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Solvent and catalyst free synthesis of sunflower oil based polyurethane through non-isocyanate route and its coatings properties

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ABSTRACT: Bio-based Non-Isocyanate Polyurethanes (NIPUs) were synthesized by bulk polyaddition of diamine with carbonated sunflower oil (CSFO). Carbonated vegetable oils were obtained by solvent free mixture reaction of CO₂ with epoxidized sunflower oil under the conditions (120 °C, 50 bar) and characterized by FTIR, ¹H NMR, and ¹³C NMR. Finally, the effect of the amine structure as well as CSFO/amine molar ratio (1:0.75, 1:1 and 1:2) on mechanical, and chemical properties NIPU's were studied by using curing agents EDA (1,2-ethylenediamine), DETA (Diethyltriamine) and IPDA (Isophorone diamine). Except for IPDA based NIPU, it was seen that along with urethane formation, the amine group also reacted with ester groups to form amides. IPDA and EDA showed good thermal, mechanical, chemical and anticorrosive properties. Furthermore, DETA based NIPU displayed high elongation at break. These results highlight the potentiality of this environmental friendly approach to prepare renewable NIPU materials for surface coatings purpose.

Keywords: *carbonated sunflower oil, diamines, non-isocyanate polyurethane, coating properties.*

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