

Production of ecofriendly bio-lubricant samples from palm kernel oil using different chemical modification approaches

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Abstract

This work focused on the chemical synthesis and characterization of palm kernel oil (PKO) for bio-lubricant production using transesterification of palm kernel methyl ester (PKME) with trimethylolpropane (TMP) and epoxidation-esterification methods. The PKO was extracted using solvent extraction method. The physicochemical characteristics of the PKO and produced bio-lubricant samples were determined using standard methods. Fourier Transform Infrared (FTIR) spectrometry and Gas Chromatographic analyses, were respectively, used to determine the predominant functional groups and fatty acids of PKO and the produced bio-lubricant samples. At 55 °C, 150 min and 0.5 mm particle size, kernel oil yield was 49.82 % (by weight). The viscosities at 40 °C, 100 °C, viscosity index, pour and flash points of the bio-lubricants produced by transesterification of TMP (PKBLT) and epoxidation-esterification (PKBLE) methods, were [42.53 cSt, 10.65 cSt, 139, - 11 °C, 235 °C] and [44.69 cSt, 11.42 cSt, 132, - 12 °C, 240 °C], respectively. Time, mole ratio and temperature effects were the main factors that significantly influenced the transesterification and epoxidation processes. The obtained physicochemical properties of PKBLE and PKBLT samples showed conformity with ISO VG 32 standard, hence, their possible application as bio-lubricant basestock.

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