

Synthesis of KCC-1 using rice husk ash for Pb removal from aqueous solution and petrochemical wastewater

Rosaliza Hasan^a; Chi Cheng Chong^a; Herma Dina Setiabudi^{ab}

^a Faculty of Chemical and Natural Resources Engineering, Universiti Malaysia Pahang, 26300 Gambang, Kuantan, Pahang, Malaysia

^b Centre of Excellence for Advanced Research in Fluid Flow, Universiti Malaysia Pahang, 26300 Gambang, Kuantan, Pahang, Malaysia

ABSTRACT

A silica-rich rice husk ash (RHA, 95.44% SiO₂) was used as a silica precursor in the synthesis of KCC-1 for Pb(II) removal. The extraction of silica was carried out under several extraction methods (alkali fusion (AF), reflux (RF) and microwave heating (MW)) and extraction parameters (NaOH/RHA mass ratio, fusion temperature and H₂O/NaOH-fused RHA mass ratio). The highest silica content was obtained using AF method at extraction conditions of NaOH/RHA mass ratio = 2, fusion temperature = 550 °C, and H₂O/NaOH-fused RHA mass ratio = 4, with silica concentration of 85,490 ppm. TEM, FTIR, and BET analyses revealed the synthesized KCC-1 has fibrous morphology with surface area of 220 m²/g. The synthesized KCC-1 showed good performance in removal of Pb(II) from aqueous solution (74%) and petrochemical wastewater (70%). The analyses of petrochemical wastewater revealed that the adsorption process using synthesized KCC-1 effectively decreased the concentration of COD (489 mg/L to 106 mg/L), BOD (56 mg/L to 34 mg/L) and Pb(II) (22.8 mg/L to 6.71 mg/L). This study affirmed that KCC-1 was successfully synthesized using RHA as silica precursor and applied as an efficient adsorbent for Pb(II) removal.

KEYWORDS:

Rice husk ash (RHA); Alkali fusion; Lead; Adsorption