图 4 所示。

3 结语

非织造材料作为一次性卫生用品中的主要材料起到了吸液导液、透气防渗的作用，在女性卫生用品、婴儿尿裤尿片、成人失禁用品中应用广泛。而一次性卫生用非织造材料的新原料、新结构以及制备工艺和后整理技术将不断赋予一次性卫生用品新功能和更优化的产品质量，以满足人们对用即弃个人卫生产品的个性化和高质化需求，同时促进了该类产品的升级换代。未来，一次性卫生用非织造材料将在原料绿色化、功能集成化、生产工艺和技术智能化等领域寻求更加长远的发展。

leakage prevention and mechanical properties, but due to cost constraints, currently, it is only used on the side leakage prevention of paper diaper pants.

Electrospinning technology is a kind of electrostatic jet stretching spinning technology. It is a method of preparing nanofibers. The prepared nanofiber membrane has a large specific surface area, high porosity, and controllable structure, size and morphology, and broad application prospects. ES Bokova et al, combined electrospinning technology and “Nanospider” technology at room temperature, mixed polyacrylic acid, polyvinyl alcohol, and polyethylene glycol as spinning solutions, successfully spun the non-woven fiber membrane with fiber diameters of 120 to 400 nm, which has higher hydrophilicity and hygroscopicity than industrial non-woven products and has certain application potential in disposable hygiene products. However, the large-scale production of electrospinning materials is the bottleneck problem of this technology.

2.2 Finishing technology of non-woven materials for disposable hygiene products

Finishing technology can give textile materials new functionality in a relatively simple way, expand product application areas, and bring consumers a better user experience. It is one of the ways to improve the functionality of disposable hygiene products. The finishing technology of non-woven fabrics usually adopts dipping and padding methods, as shown in Figure 3. Mariana Pohlmann et al, using lipophilic substances such as butter and essence as the core material, used microcapsule technology to synthesize microcapsules with functions of skincare, sterilization, and anti-inflammatory, and proved that the microcapsules can be sprayed or dipped to finish the non-woven surface layer of female sanitary napkins, which can help balance the microflora in the female vulva and improve the safety of female hygiene products. Through research, Sibel Kaplan et al found that natural antibacterial agents such as cinnamaldehyde, geraniol, and phenethyl alcohol can be used to carry out antibacterial finishing on the surface of disposable hygiene products, which will only cause a slight decrease in the liquid absorbing performance of the material without reducing other application performance indexes of disposable hygiene products. In addition to the above-mentioned antibacterial and skin-friendly modification of disposable hygiene products, the moisture-releasing aromatic microcapsules are arranged into the absorbent core non-woven material. When the core body encounters urine, the aromatic microcapsules release the fragrance to cover up the smell of excrement, which is also a feasible solution, as shown in Figure 4.

3 Conclusion

As the main material in disposable hygiene products, non-woven materials have the functions of absorbing liquid and guiding fluid. The breathability and impermeability are widely used in feminine hygiene products, baby paper diaper pants and diapers, and adult incontinence products. The new raw materials, new structure, preparation process, and finishing technology of non-woven materials for disposable hygiene products will continue to give disposable hygiene products new functions and more optimized product quality to meet people's personalized and high-quality demands for disposable personal hygiene products and promote the upgrading of such products. In the future, non-woven materials for disposable hygiene products will seek more long-term development in the fields of green raw materials, functional integration, production process, technology intelligence, etc.



面向电子纺织品的纤维基能源材料的研究进展与趋势

Progress and Trend of Research on Fiber-based Energy Materials for E-textiles

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Wangdong Group

电子纺织品 (e-textiles) 是能够将电池、微控制器、传感器、执行器和显示器等电子元件无缝集成其中的织物，提供生理信号监测、体域网通讯、温度调节、能量存储等众多颠覆传统织物的革命性新功能。据 IDTechEx 研究报告，2018 年全球 e-textiles 市场规模已逾 20 亿美元，是未来电子科技最热门的领域。**目前，可穿戴 e-textile 的研发已进入全织物（全纤维）电子系统阶段，即系统所有部件均由纤维材料通过智能制造工艺制备，使服装成为具有电子产生、传输、调制和测量功能的纤维集合体系统。**由于纤维材料具备轻质、柔性、高比表面积的特点，能通过编织、刺绣等方式实现与服饰和柔性器件最大程度的匹配，因而，基于纤维的储能器件被认为是最合适的可穿戴能量供给系统。对于全纤维的 e-textile 系统，高度适配的纤维基储能器件的稳定工作是实现整个系统功能的关键。



Electronic textiles (e-textiles) are fabrics where electronic components such as batteries, microcontrollers, sensors, actuators and displays are integrated seamlessly and can provide many revolutionary new functions that subvert traditional fabric properties, such as physiological signal monitoring, body area network communication, temperature regulation and energy storage. According to IDTechEx research report, the global e-textiles market size exceeded USD2 billion in 2018, and it is the hottest field of electronic technology in the future. **At present, the R&D of wearable e-textile have entered the stage of all-fabric (all-fiber) electronic system, that is, all components of the system are made of fiber materials through an intelligent manufacturing process, which makes the clothing become a fiber aggregate system with the electronic generation, transmission, modulation and measurement functions.** Fiber materials have the characteristics of lightweight, softness and high specific surface area, which can be matched with clothing and flexible devices to the greatest extent by weaving and embroidery. Therefore, fiber-based energy storage devices are considered the most suitable wearable energy supply system. For all-fiber e-textile systems, the stable operation of highly adaptive fiber-based energy storage devices is the key to realize the functions of the whole system.

Fiber-based secondary batteries and fiber-based supercapacitors are the most potential energy storage devices applicable to all-fiber e-textile. Secondary batteries are represented by lithium-ion battery (which operate by lithium ions moving between positive and negative electrodes). The energy storage mechanism of supercapacitors (electrochemical capacitors) is mainly based on electric double-layer capacitance (EDLC) and pseudocapacitance (Faraday reaction). These two energy storage systems are usually designed as one-dimensional yarn structure or two-dimensional fabric structure. One-dimensional yarn structure includes coaxial structure (positive and negative electrodes, active materials are coaxial with electrolyte) and winding structure (two fiber electrodes are intertwined and separated by electrolyte or diaphragm). Two-dimensional fabric structure needs to sandwich solid electrolyte or diaphragm between two planar electrodes. They are the evolution of traditional two-dimensional supercapacitors or the sandwich structure of “electrode (positive electrode)/diaphragm/electrode (negative electrode)”. Figure 1 shows the structure of fiber-based supercapacitors and fiber-based lithium-ion batteries^[1]. It can be seen that the fabric-based battery with yarn structure can

纤维基二次电池和纤维基超级电容器是目前最有潜力应用于全纤维 e-textile 的能量存储器件。二次电池以锂离子电池（依靠锂离子在正极和负极之间移动来工作）为代表。超级电容器（电化学电容器）的储能机理主要基于双电层电容（EDLC）和赝电容（法拉第反应）。这两种储能系统通常被设计成一维纱线结构或二维织物结构。一维纱线结构包括同轴结构（正负电极、活性物质与电解质同轴）和缠绕结构（两根纤维电极相互缠绕，以电解质或隔膜相隔离）。二维织物结构需要将固态电解质或隔膜夹在两个平面电极间。它们都是传统二维超级电容器或“电极（正极）/隔膜/电极（负极）”三明治结构的演进。图 1 显示了纤维基超级电容器和纤维基锂离子电池的构造^[1]。可见，纱线结构的织物基电池可通过织造与 e-textile 直接集成，从而提供三维形状的贴合性和良好的透气性。

高容量和长循环寿命的纤维基储能器件是实现 e-textiles 系统正常工作的关键。目前，柔性电子市场对 1.5V -3V 之间的柔性电池的需求处于激增状态。各种智能卡、RFID 标签等能量收集和消费电子应用对柔性能源的容量要求大约在 10 -100 mAh 之间。高功率应用中需使用 100 mAh 以上柔性电池。储能器件的容量可采用高理论容量的活性材料和结构设计等来实现，其中电极材料的结构设计是行之有效的方法。如通过增大电极的活性面积产生更多的活性位点有利于电荷转移，以及杂原子掺杂优化电子结构提高电导率，从而提高扩散动力学。例如，Li e al.^[2] 报道了可编织的一维纤维状锌 -

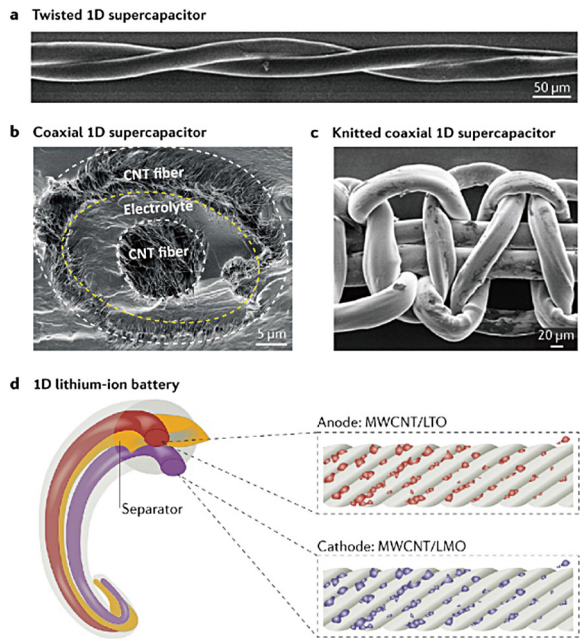


图 1 纤维基能源存储系统构造：(a, b, c) 同轴、缠绕和针织型一维纤维基超级电容器的 SEM 图像，(d) 一维锂离子电池结构示意图 [1]

Figure 1 Structure of fiber-based energy storage system: (a, b, c) SEM images of coaxial, wound and knitted one-dimensional fiber-based supercapacitors, and (d) schematic diagram of one-dimensional lithium-ion battery structure [1]

be directly integrated with e-textile by weaving, thus providing three-dimensional conformability and good air permeability.

Fiber-based energy storage devices with high capacity and long cycle life are the key to realize the normal operation of the e-textures system. At present, the demand for flexible batteries between 1.5V and 3V in the flexible electronics market is in a surge state. All kinds of smart cards, RFID tags and other energy collection and consumer electronics applications require about 10-100 mAh capacity of flexible energy. Flexible batteries above 100 mAh shall be used in high power applications. The capacity of energy storage devices can be realized by using active materials with high theoretical capacity and structural design, among which the structural design of electrode materials is an effective method. For example, the active superficial area of the electrode is increased to generate more active sites, which is beneficial to charge transfer, and heteroatom doping optimizes the electronic structure to improve the conductivity, thus improving the diffusion kinetics. For example, Li et al.^[2] reported a braided one-dimensional fibrous zinc-air battery, where $\text{Co}_3\text{O}_4/\text{N-rGO}$ nanosheets with atomic thinness are supported on carbon fiber electrodes as efficient catalysts for O_2 reduction. With an open-circuit voltage of 1.31 V and a volume energy density of 36.1 mWh cm^{-3} , the battery can supply power for LED watches, LED screens and even charge iPhone 4S mobile phone. In terms of cycle stability, flexible lithium-ion batteries can be cycled hundreds of times, while fiber-based supercapacitors can be cycled for about 10,000 times.

Fiber-based energy storage devices for e-textile systems require excellent distortion resistance, bending resistance and stretchability. Based on the stability of electrode materials, the fabric electrode obtained by in-situ growth of interface chemistry or electrochemistry on fabric substrate has a good bonding force between electrode and fabric interface, and can prevent the active substances on electrode materials from falling off. Our team successfully prepared fabric electrodes with three-dimensional connected network structure on PET fabric by in-situ chemical oxidative polymerization and electrochemical polymerization, and applied them to all-solid supercapacitors^[3-5] and flexible lithium-ion batteries^[6]. The test results show that the full-fabric-based flexible energy storage device developed by our team has excellent bending resistance and output stability.

