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Title : SYNTHESIS AND CHARACTERIZATION OF ULTRA VIOLET (UV) CURING ADHESIVE FROM NATURAL OILS

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Bio-Adhesive from natural oil is expected to become important sources of renewable raw material in the resin industry. The synthesis and modification process of abundant natural oil such as sunflower, vegetable, palm oil, jatropha oil are the strategy to study the potential of green resin in various applications. In this study, natural oil from sunflower, rapseed and vegetable oils were chosen to be synthesized and modified to new natural modified resin which could be exploited as adhesive and coatings resin. Oils had been chosen according to their unsaturation in glyceride. The starting materials are in the form of fatty acids and triglyceride to produce bioadhesive resin. Fatty acid or triglyceride had been synthesized to produced modified oil via various routes of synthesize method, consist of amide prepolymer, urethane oil prepolymer and fatty acid dimers. A stoichiometry and reaction temperature was studied to explore the kinetic of reactions in each of synthesize route. Gel permeation chromatography, wet chemistry and spectroscopy techniques; Fourier transform infrared (FTIR), Nuclear Magnetic Resonance (NMR) were used as characterization method to identify the functional group and chemical properties of prepolymers. Then, functional groups in these three prepolymers were activated using epoxidation and acrylation process. Epoxidation process was done via in-situ epoxidation by peroxoformic acid. This process had been optimized with the study of the effects of formic acid and hydrogen peroxide, temperature and solvents in different type of prepolymers. Grafting of Ultra violet reactive functional group were performed via acrylation. It was found that, amide polymer from isophorone diisocyanate backbone produce low viscosity pre-polymer and appropriate molecular weight for epoxidation process. Prepolymer from sunflower contain highest acrylated functional group and followed by rapseed and vegetable oil. After synthesize and modification process, ultra-violet curing (UV) resin was studied by formulating the resin with appropriate photoiniators and the intensity of UV in curing process. Co-initiator in UV curing polymerization was studied in this research due to the weakness of photoinitiator used in adhesive. The UV filtration by plastic substrate when used as UV adhesive shows the requirement of co-initiator. The performance of cured resin was evaluated by hardness, adhesion, tensile, shear strength, shrinkage, thermal resistance, chemical resistance, transition of glass, gel fraction and water adsorption. The result shows that, high crosslink network in the resin provide better physical and chemical properties. However, the density of crosslink network had reduced the adhesion properties due to the shrinkage phenomenon. To overcome this critical factor, resins from different routes of synthesis were formulated with monofunctional dan multifunctional monomers to reduce shrinkage and increase the adhesion properties. Monomers consist of mono acrylate, di acrylate, triacrylate, and teatraacrylate. The optimum formulation provides a better performance of ultraviolet curing bio-polymer.