

Extraction modeling, kinetics and thermodynamics of solvent extraction of Irvingia gabonensis kernel oil, for possible industrial application

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Abstract

Temperature, time and particle size effects on Irvingia gabonensis kernel oil (IGKO) yield, as well as the kinetics and thermodynamics parameters were investigated. Highest oil yield of 68.80 % (by weight) was obtained at 55 °C, 150 min., and 0.5 mm. Evaluated physicochemical properties of IGKO indicated that viscosity, acidity, dielectric strength, flash and pour points were 19.37 mm²s⁻¹, 5.18 mg KOHg⁻¹, 25.83 KV, 285 °C, and 17 °C, respectively, suggesting its feasibility as transformer fluid upon further treatment. Of the pseudo second order (PSO) and hyperbolic kinetic models studied, the former gave better fit to the experimental data. [?]H, [?]S and [?]G values of IGKO extraction at 0.5 mm and 328 K were, 251.81 KJ/mol, 1.08 KJ/mol and -105.49 KJ/mol, respectively, indicating the endothermic, irreversible and spontaneous nature of the process. Kinetic model equations that describe the process were successfully developed for both models based on the process parameters.

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