TBIS

Topic of the Speech:
Graphene-Functionalized Fibres and Textiles for Smart Textiles Applications

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Dr. Heng Zhai is a materials scientist whose research spans smart textiles, functional fibre engineering, and electrochemical energy devices. He received his PhD in Materials Science from The University of Manchester, UK, where he developed advanced functionalized graphene fibre materials for emerging applications in wearable electronics and environmental remediation. Over the course of night years at Manchester, Dr. Zhai built a strong interdisciplinary research profile at the interface of materials science, textile technology, and device engineering.

His doctoral research focused on the fabrication, functionalization, and assembly of graphene-based fibres using techniques such as wet spinning and electrospinning. Through this work, he developed highly sensitive, mechanically robust, and interference-resistant fibre-based sensors capable of monitoring strain, pressure, and humidity, with strong potential for integration into smart wearable systems. His work has contributed to the advancement of next-generation textile-based sensing platforms that combine flexibility, conductivity, and durability for real-world applications.

Dr. Zhai later expanded his expertise through postdoctoral research into electrochemistry and hydrogen energy technologies. His work in this area has focused on the design and optimization of proton exchange membrane fuel cells (PEMFCs), particularly through innovative membrane electrode assembly strategies and advanced nanofibrous membrane structures. This broadened research portfolio reflects his interest in translating functional materials into practical technologies for sustainability, energy, and health-related applications.

Dr. Zhai has published widely in high-quality international journals and has developed a research approach that bridges fundamental materials design with application-oriented engineering. His current research interests centre on the convergence of smart textiles, wearable electronics, and electrochemical energy technologies. Building on his background in graphene-functionalized fibres and proton exchange membrane fuel cells, he aims to develop advanced textile-integrated energy systems that combine sensing, flexibility, and sustainable power supply within a single wearable platform. His future research will particularly explore the design of soft, fibre-based and nanofibrous electrochemical devices, including fuel cell-inspired power modules for smart garments and on-body systems.