Leibniz Universität Hannover

ISD INSTITUT FÜR STATIK UND DYNAMIK

Experimental Investigation of the Mechanical Behaviour of Pure Resin

Description:

Fiber-reinforced polymers (FRPs) are a class of advanced composite materials that combine a polymer matrix with reinforcing fibres to achieve exceptional mechanical properties. These materials are widely used in engineering applications due to their high strength-to-weight ratios, corrosion resistance, and tailored performance characteristics. The polymer matrix plays a critical role in transferring stress between fibres, providing structural integrity, and protecting the fibres from environmental degradation. However, the matrix is often the weakest link in FRPs, where microcracks can originate under mechanical loading, leading to progressive damage and ultimate failure of the composite structure.

To fully understand the behaviour of FRPs, it is crucial to study the polymer matrix in isolation. This thesis aims to experimentally characterize the mechanical behaviour of pure resin, focusing on its fundamental properties under static and fracture loading conditions. By excluding fiber reinforcement, this study seeks to provide insights into the resin's inherent mechanical performance, such as its elasticity, plasticity, and fracture toughness, which are key to optimizing composite design and performance.

The task is divided into the following:

1. Conduct a literature review on the structure and typical damage mechanisms in resin matrices, as well as on standard procedures and relevant test setups for mechanical property characterization.
2. Familiarize yourself with the process of resin plate fabrication and conduct static tests (tensile, compressive, and shear) to determine elastic modulus, yield strength, and ultimate strength.

3. Perform fracture toughness tests to understand crack initiation and propagation mechanisms.
4. Evaluate and interpret test results to quantify the mechanical properties of the resin and discuss the findings in the context of improving material properties for potential FRP applications.
5. Present the outcomes of the thesis in a colloquium.

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