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Title: Synthesis, characterization and application of linear and hyperbranched modified oleo-polyurethane

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Abstract

Polymers possess tunable properties, easy processability, high strength/density ratios, resistance to chemical and physical degradation, and low cost, which made them the suitable materials for various applications. Among various polymers, polyurethanes (PUs) having special microcrystalline structure and ease of structural tailoring have found wide spectrum of applications ranging from biological to industrial realm. However, the excessive use of conventional petroleum-based PUs causes severe environmental pollution and economic losses. These limitations have forced the scientists to employ naturally derived precursors in the development of biodegradable and eco-friendly PUs. Among various bio-resources vegetable oils have found to be the most promising candidates owing to their abundance, low cost, ease of chemical modifications, etc. Nevertheless, Oleo-PUs suffer from certain drawbacks like presence of hydrolysable groups (ester and urethane), low chemical stability under harsh environment, susceptibility to bacterial attack, etc., which limit their efficiency when used as anticorrosive and antimicrobial coatings and films. Several attempts have been made to overcome these shortcomings, among which the chemical functionalization (with biocidal groups), structural modification (e.g. hyperbranching), and incorporation of (nano) fillers (composite/nanocomposite formulation) found to be the effective approaches. These methodologies not only eradicated the limitations of Oleo-PUs but also enhanced their various properties. Besides, the synergistic effect of these techniques may result in the formation of (bi) functional Oleo-PU films and coatings that may strengthen their performance as

antimicrobial/anticorrosive materials. Keeping these in mind, the present thesis describes the synthesis and characterization of various (bi-) functional Oleo-PU and Oleo-PU nanocomposite films and coatings using different vegetable oils. The antimicrobial, anticorrosive, and self-matting behavior of synthesized Oleo-PUs have also been discussed in the thesis.

Keywords: Oleo-Polyurethane, Hyperbranched, Nanocomposites, Anticorrosive, Coatings, Antimicrobial, Dual-Functional.