

Mechanical, Thermal, and Fire Properties of Biodegradable Polylactide/Boehmite Alumina Composites

Kunal Das,^{*,†} Suprakas Sinha Ray,^{†,‡} Steve Chapple,[§] and James Wesley-Smith[‡]

[†]Department of Applied Chemistry, University of Johannesburg, Doornfontein 2028, Johannesburg, South Africa

[‡]DST/CSIR National Centre for Nano-Structured Materials, Council for Scientific and Industrial Research, Pretoria 0001, South Africa

[§]Polymer and Composites, Materials Science and Manufacturing, Council for Scientific and Industrial Research, Port Elizabeth 6000, South Africa

Abstract

Boehmite alumina (BAI) was investigated in terms of its use as an filler to improve the inherent properties of polylactide (PLA). Composites of PLA with different loadings of BAI were prepared by melt-blending. Morphological analysis using transmission electron microscopy (TEM) showed that the BAI particles were well dispersed at low BAI loading and BAI agglomeration was found at higher BAI loadings. The tensile testing showed significant improvements in strength (57%) and elongation at break with 3 wt % BAI loading, consistent with the homogeneous dispersion of BAI particles in PLA matrix. The BAI nanoparticle incorporation did not improve the thermal stability of PLA matrix but showed improvement in heat release rate in fire property test in cone calorimetry.