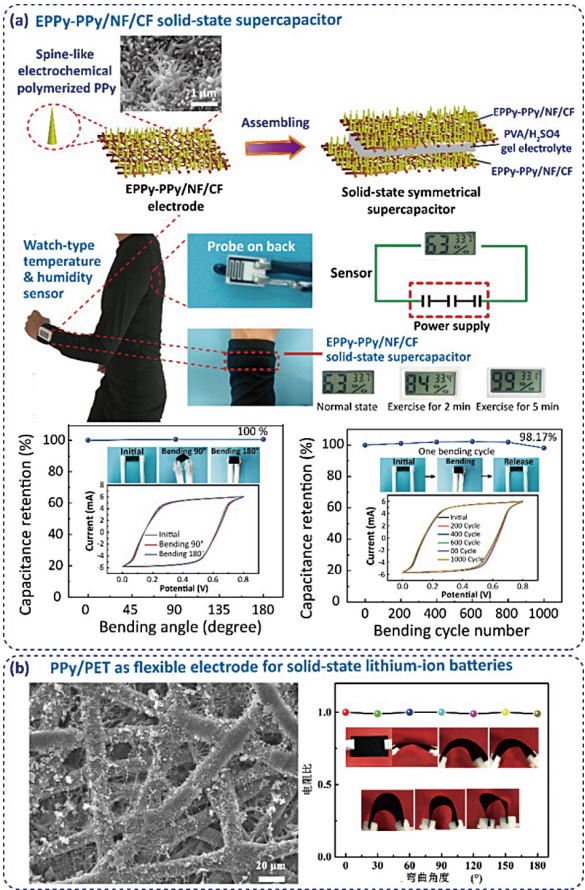
空气电池，该电池以原子级薄度的 $\text{Co}_3\text{O}_4/\text{N-rGO}$ 纳米片层负载在碳纤维电极上作为 O_2 还原的高效催化剂。该电池的开路电压为 1.31 V，体积能量密度为 36.1 mWh cm^{-3} ，能为 LED 手表、LED 屏幕供电，甚至 iPhone 4S 手机充电。在循环稳定性方面，柔性锂离子电池一般能循环几百次，而纤维基超级电容器通常可以循环 10000 次左右。

面向 e-textile 系统的纤维基储能器件要求具有优异的耐扭曲、抗弯折和可拉伸性。从电极材料的稳定性出发，通过界面化学或者电化学在织物基底上的原位生长获得的织物电极具备良好的电极 - 织物界面结合力，防止电极材料上活性物质的脱落。本团队在 PET 织物上通过原位化学氧化聚合、电化学聚合等手段成功制备了具有三维连通网络结构的织物电极应用于全固态超级电容器^[3-5]和柔性锂离子电池^[6]。测试结果表明，本团队研发的全织物基柔性储能器件具有优异的抗弯折性和输出稳定性。

面向 e-textile 系统的纤维基能量存储器件的安全性问题必须得到重视。安全性包括电解质的成分和封装两个方面。商业化的锂离子电池采用易燃的有机液态电解质，引起极大的安全隐患。织物基储能器件应开发基于不易燃、无腐蚀性的电解质系统，特别是能在极端温度（高温或低温）工作下的凝胶或固态电解质。凝胶电解质的优势

图 2 本团队开发的柔性织物能源器件具备优良的耐弯折性 [5][6]

Figure 2 The flexible fabric energy device developed by our team features excellent bending resistance[5][6]



The safety of fiber-based energy storage devices for the e-textile system must gain high attention. Safety includes electrolyte composition and encapsulation. Commercial lithium-ion batteries use the flammable organic liquid electrolyte, which causes great potential safety hazards. Fabric-based energy storage devices shall be developed based on non-flammable and non-corrosive electrolyte systems, especially gel or solid electrolytes that can work at extreme temperatures (high or low temperature). The advantage of gel electrolyte is that the leakage problem of liquid electrolyte can be avoided with high safety. Because of its high viscosity, it can be used as a binder, which can maintain the integrity of the whole assembly and the stability of electrochemical performance even under external force. Gel electrolyte can also be directly used as a diaphragm to simplify the structure of flexible batteries^[7]. However, there is still a huge gap between the all-solid fabric-based energy storage devices based on gel electrolyte and commercial button-type or soft-pack lithium-ion batteries in terms of capacity, rate performance and stability. In addition, the leakage of chemical components in the gel electrolyte may affect the safety and health of the wearer, thus requiring strict packaging. The aluminum-plastic film is commonly used in commercial flexible lithium-ion batteries, but packaging with these non-fabric materials will cause stiffness and poor flexibility of clothing.

The fiber-based energy storage device with a self-healing function for e-textile system has more commercial prospects. For example, the directionally aligned MWCNT chips are wound around the self-healing polymer fibers, and the two fibers are twisted together to form a supercapacitor. The supercapacitor can be healed by the recovery of hydrogen bonds when it is stretched and broken, and the conductive network can be reconstructed by VDW force adjacent to MWCNT. In addition, colored polymers (such as polyaniline) which display different colors during charging or discharging are introduced into the fiber supercapacitor, and the working state of the supercapacitor can be judged by directly observing the color changes. The rapid development of e-textile has put forward higher requirements for energy supply systems, multi-function sensing and interaction. Our team^[8] has built an integrated full-fabric-based self-powered-pressure-temperature electronic skin sensing array on 3D spacing fabric, and it is applied in e-textile vests, which can accurately sense the pressure of 200 ~200 kPa (the response

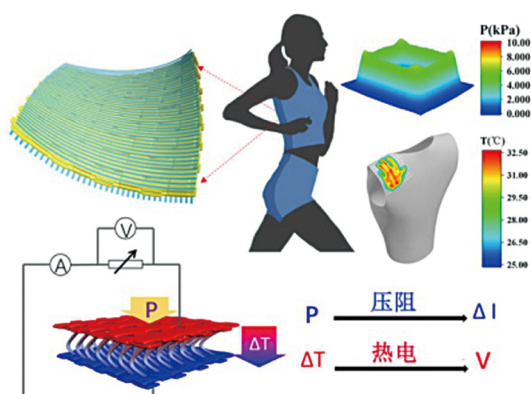


图 3 储能器件集成系统 [8]

Figure 3 Integrated energy storage device system [8]

在于可避免液态电解质的漏液问题，安全性高。高粘度使其可以作为粘结剂，即使在外力作用下，也能保持整个组件的完整性和电化学性能的稳定性。凝胶电解质还可直接作为隔膜使用，简化柔性电池的结构 [7]。然而，基于凝胶电解质的全固态织物基储能器件目前无论在容量、倍率性能、稳定性方面与商业化的纽扣型或软包型锂离子电池还存在巨大的差距。此外，凝胶电解质中化学成分的泄漏可能对穿戴者的安全 and 健康造成影响，需要严格的封装。商业化的柔性锂离子电池常用铝塑膜，但这些非织物的材料进行封装会造成衣服的僵硬及灵活性差。

面向 e-textile 系统的具有自愈合功能的纤维基能量存储器件更具商业化前景。例如，将定向排列的 MWCNT 片缠绕在自愈合的聚合物纤维上，将两根纤维捻在一起形成超级电容器，该电容器在受拉伸断裂时能通过氢键的恢复而愈合，导电网络可通过相邻 MWCNT 的范德华力而重构。此外，在纤维超级电容器中引入在充电或放电时显示不同颜色的彩色聚合物（例如聚苯胺），可通过直接观察色变，判断超级电容器的工作状态。e-textile 的快速发展对能量供给系统、多功能传感和交互提出了更高的要求，本团队 [8] 在 3D 间隔织物上构建了全织物基的自供电 - 压力 - 温度集成的电子皮肤感应阵列应用于电子织物马夹，能够准确感知 200 ~ 200 kPa 的压力（响应时间 80 ms）和 0.1 K 的温差（响应时间 1 s），同时实现连续自供电、多功能感知及多模态刺激信号的识别。

总之，面向 e-textile 的织物基储能器件已经取得了很大进步，但很多研究仍然停留在实验室阶段，离实际应用还存在巨大的差距。如果从产品化角度来看，还需考虑提高容量和循环寿命、降低成本、耐弯折、规模化制造工艺、安全性、易集成性、可水洗、可拓展性等方面，这也是未来需要集中力量突破的方向。此外，商业化的正负极材料往往需要负载较高的活性物质，在负载量提高的同时，电极的柔性必然受到影响。因此，在今后的研究中需要平衡活性物质的负载量、电化学性能和柔性之间的关系。凝胶电解质的开发是关键，普通的凝胶电解质材料不具备修复功能或只有有限的修复次数，大多不超过 5 次，修复后的超级电容器电容性能也会显著下降。因此，开发具有更优异的自愈合效果、更好的人体和环境安全性的凝胶电解质也面临着巨大的挑战。

time is 80ms) and the temperature difference of 0.1 K (the response time is 1s). At the same time, it can realize continuous self-powered supply, multi-function sensing and multi-mode stimulation signal recognition.

In conclusion, great progress has been made in fabric-based energy storage devices for e-textile, but many studies remain in the laboratory stage, with a huge gap from practical applications. From the perspective of productization, it is also necessary to consider such aspects as improving capacity and cycle life, reducing cost, realizing bending resistance, finishing large-scale manufacturing process, and ensuring safety, easy integration, washability, and expandability, which are also the directions in which we need to concentrate making breakthroughs in the future. In addition, the commercial positive and negative electrode materials often need a higher load of active substances, and the flexibility of the electrode will inevitably be affected when the load is increased. Therefore, it is necessary to balance the relationship among active material loading, electrochemical performance and flexibility in future research. The key is the development of gel electrolyte. Ordinary gel electrolyte materials have no repair function or only have limited repair frequencies, most of which cannot exceed 5 times, and the capacitance performance of repaired supercapacitors will decrease significantly. Therefore, the development of gel electrolytes with better self-healing effect and better human and environmental safety is also a great challenge.

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2012 2013 2014 2015 2016

激扬十载，纤领精彩

中国纤维流行趋势 10 周年记录与回顾

FIBERS LEADING
EXCELLENT 10 YEARS

Record and Review of the 10th Anniversary of
China Fibers Fashion Trends



2017 / 2018 / 2019 / 2020 / 2021

岁月积淀，时光不负。中国纤维流行趋势自 2012 年首次发布至今，已历经 10 年风雨峥嵘。中国纤维流行趋势发布从无到有，从有到优，时至今日已成为中国化纤行业发展的风向标，引领中国纤维在科技创新、绿色发展、时尚跨界、国际影响力等方面全方位提升，让“中国纤维”这一公共品牌在国际市场上的整体竞争力大大提高。

春风化雨，润“纤”有声。每年一度的中国纤维流行趋势发布会总是在“有所守、有所变”中寻找新的共鸣，以不同的视角传递中国纤维力量，以创新的形式展示中国纤维影响力。

Time will live up to expectations through its steady accumulation. China Fibers Fashion Trends has gone through a great history of 10 years since it was first launched in 2012. The launch of China Fibers Fashion Trends has grown from nothing, from existence to excellence, and has become the vane of the development of China's chemical fibers industry, leading China fibers to make all-around improvements in technological innovation, green development, fashion cross-border, and international influence, and greatly promoting the overall competitiveness of the public brand of "China Fibers" in the international market.

The spring breeze turns clouds into rain, and moistens "fibers" with sound. The annual China Fibers Fashion Trends Release is always looking for new resonance in "reserve and change", conveying the power of China fibers from different perspectives, and showing the influence of China fibers in innovative forms.

2012年

》 主题：生态、时尚、功能、环保、科技

》 入选：十大纤维品种

以 PPT 的形式在酒店进行发布；

发行《中国纤维流行趋势报告 2012/2013》。

Theme: Ecology, Fashion, Function, Environmental Protection, and Technology

Selected: Top Ten Fiber Varieties

Published in the form of PPT in the hotel;

Issued the "China Fibers Fashion Trends Report 2012/2013".



>> 主题：绿色、循环、低碳

>> 入选：十大纤维品种

以 PPT 的形式在酒店进行发布，同时举办“盛虹杯中国纤维创意空间作品大赛”；首次在中国国际纺织纱线（春夏）展览会上对入选中国纤维流行趋势的产品进行概念展展示，并开展上下游对接活动；发行《中国纤维流行趋势报告 2013/2014》。

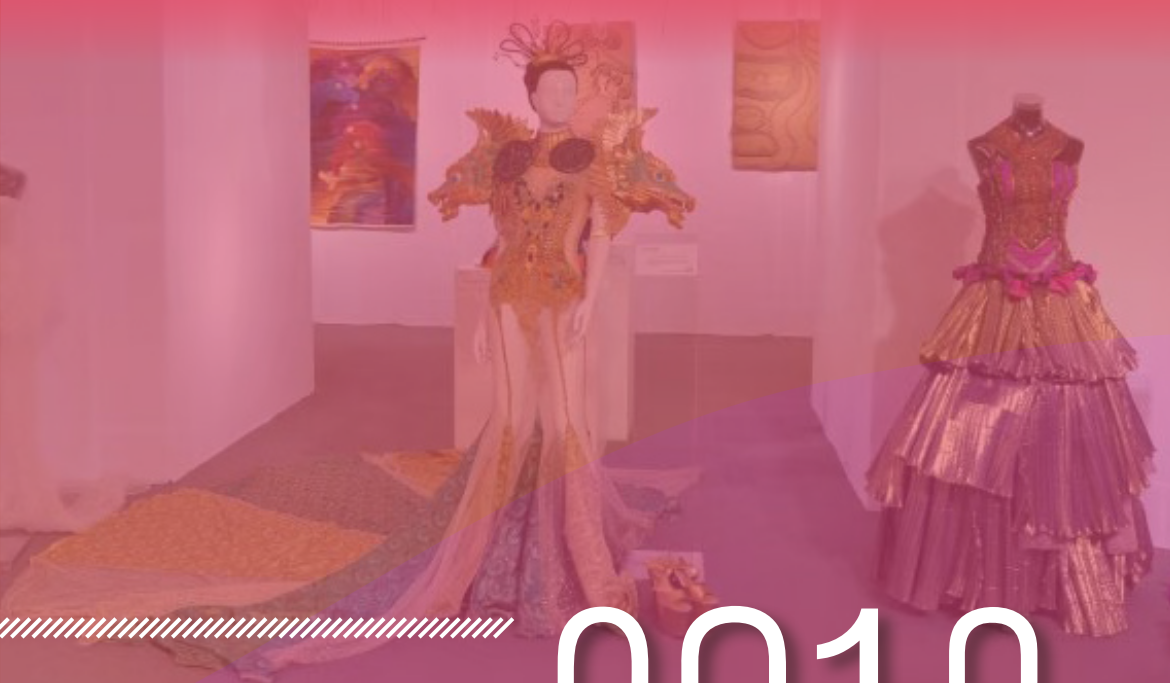
Theme: Green, Recycling, Low Carbon

Selected: Top Ten Fiber Varieties

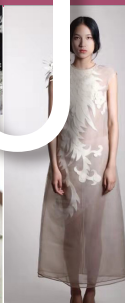
Published in the form of PPT in the hotel, and held the "Shenghong Cup China Fibers Creative Works Competition";

For the first time at the China International Yarn Expo Spring, the concept exhibition of products selected for China Fibers Fashion Trends was displayed, and upstream and downstream connection activities were carried out;

Issued the "China Fibers Fashion Trends Report 2013/2014".



