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ISOTHERM AND KINETIC STUDIES OF RESIDUAL OIL ADSORPTION FROM PALM OIL MILL EFFLUENT (POME) USING BOILER FLY ASH

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Abstract

The removal of residual oil from palm oil mill effluent (POME) using boiler fly ash was studied in this paper, with focus on the adsorption isotherms and kinetic studies by measuring the residual oil concentration using UV-spectrophotometer. The percent residual oil adsorbed decreased from 80% to 5% as contact time was increased from 10 mins to 120 mins but increased from 2.74% to 72.98% as initial concentration of residual oil increased from 0.04812 mg/L to 0.2406 mg/L. Pseudo-second order kinetic model gave a better fit to the sorption kinetic data and the adsorption of residual oil was found to follow chemisorptions mechanism. The equilibrium sorption data showed a linear relationship and among the six sorption isotherms used for analysis of equilibrium data, the Langmuir isotherm gave the best fit with R^2 value of 0.9989. The trend of fitness of the isotherms was found as; Langmuir>Smith>Temkin>Dubinin-Radushkevich>Harkins-Jura>Freundlich. The Langmuir dimensionless constant (R_L) showed that the sorption process was favourable. The maximum monolayer sorption capacity was found to be 0.3476 mg/g. Therefore, this study showed that waste boiler fly ash could be used as a good adsorbent for removal of residual oil from POME. This will help in the achievement of a zero discharge layout for palm oil mills.

Key words: adsorption, boiler fly ash, environment, POME, residual oil

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