

Influence of Al₂O₃ nanoreinforcement on the adhesion and thermomechanical properties for epoxy adhesive

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ABSTRACT

In present work, an attempt was made to investigate the effect of alumina nanoparticle (ANP) reinforcement to the wetting and mechanical properties of adhesively bonded aluminum alloy with epoxy adhesive. ANP of 13 nm size in 0–2 wt% concentration was utilized to be incorporated into two components epoxy adhesive to evaluate its effect on wetting behaviour and tensile shear strength. The addition of ANP results in improved contact angle and spreading area of the adhesive. The inclusion of ANP content up to 1.0 wt% demonstrates approximately 54.2% improvement of tensile shear stress as compared to its pristine epoxy counterpart. In this work, it is observed that regardless of ANP concentration, fractured specimens demonstrate the combination of both adhesive and cohesive fracture (CF) region, with highest CF region observed at 1.0 wt% ANP reinforcement. From thermomechanical analysis results, at 30 °C significant increment of both storage and loss modulus up to 68.3% and 17.3% respectively is achieved with 0.5 wt% ANP inclusion.

KEYWORDS

Polymer-matrix composites (PMCs); Wettability; Mechanical properties; Fracture

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