2013





2014年

» 主题：和谐与品质

» 四大篇章：纤之盾—健康防护篇、纤之韵—精致生活篇、纤之源—绿色低碳篇、纤之魅—绚丽色彩篇

» 入选：十大纤维品种，32 家企业，34 个产品

首次提出“纤动世界，美丽中国”；

首次携手中国当代颇富盛誉的“金顶奖”设计师武学凯共同合作，打造盛虹·中国纤维（逸绵）创意时尚汇；

发行《中国纤维流行趋势报告 2014/2015》；

在中国国际纺织纱线（春夏）展览会上对入选中国纤维流行趋势的产品进行概念展展示，并开展上下游对接活动。

Theme: Friendly life & Better quality

Four chapters: Fiber Shield—Health & Protection , Fiber Charm—Enriched Life, Fiber Source—Green & Low Carbon, and Fiber Charisma—Magnificent Color

Selected: Top Ten Fiber Varieties, 32 enterprises, 34 products

For the first time put forward the forum "More than Fibers•Beyond China";

For the first time cooperated with Wu Xuekai, a well-known contemporary designer in China who won a "Golden Award" in creating Shenghong•China Fibers (Yimian) Creative Fashion Collection;

Issued the China Fibers Fashion Trends Report 2014/2015;

At the China International Yarn Expo Spring, the concept exhibition of products selected for China Fibers Fashion Trends was displayed, and upstream and downstream connection activities were carried out.

>> 主题：创新与融合

>> 四大篇章：“纤·科技畅想”、“纤·舒馨生活”、“纤·美妙生态”、“纤·安全防御”

>> 入选：十大纤维品种，32 家企业，34 个产品

盛虹开始整体冠名“中国纤维流行趋势”

继续携手国内知名“金顶奖”设计师武学凯，以“新随意动”系列作品，展示纤维产品的真正魅力；

首次中国纤维流行趋势联合三家企业共同在发布会上推出“华彩 2015”；

中国纤维馆在盛泽设立，为中国纤维提供了固定的展示窗口与全产业链的交流平台，是中国纤维流行趋势研究与发布活动的实体延展；

中国纤维流行趋势携手 6 家新型纤维企业进驻第 21 届中国国际家纺展，将应用于家纺专业领域的优质纤维展示给业界；

发行《中国纤维流行趋势报告 2015/2016》；

在中国国际纺织纱线（春夏）展览会上对入选中国纤维流行趋势的产品进行概念展展示，并开展上下游对接活动。

Theme: Innovation and Integration

Four chapters: "Fibers Technology", "Fibers Life", "Fibers Ecology", and "Fibers Defence".

Selected: Top Ten Fiber Varieties, 32 enterprises, 34 products

Shenghong Group wholly became the title sponsor of "China Fibers Fashion Trends"

Continued to work with Wu Xuekai, a well-known domestic "Golden Award" designer, to showcase the true charm of fiber products with the series of works "Free Motion of Innovation";

For the first time, China Fibers Fashion Trends and three enterprises jointly launched "China Color 2015" at the Release;

China Fibers Pavilion was set up in Jiangsu Shengze, providing China Fibers with a fixed display window and a communication platform for the entire industry chain, which was a physical extension of the research and release activities of China Fibers Fashion Trends;

China Fibers Fashion Trends and 6 new fiber enterprises jointly entered the 21st China International Home Textiles Exhibition to showcase high-quality fibers used in the professional field of home textiles to the industry;

Issued the China Fibers Fashion Trends Report 2015/2016;

At the China International Yarn Expo Spring, the concept exhibition of products selected for China Fibers Fashion Trends was displayed, and upstream and downstream connection activities were carried out.

2015





2016年

» 主题：颠覆与重塑

» 四大篇章：“纤·呵护”、“纤·绿色”、“纤·智汇”、“纤·雅幻”

» 入选：十大纤维品种，34 家企业，33 个产品

首次联袂时尚集团，邀请钟丽缇、保剑锋两位公益明星参加，增加媒体曝光度，采用舞蹈的形式展现纤维的柔美和力量；

开启“绿色纤维”LOGO 的权威发布，诚邀国际顶级时尚配饰设计师 Cherry René-Bazin 以绿色纤维为题材，设计艺术发饰；

发行《中国纤维流行趋势报告 2016/2017》；

在中国国际纺织纱线（春夏）展览会上对入选中国纤维流行趋势的产品进行概念展展示，并开展上下游对接活动。

Theme: SUBVERSION & REMODELING

Four chapters: "FIBERS CARE", "FIBERS GREEN", "FIBERS WISDOM", and "FIBERS ELEGANT"

Selected: Top Ten Fiber Varieties, 34 enterprises, 33 products

For the first time invited two charity celebrities, Christy Chung (Zhong Liti) and Bao Jianfeng to participate and increase media exposure together with a fashion group, and showed the softness and power of fibers in the form of dance;

Initiated the authoritative launch of the "Green Fibers" LOGO, and sincerely invited the international top fashion accessory designer Cherry René-Bazin to design artistic hair accessories with green fibers as the theme;

Issued the China Fibers Fashion Trends Report 2016/2017;

At the China International Yarn Expo Spring, the concept exhibition of products selected for China Fibers Fashion Trends was displayed, and upstream and downstream connection activities were carried out.

>> 主题：本源与生机

>> 两大篇章：“纤恋·舒馨亲和”、“纤动·绿色先锋”

>> 入选纤维：十大纤维品种，23 家企业，20 个产品；入围纤维：十大纤维品种，35 家企业，31 个产品

提出“纤维改变生活”；

首次增加入围纤维产品，使更多的优秀纤维融入到纤维流行趋势发布平台中；

邀请罗嘉良、陶红、鲍春来三位公益明星参加，广泛吸引大众关注，增加现代舞环节，用舞蹈的形式展现纤维之美；

发布会首次入驻纱线展馆，同期同馆举办，相得益彰；

首次开启中国纤维流行趋势—“最佳年度合作伙伴”、“优秀年度合作伙伴”颁奖活动，表彰与国内纤维企业在新型纤维开发与应用有深入合作的下游厂商；

首次引导化纤企业从幕后走到前台，9 家企业借助中国纤维流行趋势发布平台进行了新品发布会和发布秀，让化纤企业渐渐成为舞台的主角；

发行《中国纤维流行趋势报告 2017/2018》；

开设了多维创意静态展区和历史回顾墙，记载了五年来中国纤维流行趋势走过的精彩瞬间；

在中国国际纺织纱线（春夏）、（秋冬）展览会上对入选中国纤维流行趋势的产品进行概念展展示，并开展上下游对接活动。

Theme: Origin and Vitality

Two chapters: "Fiber Love•Comfort and Affinity", "Fiber Moving•Green Pioneer"

Selected fibers: Top Ten Fiber Varieties, 23 enterprises, 20 products; shortlisted fibers: Top Ten Fiber Varieties, 35 enterprises, 31 products

Put forward the forum "Fibers Change Life";

For the first time increased the shortlisted fiber products, bringing more excellent fibers to the China Fibers Fashion Trends Release platform;

Invited three charity celebrities, Luo Jialiang, Tao Hong, and Bao Chunlai, to participate and attract wide public attention; added the contemporary dance performance to show the beauty of fibers;

The Release entered the Yarn Exhibition Stadium for the first time and was held in the same stadium at the same time, which brought out the best in each other;

For the first time to start the China Fibers Fashion Trends—"Best Partner of the Year" and "Outstanding Partner of the Year" awards and commend downstream manufacturers that had in-depth cooperation with domestic fiber enterprises in the development and application of new fibers;

For the first time to guide chemical fibers enterprises—from behind the scenes to the front stage, nine enterprises took advantage of the China Fibers Fashion Trends Release platform to conduct new product launch conferences and shows, making chemical fibers enterprises gradually become the protagonists of the stage;

Issued the China Fibers Fashion Trends Report 2017/2018;

Set up a multi-dimensional creative static exhibition area and a historical review wall, recording the wonderful moments of China Fibers Fashion Trends in the past five years;

At the China International Yarn Expo Spring and Autumn, the concept exhibition of products selected for China Fibers Fashion Trends was displayed, and upstream and downstream connection activities were carried out.

2017





2018年

》主题：交融与飞越

》四大篇章：“纤·生态律动”、“纤·科技跃升”、“纤·匠心品牌”、“纤·智创工程”

》入选：十大纤维品种，36家企业，33个产品；入围：十大纤维品种，28家企业，28个产品

提出“纤维新视界”；

当年设定为发布小年，邀请了国际顶级高定品牌 TONY WARD、旅法中国独立设计师品牌 W by WenJun、中国原创设计品牌 7Crash 以服装为载体，通过动态走秀的形式，形象而生动地演绎纤维所体现的环保、匠心、科技、智创的核心价值；首次将国际顶尖的高定华服在中国的 T 台上盛绽；

首次从科技创新及绿色纤维两种维度表彰下游最佳年度合作伙伴；

7家参展化纤企业借助中国纤维流行趋势 2019/2020 发布平台举行新品发布会和发布秀，绽放魅力，成为吸睛之源；

发行《中国纤维流行趋势报告 2018/2019》；

在中国国际纺织纱线（春夏）、（秋冬）展览会上对入选中国纤维流行趋势的产品进行概念展示，并开展上下游对接活动。

Theme: Intermingling and Transcendence

Four chapters: Fiber•Ecological Rhythm, Fiber•Technological Upgrade, Fiber•Elaborate Brand, and Fiber•Intelligent Engineering

Selected: Ten Fiber Varieties, 36 enterprises, 33 products; shortlisted: Ten Fiber Varieties, 28 enterprises, 28 products

Put forward the forum "New Fiber New World";

The year was set as the minor year of launch. The international top haute couture brand TONY WARD, the Chinese independent designer brand W by WenJun, whose designer was residing in France, and the Chinese original design brand 7Crash were invited to use clothing as a carrier and vividly interpret the core values of environmental protection, ingenuity, technology, and intelligent creation embodied in fibers through the form of dynamic runway; for the first time to flourish the world's top haute couture Chinese costumes on the runway in China;

For the first time to commend the best downstream partner of the year from the two dimensions of technological innovation and green fibers;

Seven exhibiting chemical fibers enterprises took advantage of the 2019/2020 China Fibers Fashion Trends Release platform to conduct new product launch conferences and shows, blooming their charm and becoming a source of attraction;

Issued the China Fibers Fashion Trends 2018/2019;

At the China International Yarn Expo Spring and Autumn, the concept exhibition of products selected for China Fibers Fashion Trends was displayed, and upstream and downstream connection activities were carried out.

