

Synthesis of epoxy resin using lignin separated from woody biomass

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A low carbon society must be realized by promoting global production that reduces the environmental emission of a product throughout its life cycle. Lignin is a major component of woody biomass that constitutes about one-fourth of woody biomass. Lignin is a three-dimensional phenylpropanoid polymer, mainly linked by ether bonds between monomeric phenylpropane units, which are not readily hydrolysable. Since pretreatments aimed at recovering polysaccharide components of woody biomass for pulping and bioethanol production by degrading and removing lignin, lignin is a major inevitable byproduct of these industries. The aim of this study is to develop a method for the synthesis of epoxy resin from lignin obtained from woody biomass by steam explosion. A chemical and physical pretreatment, i.e. steam explosion, was applied for the separation of low-molecular weight lignin in the woody biomass. The low-molecular weight lignin was separated from the steam-exploded woody biomass by the extraction of water followed by methanol. The characteristics of low-molecular weight lignin were clarified by measuring IR spectra, molecular weight, and phenolic hydroxyl group. Furthermore, the possibility of using low-molecular weight lignin from steam-exploded woody biomass was evaluated as a resource material for epoxy resin, instead of the typical resource of epoxy resin, i.e., bisphenol A. Thermal and mechanical characteristics of woody biomass lignin-based cured epoxy resins were compared with the petroleum-derived epoxy resin. Hardened lignin epoxy resins that are homogeneous can be obtained by using the low-molecular weight lignin, i.e. methanol soluble lignin from steam-exploded woody biomass.

Biography

Chikako Asada has completed her Ph.D. in 2005 from Kanazawa University and postdoctoral studies from The University of Tokushima. She has worked on biomass conversion technologies for several years, with expertise in synthesis of epoxy resin using lignin from plant biomass.

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