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Enhancing interfacial adhesion performance by using poly(vinyl alcohol) in (low-density polyethylene)/(natural rubber)/(water hyacinth fiber) composites

Abstract

The effects of (a) the chemical modification of water hyacinth fiber by poly(vinyl alcohol) (WHF-$_{PVA}$) and (b) loading on the properties of low-density polyethylene (LDPE)/(natural rubber (NR))/(water hyacinth fiber (WHF)) composites were studied. Mechanical properties, water absorption behavior, morphology, and thermal properties were examined; X-ray diffraction and infrared spectroscopic analysis were done. The results indicated that LDPE/NR/WHF-$_{PVA}$ composites had higher values of tensile strength, Young's modulus, melting temperature, and water absorption resistance but lower elongation at break than LDPE/NR/WHF composites. The LDPE/NR/WHF-$_{PVA}$ composites had better interfacial adhesion between the matrix and the fibers than LDPE/NR/WHF composites, as shown by SEM results. The LDPE/NR/WHF-$_{PVA}$ composites exhibited lower interparticle spacing than LDPE/NR/WHF composites, a feature which enhanced the interparticle interaction between the water hyacinth fibers and the LDPE/NR matrix.

Keywords; Water hyacinth fiber, Low-density polyethylene (LDPE), Chemical modification