Poly(lactic acid)/epoxidized natural rubber blends: effect of processing condition

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Abstract: The objective of this work was to evaluate the effect of processing condition on the mechanical and thermal properties and morphology of poly(lactic acid) blended with epoxidized natural rubber (PLA/ENR blend) and PLA blended with ENR grafted with maleic anhydride (PLA/ENR-g-MA blend). ENR contains 25 mol% epoxide. ENR-g-MA was prepared by melt mixing with 0.5 phr of MA. Polymer blends were prepared by melt blending in a twin screw extruder (TWSE) and an internal mixer. The blend ratio of PLA:rubber was 90:10. A ternary blend (PLA/ENR/ENR-g-MA) was also prepared at a similar condition at a ratio of 90:5:5. The blending temperature was 170°C for both instruments. The blending speeds were 100 rpm for TWSE and 60 rpm for the internal mixer. It was found that the impact strength of all blends prepared by the internal mixer was higher than that of the blends prepared by TWSE whereas the tensile properties were similar. Glass transition temperature (T_g) of PLA phase shifted to a lower temperature and T_g of ENR-g-MA was lower than that of ENR. The rubber phase showed spherical particles. The processing instrument did not show significant effect on the thermal properties and morphology.

Keywords: Poly(lactic acid); Epoxidized natural rubber; Maleic anhydride; Graft copolymer