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Response surface methodology optimization of adsorption and kinetics of Ca removal from aqueous solution using macadamia nutshell biochar

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Response surface methodology optimization of adsorption and kinetics of Ca removal from aqueous solution using macadamia nutshell biochar

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Macadamia nutshells collected from Nelspruit (Mpumalanga) were pyrolyzed using a tube furnace and microwave heating process. The produced biochar was activated chemically with varying concentrations of HCL, H₂SO₄, H₃PO₄ and HNO₃ to improve their adsorption ability. The optimised removal of calcium from a gold elution effluent is the focus of the project. This paper reports on the use of response surface methodology to optimise the adsorption isotherm of the calcium removal from aqueous solutions generated to mimic the plant effluent. The kinetics study complements the paper. BET, SEM, TGA FTIR, XRF and XRD were utilised to characterise both the as-received nutshells, the produced biochar and the Ca-loaded activated biochar. The behaviour in an attrition test as well as their proximate analysis data will be discussed in the light of the optimised Ca removal. The collected Ca adsorption parameters will be validated using the response surface methodology.

Keywords: Isotherms of adsorption, biochar, macadamia nutshells, kinetics study

Apply to be considered for a student award (Yes / No)?

yes

Level for award (Hons, MSc, PhD, N/A)?

PhD

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