

Chemical and Thermo-Mechanical Properties of Waterborne Polyurethane Dispersion Derived from Jatropha Oil

ABSTRACT

Nowadays, there is a significant trend away from solvent-based polyurethane systems towards waterborne polyurethane dispersions due to government regulations requiring manufacturers to lower total volatile organic compounds, as well as consumer preference for more environmentally friendly products. In this work, a renewable vegetable oil-based polyol derived from jatropha oil was polymerized with isophorone diisocyanate and dimethylol propionic acid to produce anionic waterborne polyurethane dispersion. Free standing films with up to 62 wt.% bio-based content were successfully produced after evaporation of water from the jatropha oil-based waterborne polyurethane (JPU) dispersion, which indicated good film formation. The chemical and thermomechanical properties of the JPU films were characterized. By increasing the OH numbers of polyol from 161 mgKOH/g to 217 mgKOH/g, the crosslinking density of the JPU was significantly increased, which lead to a better storage modulus and improved hydrophobicity. Overall, JPU produced from polyol having OH number of 217 mgKOH/g appears to be a promising product for application as a binder for wood and decorative coatings.