

Tensile Retention Properties of Thermoplastic Starch Based Biocomposites Modified with Glutaraldehyde

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Abstract : Tensile retention properties of bacterial cellulose (BC) reinforced thermoplastic starch (TPS) resins were successfully improved by reacting with glutaraldehyde (GA) in their gelatinization processes. Small amounts of poly (lactic acid) (PLA) were blended with GA modified TPS resins to improve their processability. As evidenced by the newly developed ether (-C-O-C-) stretching bands on FT-IR spectra of TPS100BC0.02GAx series specimens, hydroxyl groups of TPS100BC0.02 resins were successfully reacted with the aldehyde groups of GA molecules during their modification processes. The retention values of tensile strengths (σ_f) of TPS100BC0.02GAx and (TPS100BC0.02GAx)75PLA25 specimens improved significantly and reached a maximal value as GA contents approached an optimal value at 0.5 part per hundred parts of TPS resin (PHR). By addition of 0.5 PHR GA in biocomposite specimens, the initial tensile strength and elongation at break values of (TPS100BC0.02GA0.5)75PLA25 specimen improved to 24.6 MPa and 5.6%, respectively, which were slightly improved than those of (TPS100BC0.02)75PLA25 specimen. However, the retention values of tensile strengths of (TPS100BC0.02GA0.5)75PLA25 specimen reached around 82.5%, after placing the specimen under 20°C/50% relative humidity for 56 days, which were significantly better than those of the (TPS100BC0.02)75PLA25 specimen. In order to understand these interesting tensile retention properties found for (TPS100BC0.02GAx)75PLA25 specimens. Thermal analyses of initial and aged TPS100BC0.02, TPS100BC0.02GAx and (TPS100BC0.02GAx)75PLA25 specimens were also performed in this investigation. Possible reasons accounting for the significantly improved tensile retention properties of TPS100BC0.02GAx and (TPS100BC0.02GAx)75PLA25 specimens are proposed.

Keywords : biocomposite, strength retention, thermoplastic starch, tensile retention

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