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Utilization of Rice Husk for Oil Removal

Zufar Danial Ab Multaizidilfikri[a], Shariff Che Ibrahim[a*]

Structured Abstract

Background: Oil spills have severe environmental and economic impacts, with numerous recent cases globally. They hinder oxygen transfer in water, posing a significant threat to aquatic life. Despite various removal methods, high costs remain a challenge. This study explores an economical alternative: using biomass, specifically rice husk, for oil adsorption. Agricultural waste like rice husk has proven effective in removing pollutants due to its functional groups and porous structure, offering a sustainable solution for oil spill remediation.

Methods: The method involved preparing rice husk samples by sieving, blending, washing, and drying. Two types of oil, cooking, and engine were used. SEM and ATR-FTIR to analyze rice husk properties: SEM for surface morphology and FTIR for functional groups. The oil sorption capacity was tested by fully immersing rice husk (0.5g, 1.0g, 3.0g) in oil for 5, 10, and 15 minutes. Each sample was triplicated. Batch adsorption studies measured oil removal efficiency by immersing rice husk in an oil-water mixture. N-hexane dissolved the oil to measure water adsorption weight.

Results: The properties of rice husk show that it has irregular and porous surfaces, while FTIR results reveal the presence of carbonyl functional groups (C=O at 1635.9 cm^{-1}), which play a role in adsorption through interactions with adsorbate molecules. The adsorption capacity results indicate that engine oil has a higher adsorption capacity compared to cooking oil, with engine oil peaking at 4.06 at a 1.0g dosage within 10 minutes while cooking oil peaks at 3.8 using a 0.5g dosage within 10 minutes. For oil removal efficiency, cooking oil in water showed superior results, peaking at 40%, while engine oil reached 33%, both at a maximum dosage of 3.0g rice husk within 15 minutes of soaking time.

Conclusion: In conclusion, rice husks have considerable adsorption potential due to their irregular, porous surfaces and carbonyl functional groups (C=O at 1635.9 cm^{-1}). Engine oil showed higher adsorption capacity, peaking at 4.06 with a 1.0g dosage in 10 minutes while cooking oil peaked at 3.8 with a 0.5g dosage in 10 minutes. Cooking oil removal efficiency peaked at 40%, and engine oil at 33%, both with 3.0g in 15 minutes.

Keywords: Rice Husk, Oil, Sorption Capacity, Removal Efficiency, Properties

*Correspondence: sha88@uitm.edu.my

[a] School of Chemistry & Environment, Faculty of Applied Sciences, Universiti Teknologi MARA, Shah Alam, Malaysia