Preparation and Characterization of Lignin Polyols from the Residues of Oil Palm Empty Fruit Bunch

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Abstract

In this work, lignin polyols were prepared from the liquefaction of kraft lignin and from the direct liquefaction of Elaeis guineensis lignocellulosic waste. The liquefaction reaction was performed with polyhydric alcohols using sulfuric acid as catalyst at 160 °C. The physical and chemical characterizations of lignin and lignin polyols were conducted by elemental analysis, Fourier transform-infrared spectroscopy, 1H and 13C nuclear magnetic resonance (NMR) spectroscopy, molecular weight distribution, and thermogravimetric analysis (TGA). Quantitative 13C NMR showed that all aliphatic hydroxyl group values of polyols noticeably increased with the use of the two methods compared to kraft lignin. The average molecular weight analysis of the liquefied product showed that it exhibited high molecular weight compared to kraft lignin. Both structural and thermal characteristics suggest that lignin polyols would be a good substitute for kraft lignin in the synthesis of polymeric compounds such as environmentally friendly resins or wood adhesives, as it presents higher amounts of activated free ring positions, higher molecular weight, and high thermal stability..