

任杰

报告人简介:

任杰,男,工学博士,教授,博士生导师。同济大学材料科学与工程学院纳米与生物高分子材料研究所所长。2000年入选“上海市青年科技启明星”计划,2004年入选“上海市青年科技启明星跟踪”计划,2005年入选“教育部新世纪优秀人才”计划,2006年荣获“上海市职工科技创新标兵”称号,2007年入选“上海市优秀学科带头人”计划,2016年获中国化纤行业领军人物称号。



长期从事生物可降解高分子材料——聚乳酸的制备、改性、加工与应用研究。在该领域作为项目负责人承担完成了国家“863”计划专项、国家发改委“生物质工程”示范专项、国内外知名企业(美国 Boeing 公司、上汽集团等)委托开发的各类科研项目。已主编英文专著一部和中文专著三部。发表论文 260 余篇,其中 SCI 论文 130 余篇,被引用 4500 余次, H 指数为 35。申请国内外发明专利 120 余项,其中获国家发明专利授权 100 余项,获美国、欧洲发明专利授权 3 项。

Jie Ren

Profile of the Author:

Ren jie, male, Ph.D degree in engineering, Professor, doctoral supervisor. At present he holds the position of the director of Institute of Nano- and Bio Polymeric Materials, School of Materials Science and Engineering, Tongji University. His research was sponsored by Shanghai Rising-Star Program in 2000, sponsored by Shanghai Rising-Star Track Program in 2004, supported by Program for “New Century Excellent Talents” in MOE of China in 2005. He was chosen to be Shanghai Subject Chief Scientist in 2007. He was evaluated one of leader in chemical fiber industry in China in 2016.

He has concentrated on the research of biodegradable material - polylactic acid preparation, modification, processing and application research. In the field of biodegradable material, the main projects he has undertaken include special project for technological innovation of the 2010 Shanghai World Expo(Exposition), special project for biomass engineering high-tech industrialization of National Development and Reform Commission, the project of the National High Technology Research and Development Program of China (863 Program), Shanghai key Scientific and Technological Project, Shanghai Key Nano Science and Technology Project, international cooperation project (cooperated with Boeing company and Shanghai automotive industry corporation, etc.). He has published a few scholarly monographs including “Degradable and Absorbable Materials”. So far, he has edited one English monograph and three Chinese monographs. More than 260 papers have been published in domestic and foreign academic journals in this field, among which more than 130 SCI papers have been cited more than 4,500 times and the H index is 35. More than 120 domestic and foreign invention patents have been applied, among which more than 100 national invention patents have been authorized, and 3 American and European invention patents have been authorized.

聚乳酸纤维（乳丝）的生产加工、应用及展望

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摘要：我国高达 60% 以上的石油进口的依赖程度,以及 6000 多万吨的化学纤维消耗量所造成的资源短缺与“白色污染”, 都在催生着新型生物基纤维材料替代传统石油基高分子化学纤维材料的迅速发展。

乳丝学名为聚乳酸纤维,是一种可生物降解的新型绿色生物基纤维,具有较高的强度、良好的生物相容性和生物降解性。乳丝的形态主要有长丝和短纤。乳丝的商品化加工一般采用传统的熔融纺丝工艺。除了良好的物理力学性能,乳丝的亲肤导湿、柔滑透气使其在服用织物和非织造物方面得到了广泛的应用。

乳丝独特的结构,使其与棉混纺与涤棉具有同等的性能,处理方便、光泽比涤纶更优良,且有蓬松的手感。乳丝又有优良的导湿性,对皮肤不发粘,乳丝混纺做内衣,有助于水分的转移,不仅接触皮肤时有干爽感,且可赋予优良的形态稳定性和抗皱性,它是以人体内含有的乳酸作原料合成的乳酸聚合物,不会刺激皮肤,对人体健康有益,非常适合作内衣和家用纺织品的原料。

另外乳丝具有优良的弹性、良好的保型性、悬垂性以及染色性能。由乳丝纯纺纱或与毛纤维混纺纱加工制成的服装织物毛型感强、抗皱性好。同时,由于乳丝初始模量适中,织物具有良好的悬垂性和手感。因此,聚乳酸纤维是开发外衣服装织物较为理想的原料。

乳丝采用干法、纺粘法和熔喷法等成网,用水刺、针刺或热粘合等方法加固,可制成各种非织造产品。由于聚乳酸具有较低的熔点,不同乳丝的熔点范围很宽(120-170°C),而且具有很好的粘结作用,很适合制成复合纤维,并在非织造布方面应用,如卫生巾、护垫、纸尿裤、成人失禁用品、医用纱布、绷带、医用床单等产品,不仅能够很好的解决一次性医疗和卫生用品的抑菌要求,而其降解特性又能解决一次性用品带来的“白色污染”问题。

乳丝将逐步替代传统的石油基化学纤维,在未来生物基纤维市场中占有一席之地。

Production, Processing , Application and Prospect of Polylactic Acid Fiber

Abstract: The dependence of over 60% of petroleum import in China, the shortage of resources and "white pollution" caused by over 60 million tons of chemical fiber consumption, all contribute to the rapid development of new biobased fiber materials to replace traditional petroleum based polymer chemical fiber materials.

Rusi is a new kind of biodegradable green biobase fiber with high strength, good biocompatibility and biodegradability. The shape of Rusi mainly includes filament and staple. The traditional melt spinning can be used to process Rusi. In addition to good physical and mechanical properties, and silky breathability of the breast filaments have been widely used in the use of fabrics and nonwovens.

The unique structure of Rusi makes it have the same performance as cotton blended and terylene. Rusi has excellent guide wet again, not sticky to the skin, Rusi underwear helps moisture transfer, not only when in contact with the skin is dry, and can give good shape stability and wrinkle resistance, it is based on the human body contains some lactic acid as a raw material synthesis of lactic acid polymer, not irritate the skin and is beneficial to human body health, very suitable for the raw material of underwear and home textiles.

In addition, Rusi has good elasticity, good shape retention, drape and dyeing properties. The garment fabric made of Rusi spinning or blended with wool fiber has a strong sense of wool and good wrinkle resistance. At the same time, due to the moderate initial modulus of Rusi, the fabric has good drape and feel. Therefore, Rusi is an ideal material for developing garment fabric.

Using dry method, spunbonded method and melt-spray method to form a net, water, acupuncture or thermal bonding, such as reinforcement, can be made into a variety of non-woven products. Because the polylactic acid has a lower melting point, melting point range is very wide in different Rusi (120-170 °C), and has a good bonding effect, suits made of composite fiber, and application in nonwoven fabric,

such as sanitary napkin, pads, diapers, adult incontinence supplies, medical gauze, bandages, medical bed sheets, and other products, not only to be able to get a good bacteriostatic requirements of disposable medical and health products, and its degradation characteristics and can solve the problem of white pollution from disposable goods.

Rusi will gradually replace the traditional petroleum-based chemical fiber and occupy a place of bio-based fiber market in the future.