

ABSTRACT

Environmental pollution from crude oil spills containing heavy metals such as nickel (Ni), copper (Cu), iron (Fe), and zinc (Zn) poses toxic risks to ecosystems and human health. This study aims to reduce heavy metal concentrations in crude oil using adsorption by activated carbon derived from coconut shell. Activation was performed using soursop leaf extract rich in bioactive compounds (flavonoids, alkaloids, tannins, saponins) to enhance the diversity of active functional groups. Additionally, oxidation with 0.5 M KMnO_4 solution was applied to increase hydroxyl (OH) and carbonyl (C=O) functional groups. The research stages included preparation of soursop leaf extract, synthesis and modification of activated carbon, preparation of carbon colloid, crude oil preparation, and adsorption tests using batch and continuous flow methods. Material characterization was conducted using FT-IR, PSA, BET, SEM-EDX, and XRF. FT-IR results showed the addition of C-N (1364 cm^{-1}) and Mn-O (745 cm^{-1}) groups. EDX confirmed the presence of C, O, and Mn elements. Adsorption tests demonstrated significant reductions in Fe (from 36.62% to 9.05%), Ni (from 34.28% to 21.64%), and Cu (from 22.73% to 16.10%), indicating the effectiveness of carbon colloid in adsorbing and lowering heavy metal concentrations in crude oil samples.

Keyword : activated carbon, coconut shell, soursop leaf, kmno_4 , adsorption, heavy metals and crude oil.