Fracture toughness analysis of O-POSS/PLA composites assessed by essential work of fracture method

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Abstract
Essential work of fracture (EWF) method was employed to investigate the effect of the octavinylisobutyl based polyhedral oligomeric silsesquioxane (O-POSS) addition in poly(lactic acid) (PLA) matrix on the fracture behavior of O-POSS/PLA composites. The 2 mm thick rectangular shaped PLA-matrix composites containing various weight ratios of O-POSS were injection molded after processing in a twin-screw extruder. Constant deformation rate tensile tests at room temperature were performed on double edge notched tensile (DENT) specimens with various ligament lengths. It was found that the addition of O-POSS to PLA improved the toughness. It was observed that a greater energy consumed after the maximum load reached on load-displacement curves for the composites. Optimum additive value was obtained at 7 wt% O-POSS.

Keywords: A. Polymer-matrix composites (PMCs); B. Fracture toughness; D. Fractography; D. Mechanical testing; POSS

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