》主题：筑梦与制创

》四大篇章：“纤·绿意之道”、“纤·多元之本”、“纤·匠心之品”、“纤·卓越之魂”

》入选：十大纤维品种，36 家企业，33 个产品；入围：十大纤维品种，28 家企业，28 个产品

设定为发布小年，联合两次问鼎中国时装设计最高奖项“金顶奖”的著名时装设计师王玉涛，呈现了一场高规格、高水准的年度纤维时尚艺术大秀；

8 家参展化纤企业借助中国纤维流行趋势 2019/2020 发布会平台从幕后走到台前，举行新品发布会和发布秀，绽放魅力，成为吸睛之源；

构建“筑梦与制创”亮丽背景墙，成为纱线展馆流量打卡地；

发行《中国纤维流行趋势报告 2019/2020》；

在中国国际纺织纱线（春夏）、（秋冬）展览会上对入选中国纤维流行趋势的产品进行概念展览展示，并开展上下游对接活动。

Theme: Constructing the Dream

Four chapters: Fiber•THE GREEN WAY, Fiber•SOURCE OF MULTI-ELEMENT, Fiber•PRODUCTS OF INGENUITY, and Fiber•SOUL OF OUTSTANDING

Selected: Ten Fiber Varieties, 36 enterprises, 33 products; shortlisted: Ten Fiber Varieties, 28 enterprises, 28 products

It was set as the minor year of launch, and cooperated with the famous fashion designer Wang Yutao, who won the "Golden Award" twice, the highest award of China fashion design to present a high-standard and high-level annual fiber fashion art show;

Eight exhibiting chemical fibers enterprises took advantage of the 2019/2020 China Fibers Fashion Trends Release platform to walk from behind the scenes to the front stage, and conducted new product launch conferences and shows, blooming their charm and becoming a source of attraction;

Built a beautiful background wall of "Constructing the Dream" to become a check-in place for the Yarn Exhibition Stadium;

Issued the China Fibers Fashion Trends Report 2019/2020;

At the China International Yarn Expo Spring and Autumn, the concept exhibition of products selected for China Fibers Fashion Trends was displayed, and upstream and downstream connection activities were carried out.





2020年

》》 主题：守正与鼎新

》》 四大篇章：“纤·绿动”、“纤·巧思”、“纤·质尚”、“纤·鼎制”

》》 入选：九大纤维品种，39 家企业，35 个产品；入围：十大纤维品种，28 家企业，28 个产品
首次在“云”上华幕开启，全方位数字化的新发布模式，全网平台累计总观看人次达 3400 万。

同一时间段在线观看人数高达 70 多万；

再次携手“金顶奖”设计师武学凯，用民族化的设计传递着纤维的新鲜能量；

首次网上开展“纤维守护健康，微笑祝福世界”青少年口罩笑脸征集活动，并邀请明星参与；

搭建纤维新视界直播间，云发布共享平台，同时邀请明星在直播间参加发布会互动；

开发“中国纤维流行趋势”小程序，将九届入选入围纤维收录，并设置检索功能；

首次发布了中国纱线流行趋势，实现中国纤维流行趋势在产业链上的延伸；

首次尝试采用云对接的形式，将发布的纤维与下游企业进行对接；

发行《中国纤维流行趋势报告 2020/2021》；

在中国国际纺织纱线（秋冬）展览会及 2020 大湾区纱线展上对入选中国纤维流行趋势的产品进行概念展展示，并开展上下游对接活动。

Theme: Integrity & Innovation

Four chapters: Fiber•Green Motion, Fiber•Exquisite Creativity, Fiber•Stylish Design, and Fiber•Top Manufacture

Selected: Nine Fiber Varieties, 39 enterprises, 35 products; shortlisted: Ten Fiber Varieties, 28 enterprises, 28 products

It was the first time to hold the Release on the "cloud" network platform, a new all-round digital release model, and the total number of viewers on the entire network platform reached 34 million, with online viewers reaching more than 700,000 at the same time;

Once again joined hands with designer Wu Xuekai, the "Golden Award" winner, and conveyed the fresh energy of fibers with nationalized design;

For the first time to launch the youngsters' smile mask collection activity "Fibers protect health, smiles bless the world" online, and celebrities were invited to participate;

Built a live broadcast room of New Fiber New World, a cloud publishing and sharing platform, and invited celebrities to participate in the Release interaction in the live broadcast room;

Developed the "China Fibers Fashion Trends" Applet, collected the selected and shortlisted fibers from 2012 to 2020 and set up a search function;

For the first time to release China Yarns Fashion Trends, realizing the extension of China Fibers Fashion Trends in the industrial chain;

For the first time to attempt to adopt cloud connection to connect the released fibers with downstream enterprises;

Issues the China Fibers Fashion Trend Report 2020/2021;

At the China International Yarn Expo Autumn and the 2020 Greater Bay Area Yarn Exhibition, the concept exhibition of products selected for China Fibers Fashion Trends was displayed, and upstream and downstream connection activities were carried out.

>> 主题：激荡与领航

>> 四大篇章：“纤·溯绿源”、“纤·筑安心”、“纤·致风尚”、“纤·创未来”

>> 入选：十大纤维品种，33 家企业，31 个产品；入围：十大纤维品种，35 家企业，35 个产品

桐昆集团股份有限公司开始冠名“中国纤维流行趋势”

精彩继续

Theme: Leading the innovation

Four chapters: Fiber• Tracing Back to Green Source, Fiber•Building Consumer Confidence, Fiber•Leading the Trend, and Fiber•Creating the Future

Selected: Top Ten Fiber Varieties, 33 enterprises, 31 products; shortlisted: Top Ten Fiber Varieties, 35 enterprises, 35 products

TongKun Group Co., Ltd becomes the title sponsor of "China Fibers Fashion Trends".

To be continued...

2021 年

入选纤维

入选纤维	纤维名称	企业	品牌
纤·溯绿源			
生物基化学纤维	聚乳酸纤维	安徽丰原生物纤维股份有限公司	丰原绒
	卫材专用莱赛尔纤维	保定天鹅新型纤维制造有限公司	元丝
	竹莱赛尔纤维	中纺院绿色纤维股份公司	绿纤
	细旦生物基聚酰胺 56 纤维	上海凯赛生物技术股份有限公司	泰纶
循环再利用化学纤维	高透气性循环再利用聚酯纤维	桐昆集团股份有限公司	桐昆
	弹性循环再利用聚酯纤维	浙江佳人新材料有限公司	Green Circle
	循环再利用聚酰胺 6 纤维	恒天中纤纺化无锡有限公司	中纤
原液着色化学纤维	原液着色细旦超黑聚酯纤维	桐昆集团浙江恒盛化纤有限公司	桐昆
	原液着色循环再利用空变聚酯纤维	福建省百川资源再生科技股份有限公司	百川
	原液着色高耐久晒户外专用聚酯纤维	浙江恒远化纤集团有限公司	恒运
	原液着色细旦聚丙烯纤维	广东蒙泰高新纤维股份有限公司	蒙泰丝
纤·筑安心			
健康防护纤维	锌系抑菌聚酯纤维	上海德福伦化纤有限公司	锌力康
	银离子抑菌氨纶	连云港杜钟新奥神氨纶有限公司	奥神
	银 / 锌复合抑菌聚酰胺 6 纤维	广东新会美达锦纶股份有限公司	达洁纶
	PTFE 微纳纤维膜	浙江理工大学	禾海
安全防护纤维	阻燃抗熔滴聚酯纤维	四川东材科技集团股份有限公司 苏州联物特种纤维有限公司	葛伦森
	一步法高强聚酰胺 6 纤维	长乐恒申合纤科技有限公司	恒申
	抗老化阻燃循环再利用聚酯纤维	厦门翔鹭化纤股份有限公司	鹭安丝
可追溯性纤维	可追溯性再生纤维素纤维	唐山三友集团兴达化纤有限公司	唐丝
纤·致风尚			
弹性纤维	异组分异收缩全消光聚酯纤维	盛虹集团·国望高科	舒棉弹
	凉感 PET/PTT 双组份复合纤维	桐昆集团股份有限公司	桐昆
	熔体直纺原液着色 PBT 纤维	无锡市兴盛新材料科技有限公司	海洋天丝纤维
	低温易粘合氨纶	华峰化学股份有限公司	千禧
仿真纤维	全消光聚酯仿棉纤维	新凤鸣集团股份有限公司	凤逸棉
	仿皮草用异形循环再利用聚酯纤维	苏州龙杰特种纤维股份有限公司	龙杰
	仿马毛聚丙烯腈纤维	吉林奇峰化纤股份有限公司	马海腈纶
	车内饰专用原液着色仿毛 PBT/PET 复合纤维	旷达纤维科技有限公司	旷达
纤·创未来			
产业用高强纤维	原液着色黑色高强聚酯工业丝	浙江尤夫高新纤维股份有限公司	尤夫
	细旦高强高模聚丙烯醇纤维	安徽皖维集团有限责任公司	皖维
高性能碳纤维	超高强度碳纤维	中复神鹰碳纤维有限责任公司	神鹰
		威海拓展纤维有限公司	拓展
	中模高强碳纤维预浸料	江苏恒神股份有限公司	恒神

Tongkun · China Fibers Fashion Trends 2021/2022 Issue Products

Category	Product Name	Company	Brand
Fiber · Tracing Back to Green Source			
Bio-based Chemical Fiber	Polylactic Acid Fiber	Anhui BBFA Biofibre Co., Ltd.	BBFA GROUP
	Lyocell Fiber for Sanitary Materials	Baoding Swan Fiber Co., Ltd.	ORICELL
	Bamboo Lyocell Fiber	China Textile Academy Green Fibre Co., Ltd.	GRECELL
	Fine-denier Bio-based Polyamide-56 Fiber	Cathty Biotech Inc.	TERRYL
Regenerated Chemical Fiber	High Permeability Regenerated PET Fiber	Tongkun Group Co., Ltd.	GOODEN COCK
	Elasticity Regenerated PET Fiber	Zhejiang Jiaren New Materials Co., Ltd.	Green Circle
	Regenerated Polyamide-6 Fiber	CHTC Sionfiber Wuxi Co., Ltd.	Sinofiber
DopeDyed Chemical Fiber	Fine-Denier and Ultra Black Dope-Dyed PET Fiber	Tongkun Group Zhejiang Hengsheng Chemical Fiber Co., Ltd.	GOODEN COCK
	Dope-Dyed Regenerated Air Interlaced PET Fiber	Fujian Baichuan Resources Recycling Science & Technology Co., Ltd.	Baichuan
	Dope-Dyed High UV-Resistant PET Fiber for Outdoors	Zhejiang Hengyuan Chemical Fiber Group Co., Ltd.	Hengyun
	Dope Dyed Fine-denier PP Fiber	Guangdong Modern High-tech Fiber Co., Ltd.	Moderns
Fiber · Building Consumer Confidence			
Health Protection Fiber	Zinc Antibacterial Polyester Fiber	Shanghai Different Chemical Fiber Co., Ltd.	Zinycon
	Silver Ion Antibacterial Spandex	LDZ New Aoshen Spandex Co., Ltd.	AOSHEN
	Silver Zinc Composite Antimicrobial Polyamide-6 Fiber	Guangdong Xinhui Meida Nylon Co., Ltd.	DACLEANON
	PTFE Micro-Nano Fiber Membrane	Zhejiang Sci-Tech University	Hehai
Safety Protection Fiber	Flame Retardant and Anti-Dripping Polyester Fiber	Sichuan EM Technology Co., Ltd. Suzhou Lianchang Special Fiber Co., Ltd.	EMT
	One-step Method High Strength Polyamide-6 Fiber	Changle Hengshen Hexian Technology Co., Ltd.	HSCC
	Anti-Aging and Anti-Flame Regenerated PET Fiber	Xiamen Xianglu Chemical Fiber Co., Ltd.	Lugard
Traceable Fiber	Traceable Regenerated Cellulose Fiber	Tangshan Sanyou Group Xingda Chemical Fiber Co., Ltd.	TangCell
Fiber · Leading the Trend			
Elastic Fiber	Heteromorphosis Full-Dull PET Fiber with Foreign Constituents	Shenghong Group·Guowang High-Tech	SUMITAN
	Cool PET/PTT Bicomponent Composite Fiber	Tongkun Group Co., Ltd.	GOODENCOCK
	Melt Direct Spinning Dope Dyed PBT Fiber	Wuxi Xingsheng New Material Technology Co., Ltd.	Oceanles
	Low-Temperature Adhesive Spandex	Huafon Chemical Co., Ltd.	QIANXI
Simulated Fiber	Full-Dull Cotton-like PET Fiber	Xin Feng Ming Group Co., Ltd.	Phoenixcotton
	Fur-like Regenerated Special-shaped PET Fiber	SuZhou LooJee Special Fiber Co., Ltd.	LooGee
	Mohair-like Polyacrylonitrile Fiber	Jilin Qifeng Chemical Fiber Co., Ltd.	MohairAcrylic
	Dope-Dyed Wool-like PBT/PET Fiber Composite for Car Interiors	Kuangda Fiber Technology Co., Ltd.	KDTECH
Fiber · Creating the Future			
High Strength Technical Fiber	Dope-Dyed Black High Strength Polyester Industrial Yarn	Zhejiang Unifull Industrial Fibre Co., Ltd.	UNIFULL
	High Strength and High Modulus Fine Denier Polyvinyl Alcohol Fiber	Anhui Wanwei Group Co., Ltd.	WANWEI
High-performance Carbon Fiber	Ultra High Strength Carbon Fiber	Zhongfu Shenying Carbon Fiber Co., Ltd.	SY
		Weihai Tuozhan Fiber Co., Ltd.	TZ
	Middle Mould and High Strength Carbon Fiber Prepreg	Jiangsu Hengshen Co., Ltd.	HS

