

Public Abstract

First Name: Arnold

Middle Name: Ano-os

Last Name: Lubguban

Adviser's First Name: Galen

Adviser's Last Name: Suppes

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Department: Chemical Engineering

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Title: SYNTHESIS AND TESTING OF SOY-BASED POLYOLS: PHOSPHATE AND GLYCEROLYSIS OLIGOMERS

Soy-based polyols are important industrial prepolymeric materials that use renewable resource. They react with isocyanates to produce polyurethanes (PU) and can be produced at costs less than polyols derived from petrochemicals. Biocatalytic, transesterification and polymerization processes were evaluated to increase equivalent weights and hydroxyl functionality of soy-based polyols used in polyurethane formulations.

Oligomeric soy-based polyols were synthesized using the following chemistries: 1) acidolysis of epoxidized soybean oil with phosphoric acid, 2) glycerol transesterification of bodied soybean oil, 3) ethylene glycol alcoholysis of epoxidized soybean oil, and 4) enzymatic polymerization. These reactions generally involved both polymerization and functionalization of the soybean oil to increase its hydroxyl equivalent weight.

Soy-based polyol products described in this study have physicochemical properties comparable to both commercial triglyceride-based and petroleum-based polyols with relatively significant reactivity with isocyanate to produce polyurethane products that include rigid and flexible polyurethane foams, and bioelastomers.