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Topic of the Speech:
Polypyrrole-based Conductive Fibers and Textiles for Biomedical Applications

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Professor Jifu Mao has been a distinguished research fellow in College of Textiles at Donghua University since 2019. He received BS (2009) and MSc (2012) from Beijing University of Chemical Technology (BUCT), and obtained Ph.D. in Experimental Medicine from Université Laval (UL), Canada (2017). He worked in the Research Center CHU of Quebec-UL as a postdoctoral fellow (2017-2019).

His current research involves electrically conducting bio-textiles, electro-mechanical bioreactors, and their biomedical applications. He has published more than 50 peer-reviewed papers in the journals such as ACS Nano, Adv Funct Mater, Bioact Mater, Adv Sci, Chem Eng J, applied for 20 patents and contributed two book chapters.

ABSTRACT SUBMISSION
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Polypyrrole-based Conductive Fibers and Textiles for Biomedical Applications

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ABSTRACT (NO MORE THAN 500 WORDS:)

The development of conductive biomaterials has been a key focus in biomedical research, aiming to influence cell behavior for tissue regeneration and to enable the monitoring of physiological status through bioelectricity. Conductive fibers have emerged as a promising solution due to their ability to address the mechanical disparities between conductive biomaterials and tissues. A template-assisted interface polymerization method was proposed to prepare a pure Polypyrrole (PPy) membrane, allowing for an investigation into the softening factors of PPy. Additionally, a stretchable PPy coating was prepared by pre-strain engineering to fabricate wearable fiber electrodes. A multifunctional suture was designed by incorporating a drug-loaded PPy coating using an *in situ* polymerization method to study its wound healing performance. A seamless conductive cardiac patch was designed by textile manufacturing process to study its myocardial repair performance. This research introduced the theory of sodium sulfosalicylate softening the molecular structure of PPy, and two stretchable conductive coatings, inspired by biomimetic cardiac fiber bundles and maple leaf structures, were designed to enhance the stretchability and insensitive conductivity of the fibers. Furthermore, the application of these fibers in physiological monitoring and stretchable energy storage was verified. Additionally, various antibacterial and anti-inflammatory drug-loaded PPy conductive coatings were developed, leading to the creation of a series of multifunctional antibacterial and anti-inflammatory conductive medical sutures, which demonstrated the ability to promote wound healing and tissue regeneration. Finally, a strategy for the oriented injection of conductive fibers and the use of conductive cardiac patches with barbed microneedles to achieve immediate mechanical and electrical integration of infarcted myocardium, thereby restoring post-infarction myocardial electrical communication and enhancing cardiac function. This study offers promising solutions for tissue regeneration and physiological monitoring.