入围纤维

品类	入围纤维	企业
安全防护纤维	白色抗静电聚酯纤维	江苏中杰澳新材料有限公司
	碳黑导电聚酯胺 6 纤维	海宁泰尔欣新材料有限公司
弹性纤维	低温定型熔纺氨纶	河北邦泰氨纶科技有限公司
	瑜伽服专用高伸低模氨纶	杭州邦联氨纶股份有限公司
定制化纤维	单组份双捻抗皱聚酯纤维	桐昆集团浙江恒通化纤有限公司
	抗起球喷织磨毛布专用聚酯纤维	桐昆集团浙江恒腾差别化纤维有限公司
	细旦多孔灯芯绒专用弹性聚酯纤维	桐乡市恒基差别化纤维有限公司
仿真纤维	消光仿棉聚酯胺 6 混纤	福建永荣锦江股份有限公司
	仿棉弹性双组分混纤	淮安三联新材料有限公司
功能复合纤维	遮光用聚酯复合纤维	浙江恒优化纤有限公司
	原液着色功能复合聚酯胺 6 纤维	浙江金旗新材料科技有限公司
	石墨烯改性异形聚酯胺 6 纤维	常州恒利宝纳米新材料科技有限公司
	石墨烯原位聚合改性细旦聚酯胺 6 纤维	杭州高烯科技有限公司
	太极石改性高强高模再生纤维素纤维	太极石股份有限公司
	非六方氮化硼（h-BN）改性再生纤维素纤维	南通强生石墨烯科技有限公司
健康防护纤维	艾草改性聚酯纤维	青岛百草新材料股份有限公司
	超低纤度锌系抑菌聚酯胺 6 纤维	江苏文凤化纤集团有限公司
	锌系抑菌聚酯胺 6 纤维	博富科技股份有限公司
	胶原蛋白改性聚酯胺 6 纤维	长乐恒申合纤科技有限公司
	铜系抑菌竹莱赛尔纤维	上海里奥纤维企业发展有限公司
	青蒿素改性再生纤维素纤维	新乡化纤股份有限公司
	消臭抑菌再生纤维素纤维	上海正家牛奶丝科技有限公司
	PE（PHBV）/PP 双组份皮芯复合纤维	南京禾素时代抑菌材料科技有限公司
生物基化学纤维	抑菌莱赛尔纤维	山东金英利新材料科技股份有限公司
	三维卷曲 PLA/PTT 双组份高弹性纤维	苏州金泉新材料股份有限公司
舒感纤维	异组分规格异收缩棉感聚酯纤维	徐州斯尔克纤维科技股份有限公司
	一步法异形涤锦复合纤维	凯泰特种纤维科技有限公司
	低熔点聚酯胺 6 纤维	福建漳平协龙高新化纤有限公司
	小麦蛋白改性再生纤维素纤维	杭州优标科技有限公司
	超高收缩聚丙烯腈纤维	中国石油大庆石化公司腈纶厂
	一步法易染阳涤包覆纱	桐昆集团浙江恒盛化纤有限公司
循环再利用化学纤维	循环再利用再生纤维素纤维	赛得利集团
原液着色化学纤维	原液着色超黑聚酯纤维	浙江华欣新材料股份有限公司
	原液着色高蓬松聚酯纤维	桐乡市中洲化纤有限责任公司
	原液着色异形截面混纤 BCF	江苏凯普特新材料科技有限公司

Tongkun · China Fibers Fashion Trends 2021/2022 Recommended Products

Cateoory	Recommend Products	Company
Safety Protection Fiber	White antistatic polyester fiber	Jiangsu ZJA New Material Co., Ltd.
	Conductive carbon black polyamide 6 fiber	Haining TAIERXIN New Materials Co., Ltd.
Elastic Fiber	Low-temperature setting melt-spun spandex	Hebei Bangtai Spandex Technology Co., Ltd.
	High-stretch low-modulus spandex for yoga clothes	Hangzhou Banglian Spandex Co., Ltd.
Customized Fiber	Single-component double-twist wrinkle-resistant polyester fiber	Tongkun Group Zhejiang Hengtong Chemical Fiber Co., Ltd.
	Pilling-resistant jet-woven polyester fiber for brushed cloth	Tongkun Group Zhejiang Hengtong Differential Fiber Co., Ltd.
	Elastic fine-denier porous polyester fiber for corduroy	Tongxiang Hengji Differential Fiber Co., Ltd.
Simulated Fiber	Dull cotton-like polyamide 6 blend fiber	Fujian Yongrong Jinjiang Co., Ltd.
	Cotton-like elastic bicomponent blended fiber	Huai'an Sanlian New Material Co., Ltd.
Functional Composite Fiber	Lightproof composite polyester fiber	Zhejiang Heng You Fiber Co., Ltd.*
	Dope dyed functional composite polyamide 6 fiber	Zhejiang JinQi New Material Technology Co., Ltd.
	Graphene modified special-shaped polyamide 6 fiber	Changzhou Highbery Nano New Material Technology Co., Ltd.
	Graphene in-situ polymerized modified fine-denier polyamide 6 fiber	Hangzhou Gaoxi Tech Co., Ltd.
	Taichi Stone modified high-strength high-modulus regenerated cellulose fiber	Taichi Stone Co., Ltd.
	Non-hexagonal boron nitride (h-BN) modified regenerated cellulose fiber	Nantong QS Group
Health Protection Fiber	Wormwood modified polyester fiber	Qingdao Byherb New Materials Co., Ltd.
	Ultra-low denier zinc-based bacteriostatic polyamide 6 fiber	Jiangsu Wenfeng Chemical Fiber Group Co., Ltd.
	Zinc-based bacteriostatic polyamide 6 fiber	Bofu Technology Co., Ltd.
	Collagen modified polyamide 6 fiber	Changle Hengshen Synthetic Fiber Technology Co., Ltd.
	Copper-based bacteriostatic bamboo lyocell fiber	Shanghai Lyocell Fiber Enterprise Development Co., Ltd.
	Artemisinin modified regenerated cellulose fiber	Xinxiang Chemical Fiber Co., Ltd.
	Deodorizing and bacteriostatic regenerated cellulose fiber	Shanghai Zhengjia Milkfiber Sci & Tech co., Ltd.
	PE (PHBV)/PP Bicomponent Skin Core Composite Fiber	Nanjing Bioserica Era Bacteriostatic Material Technology Co., Ltd.
Bio-based Chemical Fiber	Bacteriostatic Lyocell Fiber	Shandong Jinyingli New Material Technology Co., Ltd.
	Three-dimensional crimped PLA/PTT bicomponent high elastic fiber	Suzhou Jinquan New Materials Co., Ltd.
Comfortable Fiber	Different-component, different-specification, different-shrinkage cotton-like polyester fibers	Xuzhou Silk Fiber Technology Co., Ltd.
	One-step special-shaped polyester nylon composite fiber	Kaitai Special Fiber Technology Co., Ltd.
	Polyamide 6 fiber with a low melting point	Fujian Zhangping Xielong High-tech Chemical Fiber Co., Ltd.
	Wheat protein modified regenerated cellulose fiber	Hangzhou Youbiao Technology Co., Ltd.
	Ultra-high shrinkage polyacrylonitrile fiber	Acrylic Fiber Plant of PetroChina Daqing Petrochemical Company
	One-step easily dyed cationic polyester covered yarn	Tongkun Group Zhejiang Hengsheng Chemical Fiber Co., Ltd.
Recycled Chemical Fiber	Recycling regenerated cellulose fiber	Sateri Group
Dope Dyed Chemical Fiber	Dope dyed ultra-black polyester fiber	Zhejiang Huaxin New Materials Co., Ltd.
	Dope dyed high-fluffiness polyester fiber	Tongxiang Zhongzhou Chemical Fiber Co., Ltd.
	BCF dope dyed special-shaped cross-section blended fiber	Jiangsu Kaipute New Material Technology Co., Ltd.

入选及入围纤维下游应用推荐表

服装用纺织品

应用领域	推荐纤维品种	企业
休闲服 / 吸湿透气 / / 柔软亲肤 /	聚乳酸纤维	安徽丰原生物纤维股份有限公司
	循环再利用聚酰胺 6 纤维	恒天中纤纺化无锡有限公司
	原液着色循环再利用空变聚酯纤维	福建省百川资源再生科技股份有限公司
	异组分异收缩全消光聚酯纤维	盛虹集团·国望高科
	凉感 PET/PTT 双组份复合纤维	桐昆集团股份有限公司
	弹性循环再利用聚酯纤维	浙江佳人新材料有限公司
	消光仿棉聚酰胺 6 混纤	福建永荣锦江股份有限公司
	仿棉弹性双组分混纤	淮安三联新材料有限公司
	太极石改性高强高模再生纤维素纤维	太极石股份有限公司
	消臭抑菌再生纤维素纤维	上海正家牛奶丝科技有限公司
	抑菌莱赛尔纤维	山东金英利新材料科技股份有限公司
	异组分异规格异收缩棉感聚酯纤维	徐州斯尔克纤维科技股份有限公司
	一步法易染阳涤包覆纱	桐昆集团浙江恒盛化纤有限公司
	循环再利用再生纤维素纤维	赛得利集团
运动服 / 轻柔 / / 吸湿 / / 有弹性 /	聚乳酸纤维	安徽丰原生物纤维股份有限公司
	细旦生物基聚酰胺 56 纤维	上海凯赛生物技术股份有限公司
	高透气性循环再利用聚酯纤维	桐昆集团股份有限公司
	循环再利用聚酰胺 6 纤维	恒天中纤纺化无锡有限公司
	原液着色细旦超黑聚酯纤维	桐昆集团浙江恒盛化纤有限公司
	原液着色循环再利用空变聚酯纤维	福建省百川资源再生科技股份有限公司
	凉感 PET/PTT 双组份复合纤维	桐昆集团股份有限公司
	熔体直纺原液着色 PBT 纤维	无锡市兴盛新材料科技有限公司
	低温易粘合氨纶	华峰化学股份有限公司
	弹性循环再利用聚酯纤维	浙江佳人新材料有限公司
	低温定型熔纺氨纶	河北邦泰氨纶科技有限公司
	消光仿棉聚酰胺 6 混纤	福建永荣锦江股份有限公司
	仿棉弹性双组分混纤	淮安三联新材料有限公司
	超低纤度锌系抑菌聚酰胺 6 纤维	江苏文凤化纤集团有限公司
	胶原蛋白改性聚酰胺 6 纤维	长乐恒申合纤科技有限公司
	异组分异规格异收缩棉感聚酯纤维	徐州斯尔克纤维科技股份有限公司
	瑜伽服专用高伸低模氨纶	杭州邦联氨纶股份有限公司
	一步法异形涤锦复合纤维	凯泰特种纤维科技有限公司
安全防护服 / 阻燃 / / 耐磨 / / 抗静电 /	白色抗静电聚酯纤维	江苏中杰澳新材料有限公司
	阻燃抗熔滴聚酯纤维	四川东材科技集团股份有限公司
		苏州联畅特种纤维有限公司
	一步法高强聚酰胺 6 纤维	长乐恒申合纤科技有限公司
	碳黑导电聚酰胺 6 纤维	海宁泰尔欣新材料有限公司

