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# MODIFICATION OF EXPOXY RESIN WITH EPOXIDISED HYDROXYL TERMINATED LIQUID NATURAL RUBBER

Epoxy resins are generally glassy at ambient temperature and are characterised by a densely crosslinked microstructure. Therefore, they fail by brittle fracture under normal conditions. Achary *et al.* (1990), Mc Garry (1970) Mc Garry and Sultan (1969), Rowe *et al.* (1970) and Rowe (1969) reported substantial improvements in fracture energy with the addition of 5 to 15 per cent carboxyl terminated polybutadiene. In the present work, epoxy resin, Gy 250, a bisphenol- A diglycidyl ether based resin is modified by using EHTNR as toughening agent.

Epoxy resin Gy 250, a bisphenol-A diglycidyl ether based resin made by Ciba Geigy Ltd., was chosen. Its epoxy value was 5.5 equivalents/kg. The curing agent was 2,4,6-tris (N, N-dimethyl aminomethyl) phenol, the trade name being HY 960. EHTNR was used as the toughening agent.

Hydroxyl terminated natural rubber (HTNR) which is a liquid rubber was made by depolymerising natural rubber and imparting hydroxyl groups at its terminals (Gupta *et al.*, 1985). HTNR on epoxidation with performic acid prepared *in situ* gives EHTNR (Gupta, 1986). Epoxy equivalent of the EHTNR was 1.3-1.6 eq/kg.

Six formulations containing 0,5,10,15,20 and 25 parts by weight of EHTNR with 100 parts by weight of Gy 250 were made. These formulations were mixed with 6 parts by weight of 2,4,6-tris (N, N-dimethyl aminomethyl) phenol per 100 parts by weight of the epoxy resin and cured under ambient conditions for seven days. Experiments were repeated with the same formulations but cured at 120°C for 1 h.

Lap shear bond strength and T - peel strength specimens were made as per ASTM D-1002 and ASTM D-1876 respectively. The resin formulations were applied on both sides and joined using contact pressure. The strength of the bonded specimens were measured after curing at room temperature for seven days. Five specimens were tested for each formulation.

To determine tensile strength, elongation and modulus, dumbbells were cast with the above mentioned formulations and cured for 7 days at room temperature. Experiments were repeated with curing at 120°C for 1 h. Tensile strength was tested on Instron 4202, at a crosshead speed of 10mm/min with a guage length of 45 mm at a temperature of 20°C

Differential scanning calorimetry (DSC) was used to determine glass transition temperature (Tg).

Morphology of the cured resin was studied by observing the fracture surfaces in a Cambridge stereoscan MK3 scanning electron microscope (SEM). The specimen was cut and mounted on an aluminium stub using a conductive paint and sputter coated with gold.

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