UNIVERSITI TEKNOLOGI MARA

SYNTHESIS AND CHARACTERIZATION OF NANOPARTICLE RESIN DERIVED FROM MALEINATED SOYBEAN OIL

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Thesis submitted in fulfilment
of the requirements for the degree of
Master of Science

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AUTHOR'S DECLARATION

I declare that the work in this thesis was carried out in accordance with the regulations of Universiti Teknologi MARA. It is original and is the result of my own work, unless otherwise indicated or acknowledged as referenced work. This thesis has not been submitted to any other academic institution or non-academic institution for any degree or qualification.

I, hereby, acknowledge that I have been supplied with the Academic Rules and Regulation for Post Graduate, Universiti Teknologi MARA, regulating the conduct of my study and research.

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ABSTRACT

A study of characteristic and properties of Maleinated Soybean Oil (MSO) synthesized from different mole ratio of Maleic Anhydride and Epoxidized Soybean Oil (ESO) has been studied. Increase in acid value, the reduction of oxygen oxirane content and the color changes shows the grafting process of MA onto epoxy group of ESO. Molecular weight and viscosity of MSO is higher than ESO indicates the inclusion of carboxylic group and the values are increased with increase of MA mole ratio. MSO-1.5 was utilized for waterborne dispersion preparation due to its better properties compared with others. The MSO-1.5 was dispersed with different amount of deionized water to produce waterborne Maleinated Soybean Oil dispersion (WMSO). Nano-sized particle was confirmed through particle size testing by using particle size analyzer. Increased in molecular weight and reduction of acid value and viscosity of water-borne dispersion can be seen as volume of de-ionized water in dispersion increased. WMSO was cured by exposing under UV radiation and it physical, thermal and surface performance was investigated. Based on Differential Scanning Calorimetric (DSC) and Thermogravimetric analyzer (TGA), dispersion with smaller nano-sized particle possesses high film glass transition temperature (T_g) and degradation temperature. Film surface hardness determined by pencil hardness testing was increased with decreasing of particle size of dispersion. The adhesion of film with glass substrate was poor due to low adhesion with substrate. Through film morphology analysis, smooth surface was observed for all film samples. Wettability and surface energy of film was determined using water contact angle analyzer. Results from the contact angle showed that the high water content water-borne film sample made up with high water content have good wettability and possesses low surface energy compared with others due to the higher film surface polarity.

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