

Compatibility, Mechanical, Thermal, and Morphological Properties of Epoxy Resin Modified with Carbonyl-Terminated Butadiene Acrylonitrile Copolymer Liquid Rubber

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Abstract: Epoxy resin (EP) was premixed with (0, 5, 10, 15, and 20 phr) carbonyl-terminated butadiene acrylonitrile copolymer (CTBN) liquid rubber and cured with a diamine curing agent (IPD) for one hour at 100°C and post cured at 110°C for two hours in an air oven. The compatibility, reactivity, thermal, mechanical, and morphological properties were determined. The gel time and cure time were increased with an increase of the CTBN content. The gel and cure temperature values for all of the CTBN modified epoxy samples are higher than those of the unmodified EP. The glass transition temperatures (T_g) of the modified EP decreased with increasing CTBN content. The tensile and flexural properties (strength and modulus) of modified EPs were observed to be lower than those of the unmodified EP and decrease with an increase in the CTBN content. Conversely, an increase in the tensile strain with the incorporation of CTBN was observed. The results showed an improvement of the fracture toughness of the EP with the presence of CTBN. The toughening effect became more apparent as the testing speed was increased from 1 to 500 mm min⁻¹. The fracture surface analysis by scanning electron microscopy (SEM) discovered the presence of a two-phase morphology.

Keywords: epoxy resin, toughening of epoxy resins, liquid rubber, CTBN