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Physical Properties of Polyurethane Plastic Sheets Produced from Polyols from Canola Oil

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Abstract:

Polyurethane (PUR) plastic sheets were prepared by reacting polyols synthesized from canola oil with aromatic diphenylmethane diisocyanate. The properties of the material were measured by dynamic mechanical analysis (DMA), differential scanning calorimetry (DSC), and thermogravimetric analysis (TGA) as well as tensile properties measurements. The effect of stoichiometric balance (i.e., OH/NCO molar ratio) on the final properties was evaluated. The concentration of elastically active network chains (EANCs), ν_e , of the polymer networks was calculated using rubber elasticity theory. The glass transition temperatures (T_g) for the plastic sheets with OH/NCO molar ratios of 1.0/1.0, 1.0/1.1, and 1.0/1.2 were found to be 23, 41, and 43 °C, respectively. The kinetic studies of the degradation process of the PUR plastics showed three well-defined steps of degradation. The PUR plastic sheets with OH/NCO molar ratio 1.0/1.1 had the highest ν_e , lowest number-average molecule weight between cross-links, M_C , and excellent mechanical properties, indicating that this is the optimum ratio in the PUR formulations.

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