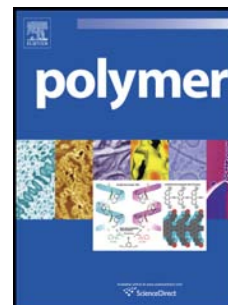


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Effects of Unsaturation and Different Ring-Opening Methods on the Properties of Vegetable Oil-Based Polyurethane Coatings

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13
14 **Abstract**

15
16 A variety of vegetable oil-based, waterborne polyurethane dispersions have been successfully
17 synthesized from different vegetable oil polyols exhibiting almost constant hydroxyl
18 functionalities of 2.7 OH groups per molecule. The vegetable oil polyols, which have been
19 prepared from vegetable oils with different fatty acid compositions (peanut, corn, soybean, and
20 linseed oil), range in residual degree of unsaturation from 0.4 to 3.5 carbon-carbon double bonds
21 per triglyceride molecule. The effects of residual unsaturation on the thermal and mechanical
22 properties of the resulting polyurethane films have been investigated by dynamic mechanical
23 analysis, differential scanning calorimetry, and thermal gravimetric analysis. Matrix-assisted
24 laser desorption/ionization time-of-flight mass spectrometry (MALDI-TOF) has been used to
25 accurately determine the molecular weight and mass distribution of the vegetable oil polyols.
26 Higher residual unsaturation results in polyurethane films with increased break strength, Young's
27 modulus, and toughness. This work has isolated the effect of unsaturation on vegetable oil-based
28 polyurethane films, which has been neglected in previous studies. The effect of different oxirane
29 ring opening methods (methanol, butanol, acetic acid, and hydrochloric acid) on the properties of
30 the coatings has also been examined.

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