Synthesis and material properties of elastomeric high molecular weight polycycloacetals derived from diglycerol and meso-erythritol

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ABSTRACT: Copolymerizing glutaraldehyde with tetraols such as diglycerol, meso-erythritol, and pentaerythritol is particularly effective for forming very high molecular weight polycycloacetal (M<sub>n</sub>, up to 65,000 g/mol) with elastomeric properties and up to 70% biorenewable content by weight. Altering the tetraol monomer feed ratio provides control over the polycycloacetal molar mass (M<sub>n</sub>), up to 65,000 g/mol and achieves tensile properties.

This research identified a polymerization method to prepare elastomeric, high molecular weight polymers that are derived from bio-renewable sources. One of the bio-renewable sources, diglycerol, is a byproduct of biodiesel fuel production, and this new polymerization method provides an outlet for this previously underutilized raw material. In addition to the polymerization procedures, this paper highlights the significant work of UW-Eau Claire undergraduates who characterized the physical and material properties of these new polymers.