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Material Properties

## **Effect of particle size and crosslinking on the toughening of core-shell-type rubber-modified poly(lactic acid) composites**

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### **Abstract**

The toughness of poly(lactic acid) (PLA) has been improved without loss of its intrinsic physical properties by incorporating core-shell-type rubber particles (CSRs) which have a rubbery core of poly(n-butyl acrylate) and a rigid shell of poly(methyl methacrylate). The CSRs of different sizes were prepared via emulsion polymerization and mixed into PLA in different amounts using a twin-screw extruder. The size and distribution of the CSRs were measured by an electrophoretic light scattering photometer and their morphology was observed by scanning electron microscopy and transmission electron microscopy. The core size of the CSRs was determined to be ~120–650 nm, and it was confirmed that relatively uniform rubber particles with a core-shell structure had been produced. The mechanical properties of PLA/CSR blends were measured using a universal testing machine and Izod impact tester. It was found that the impact strength and elongation at break increased without the loss of thermal properties in PLA mixed with rubber particles of a specific particle size. The fractured surface of the specimen after the impact test and the toughening mechanism of rubber-toughened PLA was studied by examining the fracture morphology.

**Keywords:** poly(lactic acid); core-shell; rubber; toughening; fracture

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