Tongkun · China Fibers Fashion Trends 2021/2022

Recommended list of downstream applications

CLOTHING TEXTILES

Application field	Recommended fiber	Company
Casual wear /hygroscopic/ /breathable/ /soft/ /skin-friendly/	Polylactic acid fiber	Anhui BBKA Biofibre Co., Ltd.
	Recycled polyamide 6 fiber	CHTC Sinofiber Wuxi Co., Ltd.
	Dope-dyeing recycled air textured polyester fiber	Fujian Baichuan Resources Recycling Science & Technology Co., Ltd.
	Heterofil component, differential shrinkage and full dull polyester fiber	Shenghong Group•Jiangsu Guowanggaoke Fiber Co., Ltd.
	Cooling PET/PTT bicomponent composite fiber	TongKun Group Co., Ltd.
	Elastic recycled polyester fiber	Zhejiang Jiaren New Materials Co., Ltd.
	Dull and cotton-like polyamide 6 synthetic fabric	Fujian Eversun Jinjiang Co., Ltd.
	Cotton-like and elastic bicomponent synthetic fabric	Huai'an Sanlian New Material Co., Ltd.
	Tai Chi stone modified high-strength and high-modulus regenerated cellulose fiber	Tai Chi Stone Co., Ltd.
	Deodorant and bacteriostatic regenerated cellulose fiber	Shanghai Zhengjia Milkfiber Sci & Tech Co., Ltd.
	Bacteriostatic Lyocell	Shandong Jinyingli New Material Technology Co., Ltd.
	Heterofil component, differential specification, and differential shrinkage cotton-touch polyester fiber	Xuzhou Silk Fiber Technology Co., Ltd.
	One-step easy-dyeing cationic-treated covered yarn	TongKun Group Zhejiang Hengsheng Chemical Fiber Co., Ltd.
Sports wear /soft/ /hygroscopic/ /elastic/	Recycled regenerated cellulose fiber	Sateri Group
	Polylactic acid fiber	Anhui BBKA Biofibre Co., Ltd.
	Fine-denier bio-based polyamide 56 fiber	Shanghai Cathay Biotech Inc.
	Highly breathable recycled polyester fiber	TongKun Group Co., Ltd
	Recycled polyamide 6 fiber	CHTC Sinofiber Wuxi Co., Ltd.
	Dope-dyeing fine-denier super-black polyester fiber	TongKun Group Zhejiang Hengsheng Chemical Fiber Co., Ltd.
	Dope-dyeing recycled air textured polyester fiber	Fujian Baichuan Resources Recycling Science & Technology Co., Ltd.
	Cooling PET/PTT bicomponent composite fiber	TongKun Group Co., Ltd
	Melt directly spinning and dope-dyeing PBT fiber	Wuxi Xingsheng New Material Technology Co., Ltd.
	Low-temperature easy-bonding spandex	Huafon Chemical Co., Ltd.
	Elastic recycled polyester fiber	Zhejiang Jiaren New Materials Co., Ltd.
	Low-temperature setting melt-spun spandex	Hebei Bangtai Spandex Co., Ltd.
	Dull and cotton-like polyamide 6 synthetic fabric	Fujian Eversun Jinjiang Co., Ltd.
	Cotton-like and elastic bicomponent synthetic fabric	Huai'an Sanlian New Material Co., Ltd.
	Ultra-low denier zinc bacteriostatic polyamide 6 fiber	Jiangsu Wenfeng Chemical Fiber Group Co., Ltd.
	Collagen-modified polyamide 6 fiber	Changle Highsun Synthetic Fiber Technologies Co., Ltd.
	Heterofil component, differential specification, and differential shrinkage cotton-touch polyester fiber	Xuzhou Silk Fiber Technology Co., Ltd.
	High-elongation low-module spandex for yoga clothes	Hangzhou Banglian Spandex Co., Ltd.
	One-step profiled polyester-nylon complex fiber	CTA High-tech Fiber Co., Ltd.
Safety protective clothing /flame-retardant/ /wear-resistant/ /anti-static/	White anti-static polyester fiber	Jiangsu ZJA New Material Co., Ltd.
	Flame-retardant anti-dripping polyester fiber	Sichuan EM Technology Co., Ltd.
		Suzhou Lianchang Special Fiber Co., Ltd.
	One-step high-strength polyamide 6 fiber	Changle Highsun Synthetic Fiber Technologies Co., Ltd.
	Carbon black conductive polyamide 6 fiber	Haining TAIERXIN New Materials Co., Ltd.

入选及入围纤维下游应用推荐表

服装用纺织品

应用领域	推荐纤维品种	企业
家居服 / 手感柔软 / / 亲肤 /	聚乳酸纤维	安徽丰原生物纤维股份有限公司
	竹莱赛尔纤维	中纺院绿色纤维股份公司
	细旦生物基聚酰胺 56 纤维	上海凯赛生物技术股份有限公司
	原液着色循环再利用空变聚酯纤维	福建省百川资源再生科技股份有限公司
	锌系抑菌聚酯纤维	上海德福伦化纤有限公司
	凉感 PET/PTT 双组份复合纤维	桐昆集团股份有限公司
	全消光聚酯仿棉纤维	新凤鸣集团股份有限公司
	仿皮草用异形循环再利用聚酯纤维	苏州龙杰特种纤维股份有限公司
西装 / 抗皱 /	白色抗静电聚酯纤维	江苏中杰澳新材料有限公司
	单组份双捻抗皱聚酯纤维	桐昆集团浙江恒通化纤有限公司
工装 / 抗静电 / / 耐磨 /	循环再利用聚酰胺 6 纤维	恒天中纤纺化无锡有限公司
	白色抗静电聚酯纤维	江苏中杰澳新材料有限公司
	阻燃抗熔滴聚酯纤维	四川东材科技集团股份有限公司
		苏州联畅特种纤维有限公司
	抗老化阻燃循环再利用聚酯纤维	厦门翔鹭化纤股份有限公司
	碳黑导电聚酰胺 6 纤维	海宁泰尔欣新材料有限公司
毛衣 / 抗静电 / / 蓬松 /	循环再利用聚酰胺 6 纤维	恒天中纤纺化无锡有限公司
	白色抗静电聚酯纤维	江苏中杰澳新材料有限公司
	仿马海毛聚丙烯腈纤维	吉林奇峰化纤股份有限公司
贴身内衣 / 柔软 / / 亲肤 / / 抑菌 /	聚乳酸纤维	安徽丰原生物纤维股份有限公司
	卫材专用莱赛尔纤维	中纺院绿色纤维股份公司
	细旦生物基聚酰胺 56 纤维	上海凯赛生物技术股份有限公司
	锌系抑菌聚酯纤维	上海德福伦化纤有限公司
	银离子抑菌氨纶	连云港杜钟新奥神氨纶有限公司
	凉感 PET/PTT 双组份复合纤维	桐昆集团股份有限公司
	低温定型熔纺氨纶	河北邦泰氨纶科技有限公司
	原液着色功能复合聚酰胺 6 纤维	浙江金旗新材料科技有限公司
	石墨烯原位聚合改性细旦聚酰胺 6 纤维	杭州高烯科技有限公司
	太极石改性高强高模再生纤维素纤维	太极石股份有限公司
	锌系抑菌聚酰胺 6 纤维	博富科技股份有限公司
	胶原蛋白改性聚酰胺 6 纤维	长乐恒申合纤科技有限公司
	铜系抑菌竹莱赛尔纤维	上海里奥纤维企业发展有限公司
	青蒿素改性再生纤维素纤维	新乡化纤股份有限公司
	消臭抑菌再生纤维素纤维	上海正家牛奶丝科技有限公司
	抑菌莱赛尔纤维	山东金英利新材料科技股份有限公司
	小麦蛋白改性再生纤维素纤维	杭州优标科技有限公司
蕾丝 / 柔软 / / 亲肤 /	超低纤度锌系抑菌聚酰胺 6 纤维	江苏文凤化纤集团有限公司
	低熔点聚酰胺 6 纤维	福建漳平协龙高新化纤有限公司

Tongkun · China Fibers Fashion Trends 2021/2022

Recommended list of downstream applications

CLOTHING TEXTILES

Application field	Recommended fiber	Company
Home wear /soft/ /skin-friendly/	Polylactic acid fiber	Anhui BBKA Biofibre Co., Ltd.
	Bamboo lyocell fiber	Greccell Co., Ltd.
	Fine-denier bio-based polyamide 56 fiber	Shanghai Cathay Biotech Inc.
	Dope-dyeing recycled air textured polyester fiber	Fujian Baichuan Resources Recycling Science & Technology Co., Ltd.
	Zinc bacteriostatic polyester fiber	Shanghai Different Chemical Fiber Co., Ltd.
	Cooling PET/PTT bicomponent composite fiber	TongKun Group Co., Ltd
	Full-dull polyester cotton-like fiber	Xin Feng Ming Group Co., Ltd.
	Profiled recycled polyester fiber for fake fur	Suzhou Longjie Special Fiber Co., Ltd.
Business suit /crease-resistant/	White anti-static polyester fiber	Jiangsu ZJA New Material Co., Ltd.
	Mono-component double-twist crease-resistant polyester fiber	TongKun Group Zhejiang Hengtong Chemical Fiber Co., Ltd.
Workwear /anti-static/ /wear-resistant/	Recycled polyamide 6 fiber	CHTC Sinofiber Wuxi Co., Ltd.
	White anti-static polyester fiber	Jiangsu ZJA New Material Co., Ltd.
	Flame-retardant anti-dripping polyester fiber	Sichuan EM Technology Co., Ltd.
		Suzhou Lianchang Special Fiber Co., Ltd.
	Anti-aging flame-retardant recycled polyester fiber	Xiamen XiangLu Chemical Fiber Company Limited
Sweater /anti-static/ /fluffy/	Carbon black conductive polyamide 6 fiber	Haining TAIERXIN New Materials Co., Ltd.
	Recycled polyamide 6 fiber	CHTC Sinofiber Wuxi Co., Ltd.
	White anti-static polyester fiber	Jiangsu ZJA New Material Co., Ltd.
Underwear /soft/ /skin-friendly/ /bacteriostatic/	Mohair-like polyacrylonitrile fiber	Jilin Qifeng Chemical Fiber Co., Ltd.
	Polylactic acid fiber	Anhui BBKA Biofibre Co., Ltd.
	Bamboo lyocell fiber	Greccell Co., Ltd.
	Fine-denier bio-based polyamide 56 fiber	Shanghai Cathay Biotech Inc.
	Zinc bacteriostatic polyester fiber	Shanghai Different Chemical Fiber Co., Ltd.
	Silver ion bacteriostatic spandex	Lianyungang Duzhong New Aoshen Spandex Co., Ltd.
	Cooling PET/PTT bicomponent composite fiber	TongKun Group Co., Ltd
	Low-temperature setting melt-spun spandex	Hebei Bangtai Spandex Co., Ltd.
	Dope-dyeing compound function polyamide 6 fiber	Zhejiang JinQI New Material Science and Technology Co., Ltd.
	Graphene in-situ polymerization modified fine-denier polyamide 6 fiber	Hangzhou GaoxiTech Co., Ltd.
	Tai Chi stone modified high-strength and high-modulus regenerated cellulose fiber	Tai Chi Stone Co., Ltd.
	Zinc bacteriostatic polyamide 6 fiber	Bilic-Fortune Technology Co., Ltd.
	Collagen-modified polyamide 6 fiber	Changle Highsun Synthetic Fiber Technologies Co., Ltd.
	Copper bacteriostatic bamboo lyocell fiber	Shanghai Lyocell Fibre Enterprise Development Co., Ltd.
	Artemisinin modified regenerated cellulose fiber	Xinxiang Chemical Fiber Co., Ltd.
	Deodorant and bacteriostatic regenerated cellulose fiber	Shanghai Zhengjia Milkfiber Sci & Tech Co., Ltd.
	Bacteriostatic Lyocell	Shandong Jinyingli New Material Technology Co., Ltd.
	Wheat protein modified regenerated cellulose fiber	Hangzhou Youbiao Technology Co., Ltd.
Lace /soft/ /skin-friendly/	Ultra-low denier zinc bacteriostatic polyamide 6 fiber	Jiangsu Wenfeng Chemical Fiber Group Co., Ltd.
	Low-melting-point polyamide 6 fiber	Fujian Zhangping Xielong High-Tech Chemical Fiber Co., Ltd.

入选及入围纤维下游应用推荐表

服装用纺织品

应用领域	推荐纤维品种	企业
袜子 / 柔软弹性 / / 抑菌 /	聚乳酸纤维	安徽丰原生物纤维股份有限公司
	银离子抑菌氨纶	连云港杜钟新奥神氨纶有限公司
	低温易粘合氨纶	华峰化学股份有限公司
	石墨烯改性异形聚酰胺 6 纤维	常州恒利宝纳米新材料科技有限公司
	石墨烯原位聚合改性细旦聚酰胺 6 纤维	杭州高烯科技有限公司
	超低纤度锌系抑菌聚酰胺 6 纤维	江苏文凤化纤集团有限公司
	锌系抑菌聚酰胺 6 纤维	博富科技股份有限公司
	青蒿素改性再生纤维素纤维	新乡化纤股份有限公司
	PE (PHBV) /PP 双组份皮芯复合纤维	南京禾素时代抑菌材料科技有限公司
鞋材 / 耐磨 / / 透气 /	高透气性循环再利用聚酯纤维	桐昆集团股份有限公司
	原液着色细旦超黑聚酯纤维	桐昆集团浙江恒盛化纤有限公司
	一步法高强聚酰胺 6 纤维	长乐恒申合纤科技有限公司
	仿皮草用异形循环再利用聚酯纤维	苏州龙杰特种纤维股份有限公司
	原液着色超黑聚酯纤维	浙江华欣新材料股份有限公司
箱包 / 耐磨 / / 耐晒 /	原液着色细旦超黑聚酯纤维	桐昆集团浙江恒盛化纤有限公司
	原液着色高耐日晒户外专用聚酯纤维	浙江恒远化纤集团有限公司
	原液着色超黑聚酯纤维	浙江华欣新材料股份有限公司
泳衣 / 弹性 / / 色彩丰富 /	原液着色细旦超黑聚酯纤维	桐昆集团浙江恒盛化纤有限公司
	熔体直纺原液着色 PBT 纤维	无锡市兴盛新材料科技有限公司
衬衣 / 亲肤抑菌 / / 抗皱 /	卫材专用莱赛尔纤维	保定天鹅新型纤维制造有限公司
	竹莱赛尔纤维	中纺院绿色纤维股份公司
	全消光聚酯仿棉纤维	新凤鸣集团股份有限公司
	石墨烯改性异形聚酰胺 6 纤维	常州恒利宝纳米新材料科技有限公司
	太极石改性高强高模再生纤维素纤维	太极石股份有限公司
	抑菌莱赛尔纤维	山东金英利新材料科技股份有限公司
	异组分异规格异收缩棉感聚酯纤维	徐州斯尔克纤维科技股份有限公司
服装里料 / 柔软 / 耐磨 / / 抗起球 /	白色抗静电聚酯纤维	江苏中杰澳新材料有限公司
	抗起球喷织磨毛布专用聚酯纤维	桐昆集团浙江恒腾差别化纤维有限公司
羽绒服 / 保暖 / / 轻柔 /	细旦生物基聚酰胺 56 纤维	上海凯赛生物技术股份有限公司
	异组分异规格异收缩棉感聚酯纤维	徐州斯尔克纤维科技股份有限公司
高端成衣 / 柔软 / / 挺括 / / 弹性 /	细旦生物基聚酰胺 56 纤维	上海凯赛生物技术股份有限公司
	仿皮草用异形循环再利用聚酯纤维	苏州龙杰特种纤维股份有限公司
	细旦多孔灯芯绒专用弹性聚酯纤维	桐乡市恒基差别化纤维有限公司
	超高收缩聚丙烯腈纤维	中国石油大庆石化公司腈纶厂
帽子 / 色彩鲜艳 / / 保暖 /	原液着色细旦超黑聚酯纤维	桐昆集团浙江恒盛化纤有限公司
	仿马海毛聚丙烯腈纤维	吉林奇峰化纤股份有限公司
	原液着色超黑聚酯纤维	浙江华欣新材料股份有限公司
专业运动服 / 柔软 / / 有弹性 /	熔体直纺原液着色 PBT 纤维	无锡市兴盛新材料科技有限公司
	瑜伽服专用高伸低模氨纶	杭州邦联氨纶股份有限公司
	消光仿棉聚酰胺 6 混纤	福建永荣锦江股份有限公司
	一步法易染阳涤包覆纱	桐昆集团浙江恒盛化纤有限公司

