

A Waterborne polyurethane dispersions synthesized from Jatropha oil

Abstract

A series of waterborne polyurethane dispersions derived from jatropha oil-based polyol (JOL) with different OH numbers ranging from 138 to 217. mgKOH/g, were successfully prepared. Jatropha oil-based polyols were synthesized by epoxidation and oxirane ring opening using methanol. The JOLs produced were then used to prepare jatropha oil based waterborne polyurethane (JPU) dispersions by reaction with isophrene diisocyanate (IPDI). Dimethylol propionic acid (DMPA) was used as an internal emulsifier to enable the dispersion of polyurethane in water. The influence of the OH number, DMPA content and hard segment content on the stability of the wet JPU dispersions, as well as the physical, mechanical and thermal properties of the dry JPU films were investigated. The results reveal that with increasing OH number, the DMPA content and hard segment content significantly decrease the particle size from 1.1. μm to 53. nm, indicating increasing stability of the dispersions. JPU films exhibit the stress-strain behavior of an elastomeric polymer with a Young's modulus ranging from 1 to 28. MPa, a tensile strength of 1.8 to 4.0. MPa and elongation at break ranging from 85 to 325%. The polyurethane dispersions synthesized in this work possess good pendulum hardness, water repellence and thermal stability with promising application as a binder for wood and decorative coatings. © 2014 Elsevier B.V.