Evaluation of Mode I and Mode II Fracture Toughness on Ramie, Basalt and Hybridised Reinforced Polymer Composites.

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Conventional composites made of synthetic fibres are widely used in various applications, ranging from the wind-energy sector to the automotive and aerospace industries. Most of them are non-biodegradable and non-recyclable, and are ultimately disposed of in landfills after their service life. Therefore, it is imperative to develop environmentally friendly composite materials. Plant and mineral-based fibers have shown promising results as alternatives to non-biodegradable fibers for semi-load-bearing structural elements. This research investigates the fracture toughness behavior of Ramie, Basalt, and Hybrid combination in Ramie/Basalt laminates under Mode I and Mode II loadings. The specimens were fabricated by hand layup method followed by vacuum bagging using unidirectional Ramie and Basalt fibers and an aircraft-grade epoxy resin system (Araldite LY5052 / Aradur 5052 CH). A major focus of the study is on understanding how hybridization affects the fracture toughness relative to the reference samples. The experiments were performed using Double Cantilever Beam (DCB) and End-Notched Flexural (ENF) tests in accordance with ASTM standards. The findings give insights into the synergistic toughening mechanism, which ultimately helps us to design a reliable and sustainable hybrid composite structure at a commercial level.