Research project and supervisor team

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Short introduction & description of research project	The integration of piezoelectric materials into carbon fibre-reinforced polymers (CFRPs) presents a promising approach for adding functionalities such as vibration damping and energy harvesting. Concurrently, as carbon fibre composites gain widespread use across industries, recycling waste and retired components, particularly the effective reuse of recycled carbon fibres (rCF), is becoming increasingly crucial. Utilizing rCF as a functional load-bearing layer in CFRPs, offering structural-functional integration, is a prospective solution. MXene, a renowned member of the two-dimensional nano carbon nitride family, is extensively employed across numerous fields such as piezoelectric sensing and electrochemistry. Nonetheless, achieving a homogeneous and high-performance integration of structural-functional elements within carbon fibre-reinforced polymer (CFRP) composites remains a formidable challenge. **This study aims to develop an integrated PVDF/MXene/rCF piezoelectric damping material using electrospinning technology. The composite's multilayer structure enables a variety of functions, including shock absorption, piezoelectric response, and electromagnetic shielding. The project will prioritize optimizing the electrospinning process for even MXene/PVDF distribution within the rCF base layer and focus on integrating this functional layer into CFRPs. Additionally, its mechanical and electrical properties will be benchmarked against industry standards.** The development of such composite materials has the potential to significantly impact the field of smart materials, leading to advancements in structural health monitoring, self-powered sensors, and smart material applications in the aerospace, automotive, and civil engineering sectors.
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