Tongkun · China Fibers Fashion Trends 2021/2022

Recommended list of downstream applications

CLOTHING TEXTILES

Application field	Recommended fiber	Company
Socks /soft/ /elastic/ /bacteriostatic/	Polylactic acid fiber	Anhui BBKA Biofibre Co., Ltd.
	Silver ion bacteriostatic spandex	Lianyungang Duzhong New Aoshen Spandex Co., Ltd.
	Low-temperature easy-bonding spandex	Huafo Chemical Co., Ltd.
	Graphene modified profiled polyamide 6 fiber	Changzhou Highbery New Nano Materials Technology Co., Ltd.
	Graphene in-situ polymerization modified fine-denier polyamide 6 fiber	Hangzhou GaoxiTech Co., Ltd.
	Ultra-low denier zinc bacteriostatic polyamide 6 fiber	Jiangsu Wenfeng Chemical Fiber Group Co., Ltd.
	Zinc bacteriostatic polyamide 6 fiber	Bilic-Fortune Technology Co., Ltd.
	Artemisinin modified regenerated cellulose fiber	Xinxiang Chemical Fiber Co., Ltd.
Shoe material /wear-resistant/ /breathable/	PE (PHBV)/PP bicomponent sheath-core composite fiber	Nanjing Bioserica Era Antibacterial Materials Technology Co., Ltd.
	Highly breathable recycled polyester fiber	TongKun Group Co., Ltd.
	Dope-dyeing fine-denier super-black polyester fiber	TongKun Group Zhejiang Hengsheng Chemical Fiber Co., Ltd.
	One-step high-strength polyamide 6 fiber	Changle Highsun Synthetic Fiber Technologies Co., Ltd.
	Profiled recycled polyester fiber for fake fur	Suzhou Longjie Special Fiber Co., Ltd.
Luggage /wear-resistant/ /sun-proof/	Dope-dyeing ultra-black polyester fiber	Zhejiang Huaxin Advanced Materials Co., Ltd.
	Dope-dyeing fine-denier super-black polyester fiber	TongKun Group Zhejiang Hengsheng Chemical Fiber Co., Ltd.
	Dope-dyeing high sun-proof polyester fiber for outdoor use	Zhejiang Hengyuan Chemical Fiber Group Co., Ltd.
Swimsuit /elastic/ /colorful/	Dope-dyeing ultra-black polyester fiber	Zhejiang Huaxin Advanced Materials Co., Ltd.
	Dope-dyeing fine-denier super-black polyester fiber	TongKun Group Zhejiang Hengsheng Chemical Fiber Co., Ltd.
Shirt /skin-friendly/ /bacteriostatic/ /crease-resistant/	Melt directly spinning and dope-dyeing PBT fiber	Wuxi Xingsheng New Material Technology Co., Ltd.
	Lyocell fiber for hygienic materials	Baoding Swan New Fiber Manufacturing Co., Ltd.
	Bamboo lyocell fiber	Greccell Co., Ltd.
	Full-dull polyester cotton-like fiber	Xin Feng Ming Group Co., Ltd.
	Graphene modified profiled polyamide 6 fiber	Changzhou Highbery New Nano Materials Technology Co., Ltd.
	Tai Chi stone modified high-strength and high-modulus regenerated cellulose fiber	Tai Chi Stone Co., Ltd.
Garment lining /soft/wear-resistant/ /anti-pilling/	Bacteriostatic Lyocell	Shandong Jinyingli New Material Technology Co., Ltd.
	Heterofil component, differential specification, and differential shrinkage cotton-touch polyester fiber	Xuzhou Silk Fiber Technology Co., Ltd.
	White anti-static polyester fiber	Jiangsu ZJA New Material Co., Ltd.
Down jacket /thermal/ /soft/	Anti-pilling jet-weaving polyester fiber for brushed fabric	TongKun Group Zhejiang Hengteng Differential Fiber Co., Ltd.
	Fine-denier bio-based polyamide 56 fiber	Shanghai Cathay Biotech Inc.
High-end ready-to-wear /soft/ /crisp/ /elastic/	Heterofil component, differential specification, and differential shrinkage cotton-touch polyester fiber	Xuzhou Silk Fiber Technology Co., Ltd.
	Fine-denier bio-based polyamide 56 fiber	Shanghai Cathay Biotech Inc.
	Profiled recycled polyester fiber for fake fur	Suzhou Longjie Special Fiber Co., Ltd.
	Fine-denier porous elastic polyester fiber for corduroy	Tongxiang Hengji Differential Fiber Co., Ltd.
Hat /bright in color/ /thermal/	Ultra-high shrinkage polyacrylonitrile fiber	Acrylic Fiber Plant of PetroChina Daqing Petrochemical Company
	Dope-dyeing fine-denier super-black polyester fiber	TongKun Group Zhejiang Hengsheng Chemical Fiber Co., Ltd.
	Mohair-like polyacrylonitrile fiber	Jilin Qifeng Chemical Fiber Co., Ltd.
Professional sportswear /soft/ /elastic/	Dope-dyeing ultra-black polyester fiber	Zhejiang Huaxin Advanced Materials Co., Ltd.
	Melt directly spinning and dope-dyeing PBT fiber	Wuxi Xingsheng New Material Technology Co., Ltd.
	High-elongation low-module spandex for yoga clothes	Hangzhou Banglian Spandex Co., Ltd.
	Dull and cotton-like polyamide 6 synthetic fabric	Fujian Eversun Jinjiang Co., Ltd.
	One-step easy-dyeing cationic-treated covered yarn	TongKun Group Zhejiang Hengsheng Chemical Fiber Co., Ltd.

桐昆·中国纤维流行趋势 2021/2022

入选及入围纤维下游应用推荐表

家用纺织品

应用领域	推荐纤维品种	企业
床上用品 / 抑菌 / / 亲肤 / / 柔软 /	聚乳酸纤维	安徽丰原生物纤维股份有限公司
	循环再利用聚酰胺 6 纤维	恒天中纤纺化无锡有限公司
	锌系抑菌聚酯纤维	上海德福伦化纤有限公司
	全消光聚酯仿棉纤维	新凤鸣集团股份有限公司
	石墨烯改性异形聚酰胺 6 纤维	常州恒利宝纳米新材料科技有限公司
	石墨烯原位聚合改性细旦聚酰胺 6 纤维	杭州高烯科技有限公司
	非六方氮化硼（h-BN）改性再生纤维素纤维	南通强生石墨烯科技有限公司
	艾草改性聚酯纤维	青岛百草新材料股份有限公司
	胶原蛋白改性聚酰胺 6 纤维	长乐恒申合纤科技有限公司
	铜系抑菌竹莱赛尔纤维	上海里奥纤维企业发展有限公司
	消臭抑菌再生纤维素纤维	上海正家牛奶丝科技有限公司
	抑菌莱赛尔纤维	山东金英利新材料科技股份有限公司
窗帘 / 耐晒 / / 遮光 /	原液着色细旦超黑聚酯纤维	桐昆集团浙江恒盛化纤有限公司
	抗老化阻燃循环再利用聚酯纤维	厦门翔鹭化纤股份有限公司
	遮光用聚酯复合纤维	浙江恒优化纤有限公司
	抑菌莱赛尔纤维	山东金英利新材料科技股份有限公司
	一步法异形涤锦复合纤维	凯泰特种纤维科技有限公司
	原液着色超黑聚酯纤维	浙江华欣新材料股份有限公司
地毯 / 耐磨 / / 耐脏 /	仿皮草用异形循环再利用聚酯纤维	苏州龙杰特种纤维股份有限公司
	细旦生物基聚酰胺 56 纤维	上海凯赛生物技术股份有限公司
	非六方氮化硼（h-BN）改性再生纤维素纤维	南通强生石墨烯科技有限公司
	原液着色异形截面混纤 BCF	江苏凯普特新材料科技有限公司
沙发布 / 耐磨 / / 抑菌 / / 抗老化 /	原液着色细旦超黑聚酯纤维	桐昆集团浙江恒盛化纤有限公司
	白色抗静电聚酯纤维	江苏中杰澳新材料有限公司
	抗老化阻燃循环再利用聚酯纤维	厦门翔鹭化纤股份有限公司
	锌系抑菌聚酯纤维	上海德福伦化纤有限公司
填充物 / 蓬松 / / 质轻 /	聚乳酸纤维	安徽丰原生物纤维股份有限公司
	卫材专用莱赛尔纤维	保定天鹏新型纤维制造有限公司
	循环再利用聚酰胺 6 纤维	恒天中纤纺化无锡有限公司
	三维卷曲 PLA/PTT 双组份高弹性纤维	苏州金泉新材料股份有限公司
毛巾 / 亲肤 / / 抑菌 / / 柔软 /	全消光聚酯仿棉纤维	新凤鸣集团股份有限公司
	细旦生物基聚酰胺 56 纤维	上海凯赛生物技术股份有限公司
	石墨烯原位聚合改性细旦聚酰胺 6 纤维	杭州高烯科技有限公司
	非六方氮化硼（h-BN）改性再生纤维素纤维	南通强生石墨烯科技有限公司
	锌系抑菌聚酰胺 6 纤维	博富科技股份有限公司
	胶原蛋白改性聚酰胺 6 纤维	长乐恒申合纤科技有限公司
	铜系抑菌竹莱赛尔纤维	上海里奥纤维企业发展有限公司
玩具 / 手感柔软 / / 阻燃 /	仿皮草用异形循环再利用聚酯纤维	苏州龙杰特种纤维股份有限公司
	仿马海毛聚丙烯腈纤维	吉林奇峰化纤股份有限公司

