

Investigation of the potential of empty fruit bunch (EFB) and press mud for the removal of heavy metals from wastewater

ABSTRACT

Improper management of organic industrial wastes, such as empty fruit bunch (EFB) from the palm oil industry and pressmud, i.e., a by-product of the sugar refinery industry can lead to environmental problems. This study aims to investigate the potential of pressmud and EFB as adsorbent materials in wastewater pollution removal. The chemical analysis in this study revealed that the EFB sample contained 7.30% of SiO₂, 2.11% of Fe₂O₃, 1.91% of MgO, 28.02% of CaO, 37.59% of K₂O, 1.45% of P₂O₅, 14.51% of Cl, 4.39% of SO₃, and 2.38% of other elements. Meanwhile, the pressmud sample contained 14.32% of SiO₂, 1.39% of SO₃, 81.71% of CaO, 1.03% of Fe₂O₃, and the remaining 1.56% of other compounds. The possible adsorption capacities of pressmud and EFB were determined using the Langmuir and Freundlich isotherms. The absorption of Cd, Cr, Cu, Fe, Mn, Ni, and Zn in these samples was analyzed using the Langmuir and Freundlich isotherm models. By comparing both models, the research revealed that the Langmuir model provided a more precise description of the adsorption process for the EFB and pressmud samples and was competently compared to the Freundlich model, as indicated by the highest R² values. The results indicate the potential of EFB and pressmud as promising reactive materials for heavy metal adsorption, and this involves recognizing possibilities for repurposing these economical and sustainable waste materials.