



Synthesis and characterization of novel cross-linked polyester resins (UPRs) based on succinic acid

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Abstract

Unsaturated polyester resins (UPRs) are a class of polymers that have been known since the early 1930s, when they were produced industrially for the first time. UPRs consist of a polymeric matrix that has unsaturated double bonds, which in turn are used to create a cross-linked network via radical polymerization with unsaturated monomers called binders. UPRs are among the most important cross-linkable polymeric materials, due to their simple processing and the variety of their fields of application as adhesives, coatings etc.

In recent years, due to the accumulation of waste and the inability of proper management, emphasis is given in the production of polymers from renewable monomers, the so-called bio-based polymers. Succinic acid is a C4 dicarboxylic acid, which has attracted great interest because it's a fully biobased monomer that can be produced through fermentation of renewable feedstock. Among others, the main advantage of succinic acid is that it can be utilized for many applications from the chemical, pharmaceutical and food industries as it is also biodegradable and biocompatible.

In this work, UPRs based on succinic acid were prepared. Succinic acid, ethylene glycol and maleic anhydride were used to prepare unsaturated polyester chains, which in turn were cross-linked with acrylic acid as binder and a system of BPO and Cobalt (II) ethylhexanoate as initiator/ accelerator. The physicochemical properties of the prepared materials were examined with ¹H NMR, FTIR, DSC and TGA. From ¹H NMR and FTIR the successful synthesis of the materials was confirmed. With DSC measurements, parameters of the cross-linking reaction were examined and TGA was used to investigate the thermal stability of the cross-linked materials.

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