Impact toughness and ductility enhancement of biodegradable poly(lactic acid)/poly(ε-caprolactone) blends via addition of glycidyl methacrylate

ABSTRACT

Poly(lactic acid) (PLA)/poly(ε-caprolactone) (PCL) blends were prepared via melt blending technique. Glycidyl methacrylate (GMA) was added as reactive compatibilizer to improve the interfacial adhesion between immiscible phases of PLA and PCL matrices. Tensile test revealed that optimum in elongation at break of approximately 327% achieved when GMA loading was up to 3wt%. Slight drop in tensile strength and tensile modulus at optimum ratio suggested that the blends were tuned to be deformable. Flexural studies showed slight drop in flexural strength and modulus when GMA wt% increases as a result of improved flexibility by finer dispersion of PCL in PLA matrix. Besides, incorporation of GMA in the blends remarkably improved the impact strength. Highest impact strength was achieved (160% compared to pure PLA/PCL blend) when GMA loading was up to 3 wt%. SEM analysis revealed improved interfacial adhesion between PLA/PCL blends in the presence of GMA. Finer dispersion and smooth surface of the specimens were noted as GMA loading increases, indicating that addition of GMA eventually improved the interfacial compatibility of the nonmiscible blend.

Keyword: Ductility enhancement; Elongation at break; Glycidyl methacrylate; Immiscible phasis; Interfacial adhesions; Interfacial compatibility; Polylactic acids; Reactive compatibilizers.