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Mechanical Performance of the Carbon-Fiber-Reinforced Polyetheretherketone (CF/PEKK) composite

Abstract: This study investigates the mechanical properties and temperature effects of carbon-fiber-reinforced polyetheretherketone (CF/PEKK) composite, which are rapidly recognized for their potential in high-performance aerospace structural applications. With growing environmental concerns and a demand for sustainable, lightweight materials, CF/PEKK composites offer a promising alternative to traditional thermoset composites. This study highlights the advantages of thermoplastic composites, focusing particularly on CF/PEKK. By conducting micro-failure analysis using optical microscopy and scanning electron microscopy, significant findings have emerged. Notably, the Bolted Joint Efficiency (BJE) in CF/PEKK composites varies with different width-to-hole diameter (W/D) ratios and temperatures. The study reveals that BJE increases significantly at specific W/D ratios, particularly at room temperature, demonstrating the crucial role of optimized W/D ratios in enhancing joint performance. Additionally, the incorporation of A-HNTs into carbon/epoxy composite has led to noticeable improvements in stiffness compared to pristine composites. This enhancement suggests promising applications for these composite in various industrial settings. The study offers valuable insights into the design of composites, emphasizing the impact of geometry and temperature on mechanical properties. It highlights the importance of tailoring these factors to achieve optimal performance in CF/PEKK composites. Future research should explore additional properties and optimize different composite materials to broaden their applications. This study underscores the need for ongoing research into the durability and performance of advanced composites to meet the rigorous demands of modern engineering challenges.

Keywords: Carbon-Fiber-Reinforced Polymer Composites, Mechanical Properties, Geometry Effect, Temperature Variation; Nanotube Reinforcement .

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