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Title
Preparation, Characterization And Properties Of Epoxidized Palm Oil-Modified Epoxy Resin/Glass Fiber Composite

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Surface treatment was carried out on E-glass fiber surface using different concentrations of hydrochloric acid solutions [0.01M-2.0M]. The morphologies of untreated and treated E-glass fiber surfaces were analysed by using scanning electron microscopy (SEM) and the peak of silanol group was identified by using Fourier Transform Infrared (FTIR). The treated glass fiber composites at 0.01MHCl showed the improvement on the tensile properties as compared to untreated and treated glass fiber composites at concentrations ranging from 0.1M to 2.0MHCl. Apart from that, the modified epoxy resin had also been studied by adding epoxidized palm oil (EPO) in the synthetic epoxy resin and it has a potential to partially substitute and toughen synthetic epoxy resin. The EPO was blended with the DGEBA type epoxy resin to determine the stoichiometric ratio for each ingredient for modified epoxy resin. Epoxidized Palm Oil modified epoxy resin was successfully cured by using aliphatic amine curing agent in the presence of imidazole catalyst of varied percentage ranging from 5% to 35%. The curing characteristics of modified epoxy resins were studied by using differential scanning calorimetry (DSC) and thermal gravimetric analyser (TGA). DSC and TGA thermograms revealed that 5% of imidazole catalyst provides good thermal stability as compared to the other percentages of imidazole catalyst. The value of glass transition temperature of modified epoxy resin that contains 5% imidazole

catalyst gave the low Tg value and it indicates the flexibility properties. The modified epoxy resin exhibited rubbery behaviour due to the flexibility of fatty acid chain of EPO thus, improved the toughness of synthetic epoxy resin properties. Furthermore, the composition of cured modified epoxy resin was analysed using FTIR to identify the functional groups that produced after crosslinking reaction between EPO, epoxy and amine curing agent. According to the FTIR spectrum of the hybrid polymer resin indicates that the intensity of epoxide band decreased with the increment of the hydroxyl group intensity. It was proven that the curing reaction occurs with the opening of functional group of epoxide ring. Laminated glass fiber epoxy composite was fabricated by hand lay-up technique and it consists of one to four layers of glass fiber. Whereas for the hybrid polymer resin composite, it was fabricated using hand lay-up and dipping techniques. The mechanical and physical properties of the laminated glass fiber epoxy composites were analysed and compared with the properties of hybrid polymer resin composites. The tensile results of hybrid polymer resin composites showed the decrement on the tensile properties but for the impact result, it shows the increment of impact strength due to toughening properties of hybrid polymer resin about 210.6 kJ/m2. For the water absorption results, it shows that hybrid polymer resin composite absorbs more water compared to laminate glass fiber composite. It would be happen due to the effect of crosslinking density. Meanwhile, the diffusion coefficient value of laminated glass fiber composite is high due to the polarity effect.