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Effects of Polyvinyl Alcohol Nanofiber Mats on the Adhesion Strength and Fracture Toughness of Epoxy Adhesive Joints

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ABSTRACT

The brittle nature of the polymer based adhesive joints is the major drawback limiting the service life. In this study, electrospun polyvinyl alcohol (PVA) nanofiber mat were introduced within the epoxy adhesive joint region to improve mechanical performance of the joints. The epoxy resin wetted electrospun PVA nanofiber mat were placed in between aluminum adherends and cured under vacuum conditions to remove air bubbles and volatiles. The mechanical performance of the reinforced aluminum joints was investigated by utilizing single lap joint (SLJ) and double cantilever beam (DCB). To reveal nano- and micro-scale toughening mechanics of the nanofiber reinforcements, the fracture surfaces were analysed using scanning electron microscope (SEM). Mod I fracture toughness and lap shear strength of the adhesively bonded joints were found to increase with addition of PVA nanofiber mats into epoxy adhesive.

Keywords: A. Polymer-matrix composites (PMCs), B. Fracture toughness, B. Fibre/matrix bond, B. Wettability, D Mechanical testing

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