Synthesis and thermal stability of glyoxalated alkali lignin-polyvinylpyrrolidone resins

ABSTRACT

Natural, renewable, and non-toxic lignin-based resin was synthesized through copolymerization with monomeric N-vinyl-2-pyrrolidone (VP) in the presence of benzoyl peroxide (BPO) as the free radical initiator. Glyoxalated lignin was used as the feedstock. The mechanism of copolymerization between the glyoxalated alkali lignin and VP monomer was determined through Fourier-transform infrared spectroscopy (FT-IR). The optimum amount of VP monomer used and the reflux time required in the synthesis process were determined through thermogravimetric analysis (TGA). In the presence of BPO, copolymerization between glyoxalated alkali lignin and VP monomer was accomplished via the formation of ether linkages in a condensation reaction at pH 7.0. More ether linkages were formed with higher amounts of VP monomer and longer reflux times. The addition of VP monomer into glyoxalated alkali lignin increased its thermal stability. FT-IR and TGA indicated that 0.012 moles of VP monomer and an 8-h reflux time were optimum conditions for the synthesis of glyoxalated alkali lignin-polyvinylpyrrolidone resins.

Keyword: Bio-resin; Lignin; Polyvinylpyrrolidone; Copolymer

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