

Epoxidized natural rubber toughened polylactic acid/talc composites: mechanical, thermal, and morphological properties

ABSTRACT

The aim of present study is to develop a toughened polylactic acid/talc composite. Talc and epoxidized natural rubber (ENR-50) were compounded with polylactic acid using counter-rotating twin-screw extruder followed by preparation of samples through injection molding. The effect of silane-treated talc and epoxidized natural rubber on mechanical, thermal, and morphological properties of polylactic acid was investigated. The Young's and flexural modulus of polylactic acid improved while the impact strength values dropped with increasing talc content (20-30 wt%) indicating that talc increased the stiffness of polylactic acid with a sacrifice in toughness. Subsequently, the blending of epoxidized natural rubber (20 wt%) to polylactic acid/talc (30 wt%) revealed that the impact strength of polylactic acid/talc composites improved 448% with considerable drop in Young's and flexural modulus. Polylactic acid/talc/epoxidized natural rubber composite contains 60% polylactic acid, 30 wt% talc, and 10 wt% ENR display optimum stiffness and impact strength. Scanning electron micrographs demonstrates that talc agglomerates at higher loadings. Thermogravimetric analysis indicated that thermal stability of polylactic acid/talc composite was reduced by the addition of epoxidized natural rubber due to increasing talc agglomeration.

Keyword: Polylactic acid; Talc; Epoxidized natural rubber; Mechanical properties; Thermal properties