Tongkun · China Fibers Fashion Trends 2021/2022

Recommended list of downstream applications

HOME TEXTILES

Application field	Recommended fiber	Company
Bedding /bacteriostatic/ /skin-friendly/ /soft/	Polylactic acid fiber	Anhui BBKA Biofibre Co., Ltd.
	Recycled polyamide 6 fiber	CHTC Sinofiber Wuxi Co., Ltd.
	Zinc bacteriostatic polyester fiber	Shanghai Different Chemical Fiber Co., Ltd.
	Full-dull polyester cotton-like fiber	Xin Feng Ming Group Co., Ltd.
	Graphene modified profiled polyamide 6 fiber	Changzhou Highbery New Nano Materials Technology Co., Ltd.
	Graphene in-situ polymerization modified fine-denier polyamide 6 fiber	Hangzhou GaoxiTech Co., Ltd.
	Non-hexagonal boron nitride (h-BN) modified regenerated cellulose fiber	Nantong Qiangsheng Graphene Technology Co., Ltd.
	Wormwood modified polyester fiber	Qingdao Byherb New Material Co., Ltd.
	Collagen-modified polyamide 6 fiber	Changle Highsun Synthetic Fiber Technologies Co., Ltd.
	Copper bacteriostatic bamboo lyocell fiber	Shanghai Lyocell Fibre Enterprise Development Co., Ltd.
	Deodorant and bacteriostatic regenerated cellulose fiber	Shanghai Zhengjia Milkfiber Sci & Tech Co., Ltd.
	Bacteriostatic Lyocell	Shandong Jinyingli New Material Technology Co., Ltd.
Curtain /sun-proof/ /lightproof/	Dope-dyeing fine-denier super-black polyester fiber	TongKun Group Zhejiang Hengsheng Chemical Fiber Co., Ltd.
	Anti-aging flame-retardant recycled polyester fiber	Xiamen XiangLu Chemical Fiber Company Limited
	Polyester composite fiber for shading	Zhejiang Hengyou Chemical Fiber Co., Ltd.
	Bacteriostatic Lyocell	Shandong Jinyingli New Material Technology Co., Ltd.
	One-step profiled polyester-nylon complex fiber	CTA High-tech Fiber Co., Ltd.
	Dope-dyeing ultra-black polyester fiber	Zhejiang Huaxin Advanced Materials Co., Ltd.
Carpet /wear-resistant/ /dirt-proof/	Profiled recycled polyester fiber for fake fur	Suzhou Longjie Special Fiber Co., Ltd.
	Fine-denier bio-based polyamide 56 fiber	Shanghai Cathay Biotech Inc.
	Non-hexagonal boron nitride (h-BN) modified regenerated cellulose fiber	Nantong Qiangsheng Graphene Technology Co., Ltd.
	Dope-dyeing profiled-section synthetic fabric BCF	Jiangsu Kaipute New Material Technology Co., Ltd.
Sofa-cover /wear-resistant/ /bacteriostatic/ /anti-aging/	Dope-dyeing fine-denier super-black polyester fiber	TongKun Group Zhejiang Hengsheng Chemical Fiber Co., Ltd.
	White anti-static polyester fiber	Jiangsu ZJA New Material Co., Ltd.
	Anti-aging flame-retardant recycled polyester fiber	Xiamen XiangLu Chemical Fiber Company Limited
	Zinc bacteriostatic polyester fiber	Shanghai Different Chemical Fiber Co., Ltd.
Stuffing /fluffy/ /light-weight/	Polylactic acid fiber	Anhui BBKA Biofibre Co., Ltd.
	Lyocell fiber for hygienic materials	Baoding Swan New Fiber Manufacturing Co., Ltd.
	Recycled polyamide 6 fiber	CHTC Sinofiber Wuxi Co., Ltd.
	Three-dimensional crimped PLA/PTT bicomponent high elastic fiber	Suzhou Kingcharm New Materials Corp.
Towel /skin-friendly/ /bacteriostatic/ /soft/	Full-dull polyester cotton-like fiber	Xin Feng Ming Group Co., Ltd.
	Fine-denier bio-based polyamide 56 fiber	Shanghai Cathay Biotech Inc.
	Graphene in-situ polymerization modified fine-denier polyamide 6 fiber	Hangzhou GaoxiTech Co., Ltd.
	Non-hexagonal boron nitride (h-BN) modified regenerated cellulose fiber	Nantong Qiangsheng Graphene Technology Co., Ltd.
	Zinc bacteriostatic polyamide 6 fiber	Bilic-Fortune Technology Co., Ltd.
	Collagen-modified polyamide 6 fiber	Changle Highsun Synthetic Fiber Technologies Co., Ltd.
	Copper bacteriostatic bamboo lyocell fiber	Shanghai Lyocell Fibre Enterprise Development Co., Ltd.
	Profiled recycled polyester fiber for fake fur	Suzhou Longjie Special Fiber Co., Ltd.
Toy /soft/ /flame-retardant/	Mohair-like polyacrylonitrile fiber	Jilin Qifeng Chemical Fiber Co., Ltd.

入选及入围纤维下游应用推荐表

产业用纺织品

应用领域	推荐纤维品种	企业
汽车内饰 / 阻燃 / / 耐磨 /	循环再利用聚酰胺 6 纤维	恒天中纤纺织无锡有限公司
	原液着色细旦超黑聚酯纤维	桐昆集团浙江恒盛化纤有限公司
	锌系抑菌聚酯纤维	上海德福伦化纤有限公司
	抗老化阻燃循环再利用聚酯纤维	厦门翔鹭化纤股份有限公司
	车内饰专用原液着色仿毛 PBT/PET 复合纤维	旷达纤维科技有限公司
	原液着色黑色高强聚酯工业丝	浙江尤夫高新纤维股份有限公司
体育用品 / 质轻 /	超高强度碳纤维	中复神鹰碳纤维有限责任公司
		威海拓展纤维有限公司
医疗与卫生用纺织品 / 抑菌 / / 亲肤 /	聚乳酸纤维	安徽丰原生物纤维股份有限公司
	银 / 锌复合抑菌聚酰胺 6 纤维	广东新会美达锦纶股份有限公司
	银离子抑菌氨纶	连云港杜钟新奥神氨纶有限公司
	白色抗静电聚酯纤维	江苏中杰澳新材料有限公司
	超低纤度锌系抑菌聚酰胺 6 纤维	江苏文凤化纤集团有限公司
	卫材专用莱赛尔纤维	保定天鹅新型纤维制造有限公司
	PE (PHBV) /PP 双组份皮芯复合纤维	南京禾素时代抑菌材料科技有限公司
	PTFE 微纳纤维膜	浙江理工大学
军用纺织品 / 亲肤 / / 阻燃 / / 抑菌 / / 高强 /	抑菌莱赛尔纤维	山东金英利新材料科技股份有限公司
	竹莱赛尔纤维	中纺院绿色纤维股份公司
	原液着色细旦超黑聚酯纤维	桐昆集团浙江恒盛化纤有限公司
	阻燃抗熔滴聚酯纤维	四川东材科技集团股份有限公司
	一步法高强聚酰胺 6 纤维	苏州联畅特种纤维有限公司
	原液着色黑色高强聚酯工业丝	长乐恒申合纤科技有限公司
特种纸 / 高强 / / 耐撕裂 /	细旦高强高模聚乙烯醇纤维	浙江尤夫高新纤维股份有限公司
		安徽皖维高新材料股份有限公司
消防用品 / 阻燃 / / 抗熔滴 / / 抗静电 /	白色抗静电聚酯纤维	江苏中杰澳新材料有限公司
	抗老化阻燃循环再利用聚酯纤维	厦门翔鹭化纤股份有限公司
	阻燃抗熔滴聚酯纤维	四川东材科技集团股份有限公司
	白色抗静电聚酯纤维	苏州联畅特种纤维有限公司
航空航天 / 抗静电 / / 高强 /	中模高强碳纤维预浸料	江苏恒神股份有限公司
	超高强度碳纤维	中复神鹰碳纤维有限责任公司
		威海拓展纤维有限公司
户外用品 / 耐晒 / / 高强 /	原液着色细旦超黑聚酯纤维	桐昆集团浙江恒盛化纤有限公司
	原液着色高耐日晒户外专用聚酯纤维	浙江恒远化纤集团有限公司
	一步法高强聚酰胺 6 纤维	长乐恒申合纤科技有限公司
	抗老化阻燃循环再利用聚酯纤维	厦门翔鹭化纤股份有限公司
	原液着色黑色高强聚酯工业丝	浙江尤夫高新纤维股份有限公司
面膜 / 柔软 / / 亲肤 /	卫材专用莱赛尔纤维	保定天鹅新型纤维制造有限公司
	竹莱赛尔纤维	中纺院绿色纤维股份公司
	抑菌莱赛尔纤维	山东金英利新材料科技股份有限公司
发动机壳体 / 高强 / 质轻 /	超高强度碳纤维	中复神鹰碳纤维有限责任公司
		威海拓展纤维有限公司
笔芯 / 吸水性 /	原液着色高蓬松聚酯纤维	桐乡市中洲化纤有限责任公司

Tongkun · China Fibers Fashion Trends 2021/2022
Recommended list of downstream applications

INDUSTRIAL TEXTILES

Application field	Recommended fiber	Company
Automotive interior /flame-retardant/ /wear-resistant/	Recycled polyamide 6 fiber	CHTC Sinofiber Wuxi Co., Ltd.
	Dope-dyeing fine-denier super-black polyester fiber	TongKun Group Zhejiang Hengsheng Chemical Fiber Co., Ltd.
	Zinc bacteriostatic polyester fiber	Shanghai Different Chemical Fiber Co., Ltd.
	Anti-aging flame-retardant recycled polyester fiber	Xiamen XiangLu Chemical Fiber Company Limited
	Dope-dyeing wool-like PBT/PET composite fiber for automotive interior	Kuangda Fibre Technology Co., Ltd.
	Dope-dyeing black high-strength polyester industrial yarn	Zhejiang Unifull Industrial Fibre Co., Ltd.
Sporting goods /light-weight/	Ultra-high-strength carbon fiber	Zhongfu Shenying Carbon Fiber Co., Ltd.
		Weihai Tuozhan Fiber Co., Ltd.
Medical and sanitary textiles /bacteriostatic/ /skin-friendly/	Polylactic acid fiber	Anhui BBKA Biofibre Co., Ltd.
	Silver/zinc composite bacteriostatic polyamide 6 fiber	Guangdong Xinhui Meida Nylon Co., Ltd.
	Silver ion bacteriostatic spandex	Lianyungang Duzhong New Aoshen Spandex Co., Ltd.
	White anti-static polyester fiber	Jiangsu ZJA New Material Co., Ltd.
	Ultra-low denier zinc bacteriostatic polyamide 6 fiber	Jiangsu Wenfeng Chemical Fiber Group Co., Ltd.
	Lyocell fiber for hygienic materials	Baoding Swan New Fiber Manufacturing Co., Ltd.
	PE (PHBV)/PP bicomponent sheath-core composite fiber	Nanjing Bioserica Era Antibacterial Materials Technology Co., Ltd.
	PTFE micro-nano fiber membrane	Zhejiang Sci-Tech University
Military textiles /skin-friendly/ /flame-retardant/ /bacteriostatic/ /high-strength/	Bacteriostatic Lyocell	Shandong Jinyingli New Material Technology Co., Ltd.
	Bamboo lyocell fiber	Grecell Co., Ltd.
	Dope-dyeing fine-denier super-black polyester fiber	TongKun Group Zhejiang Hengsheng Chemical Fiber Co., Ltd.
	Flame-retardant anti-dripping polyester fiber	Sichuan EM Technology Co., Ltd.
		Suzhou Lianchang Special Fiber Co., Ltd.
	One-step high-strength polyamide 6 fiber	Changle Highsun Synthetic Fiber Technologies Co., Ltd.
Specialty paper /high-strength/ /tear-resistant/	Dope-dyeing black high-strength polyester industrial yarn	Zhejiang Unifull Industrial Fibre Co., Ltd.
	Fine denier high-strength high-modulus polyvinyl alcohol fiber	Anhui Wanwei Updated High-Tech Material Industry Co., Ltd.
Fire service inventory /flame-retardant/ /anti-dripping/ /anti-static/	White anti-static polyester fiber	Jiangsu ZJA New Material Co., Ltd.
	Anti-aging flame-retardant recycled polyester fiber	Xiamen XiangLu Chemical Fiber Company Limited
	Flame-retardant anti-dripping polyester fiber	Sichuan EM Technology Co., Ltd.
		Suzhou Lianchang Special Fiber Co., Ltd.
	White anti-static polyester fiber	Jiangsu ZJA New Material Co., Ltd.
Aerospace /anti-static/ /high-strength/	Medium-modulus high-strength carbon fiber prepreg	Jiangsu Hengshen Co., Ltd.
	Ultra-high-strength carbon fiber	Zhongfu Shenying Carbon Fiber Co., Ltd.
		Weihai Tuozhan Fiber Co., Ltd.
Outdoor goods /sun-proof/ /high-strength/	Dope-dyeing fine-denier super-black polyester fiber	TongKun Group Zhejiang Hengsheng Chemical Fiber Co., Ltd.
	Dope-dyeing high sun-proof polyester fiber for outdoor use	Zhejiang Hengyuan Chemical Fiber Group Co., Ltd.
	One-step high-strength polyamide 6 fiber	Changle Highsun Synthetic Fiber Technologies Co., Ltd.
	Anti-aging flame-retardant recycled polyester fiber	Xiamen XiangLu Chemical Fiber Company Limited
	Dope-dyeing black high-strength polyester industrial yarn	Zhejiang Unifull Industrial Fibre Co., Ltd.
Facial mask /soft/ /skin-friendly/	Lyocell fiber for hygienic materials	Baoding Swan New Fiber Manufacturing Co., Ltd.
	Bamboo lyocell fiber	Grecell Co., Ltd.
	Bacteriostatic Lyocell	Shandong Jinyingli New Material Technology Co., Ltd.
Engine housing /high-strength/ /light-weight/	Ultra-high-strength carbon fiber	Zhongfu Shenying Carbon Fiber Co., Ltd.
		Weihai Tuozhan Fiber Co., Ltd.
Refill /water-absorbing/	Dope-dyeing highly fluffy polyester fiber	Tongxiang Zhongzhou Chemical Fiber Co., Ltd.

中国纤维

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CHINA FIBERS

FASHION TRENDS REPORT

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中国纤维流行趋势



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