Removal of free fatty acid from used palm oil by coffee husk ash / Vanida Chairgulprasert, Porntip Madlah

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Abstrak

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Reduction of free fatty acid (FFA) in used palm oil was determined after treatment of waste cooking oil with an adsorbent derived from coffee bean husk ash. Coffee husks were burned at 600 ºC for 12 hrs to obtain the adsorbent ash. Free fatty acid removal efficiency was optimized with respect to ash dosage, contact time and temperature. It was found that shaking ash (1 g) with waste palm oil (50 g) at 250 rpm and 30°C for 330 min gave the highest reduction in free fatty acids (FFA) (1966 mg/g). The adsorption isotherm was followed by Temkin (R2 = 0.9283) and Freundlich models (R2 = 0.9146). The adsorption of FFA at all adsorbent doses followed pseudo-second order kinetics (R2 = 0.9817-0.9999). A thermodynamic study revealed that the changes in enthalpy, entropy and Gibbs free energy were 89.07 kJ/mol, -0.25 kJ/mol.K and -5.15 to -12.17 kJ/mol, respectively. The coffee husk ash (5 g ash / 50 g waste palm oil) was found to reduce FFA by 100% at 30°C.

Keywords
Coffee husk, Used palm oil, Free fatty acid, Adsorption, Ash