# Reaction kinetics and physical properties of castor oil-based polyurethanes

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For several decades, applications of polyurethane (PU) to coatings, adhesives, foams, elastomers, composite matrices and sealant have been increased. PU has been traditionally synthesized using petroleum-based polyols that are not economic and not renewable. Using natural resources to synthesize PU would be beneficial economically and environmentally. Therefore, in this study, natural castor oil (CO) with hydroxyl groups and a petroleum-based polyol (PPG-1000) were used at various mixing ratios to synthesize aliphatic bio-PU samples via reaction with stoichiometric amount of hexamethylene diisocyanate. The effects of castor oil content, catalyst (dibutyltin dilaurate) content and reaction temperature on the reaction kinetics and physical properties of the bio-PUs were investigated. The polymerization kinetics was investigated by DSC, FTIR and viscometer. The physical properties of the bio-PUs were investigated by UTM, DMA and TGA. Tensile properties of the bio-PU were best at the CO/PPG mixing ratio of 2/1.