

Structural analysis of green adhesives synthesized by coir fiber lignin substitution in phenolic resol resins.

L.A. Panamgama* and W.M.Y. Madhuwanthi

Department of chemistry, Faculty of Science, University of Ruhuna, Matara.

This research investigated the possibility of substituting coir fiber lignin in synthesis of bio-based phenolic resol resins. Coir fiber was subjected to alkaline soda process from which the lignin was recovered. The optimum conditions were found to be at 100 °C with coir/water (1:8 w/w) and at pH=11 where the lignin yield attained ca. 26% with a purity of ca. 83%. By simultaneously reacting with phenol followed by formaldehyde in a condensation polymerization catalyzed by sodium hydroxide the coir fiber lignin has been subjected to hydroxymethylation reaction for the introduction of hydroxyl groups into its structure, to enhance the reactivity. For more complete exploitation of coir fiber lignin in the partial replacement of petroleum based phenol, a series of phenol-lignin-formaldehyde resins was prepared. Here polyblended bio-based resol resins were synthesized by varying the coir lignin (w/w) % ratio in the 0-50 range. Structural analysis of the resulting resins was determined by Fourier transform infrared spectroscopy (FTIR), ultraviolet – visible (UV-vis) absorption measurements and gel time measurement. A dramatic decreasing effect of the gel time in the copolymer system was observed with gradual increment of the (w/w) % lignin. By analyzing the FTIR and UV-vis spectroscopic data, the optimum conditions to achieve lignin hydroxymethylation could be deduced. The obtained analytical results proved the powerful potential of coir fiber lignin as a natural polyphenol.

Keywords: coir fiber, lignin, alkaline soda process, black liquor, eco-friendly materials.

*asoka@chem.ruh.ac.lk