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Cross-linked polymers of acrylated epoxidized soybean oil and different thiols

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With increasing concern over global climate change and depletion of petroleum reserves, the search for environmentally sustainable alternatives to current production continues to intensify. One area of interest which could reduce petroleum impact on the environment, is the use of vegetable oil-based polymers in place of the commonly used petroleum-based polymers. Thiol-ene chemistry has become a widely used method for preparing advanced functional materials for several advantages, such as insensitivity to moisture and oxygen, wide tolerance for many functional groups, almost quantitative yields under mild conditions, and availability of various thiol-based compounds. The aim of this work was to evaluate the effect of the chemical structure of thiols on swelling, thermal, mechanical properties, and biodegradability of acrylated epoxidized soybean oil based polymers. The cross-linked polymers were obtained by thermal polymerization of acrylated epoxidized soybean oil with structurally different thiols, i.e. 1,3-benzenedithiol, pentaerythritol tetra(3-mercaptopropionate), and hexathiolated squalene (prepared by mixing stoichiometric amounts of acrylate/SH groups (1:1). 1-Methylimidazole was used as catalyst. The cross-linked polymer of acrylated epoxidized soybean oil and pentaerythritol tetra(3-mercaptopropionate) reached the highest yield of insoluble fraction (91 %), density of cross-links (0.078 mol/m³), swelling in water (1.2 %), and tensile modulus (230 kPa) values. All polymers are amorphous materials with the low glass transition temperature: (-12 – -11) oC from DSC curves and (3 – 8) oC from DMTA tanδ curves. All polymers are soft or medium hard materials (Shore A hardness values are from 39 to 62).

Biography

Sigita Kašėtaite has completed her master studies at the age of 24 years from Kaunas University of Technology and now is a PhD student. She has 4 papers in reputed journals.

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