



# Chitosan as a reagent for synthesizing bio-based macromolecules with isochronic film formation

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The search for sustainable and multifunctional macromolecular materials has driven the search for new formulations using renewable raw materials. Investigations focused on synthesizing bio-based polyurethanes (PU-bio) have utilized polysaccharides as a polyol alongside ricinoleic acid triglyceride (the main component of castor oil, CO), which not only provides additional hydroxyl groups but also serves as a dispersant for the solid reagent [1]. In this context, chitosan (CS), previously purified and characterized, was used in the present study. Reports on PU-bio consider CS as an additive rather than a reagent, with the proportion of CS typically not exceeding 3% [2, 3]. Incorporating the typical structures of CS, a biopolymer recognized for its antimicrobial, bioadhesive, and wound-healing properties, can impart new properties to the produced materials. Hydroxyl groups in the CS structure react with isocyanate groups, generating urethane groups (-NH-CO-O-), similar to cellulose or starch as a polyol. However, potential reactions may involve isocyanate and amino groups in the CS structure, resulting in the formation of urea groups (-NH-CO-NH-). Syntheses were conducted considering various CS to CO mass ratios (0%, 50%, 65%, and 75%), along with hexamethylene diisocyanate. In all syntheses, films were formed isochronously. Fourier transform infrared spectroscopy (FTIR) confirmed the complete consumption of isocyanate groups. This is an ongoing investigation; the formed films undergo comprehensive characterization through thermogravimetric analysis, dynamic mechanical analysis, tensile properties, scanning electron microscopy, biocompatibility, surface contact angle, and zeta potential. The initial results are promising and foster expectations of materials with potential for various applications.

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