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EFFICIENT LOW-COST REMOVAL OF Pb (II) FROM INDUSTRIAL WASTEWATER USING "YAKADA MARAN-DERIVED CHARCOAL"

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Heavy metal pollution of water resources is a serious issue, implicating several health concerns, including neurological effects, cardiovascular issues, kidney damage, and reproductive effects. Lead (Pb) is particularly problematic among heavy metals due to its high toxicity, environmental persistence, and tendency to bio-accumulation. Chronic exposure to lead causes long-term damage to cardiovascular and renal systems. Biosorbents are promising materials for the removal of heavy metals through adsorption. This study explored the removal of Pb(II) ions from synthetic industrial wastewater using "Yakada Maran" (YM) *Syzygium zeylanicum*, a cost-effective, readily available natural material collected from Balangoda, Sri Lanka. The YM was converted into charcoal (YMC) to maximize its adsorption abilities. Batch experiments were conducted using 10 mg/L Pb(II) solution. Optimal dosage, shaking time, settling time and the effect of pH were identified. However, the settling time does not affect the results. Langmuir isotherm model best described the adsorption process, suggesting monolayer adsorption of lead on YMC. The lead removal efficiency of YMC was 92.5%, with the maximum adsorption capacity of 4.63 mg/g. The kinetic data fit the pseudo-second-order model with a high correlation coefficient of 0.9995, indicating that the chemisorption is the rate-limiting step. Future research will be focused on developing and testing regeneration methods to enhance the sustainability of the biosorbent.

Keywords: Adsorption isotherm, Biochar, Column study, Kinetic model, Low-cost adsorbent