Development of eco-friendly polyurethane foams based on Lesquerella fendleri (A. Grey) oil-based polyol

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In this study, we investigated the potential of polyurethane foams (LPUF) prepared from Lesquerella fendleri (A. Grey) oil-derived polyol to use as an ecological and cheap substitute for the petroleum-based polyurethane foams. The polyol was synthesized by a one-single step reaction using a mixture of hydrogen peroxide and acetic acid. The L. fendleri oil and the synthetized polyol were characterized by their physical?chemical properties as well as chromatographic analysis, iodine value, yield, saponification number, kinematic viscosity, density, theorical molecular weight, hydroxyl number, 1H and 13C NMR spectroscopy, attenuated total reflectance Fourier-transform infrared (ATR-FTIR) and Thermogravimetric analysis (TGA). The obtained L. fendleri oil-based polyol reacted with aromatic diphenylmethane diisocyanate in the presence of water, N,N,N?,N??,N??-Pentamethyldiethylenetriamine, stannous 2-ethylhexanoate and silicone, which were used as a blowing agent, catalysts and surfactant, respectively, to produce LPUF. The effects of the amount of diphenylmethane diisocyanate on apparent density values, compression test, and the average pore size of LPUFs property were studied. The results revealed that all these properties

are correlated with the MDI amount. The ATR-FTIR, TGA, SEM and selective degradation test were performed for the LPUFs, which revealed that the foam formations were successful. We obtained a macroporous structure with a combination of both open and closed cells that is more thermoresistant than the precursors with degradation products derived from hydroxylated lesquerolic (major) and linolenic (minor) acids. © 2020 Elsevier Ltd

Lesquerella fendleri

Polyol

Polyurethane foams

Renewable resource

Vegetable oil

Alcohols

Blowing agents

Chromatographic analysis

Compression testing

Degradation

Fourier transform infrared spectroscopy

Nuclear magnetic resonance spectroscopy

Polyurethanes

Pore size

Rigid foamed plastics

Silicones

Supersaturation

Vegetable oils

Attenuated total reflectance Fourier transform infrared

Diphenylmethane diisocyanate

Lesquerella

Macroporous structures

Polyol

Polyurethane Foam

Renewable resource

Stannous 2-ethylhexanoate

Thermogravimetric analysis