Activated carbon from residual oil fly ash for heavy metals removal from aqueous solution

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\textbf{ABSTRACT}

This study investigated the potentiality of residual oil fly ash as a precursor of activated carbon (AC). Fly ash samples were activated by physical activation method, i.e. with CO\textsubscript{2} flow at 950°C for 2 h. Samples were characterized by BET, SEM, FTIR, and XRD techniques. The produced AC developed a high surface area (269.013 m\textsuperscript{2}/g). The synthesized AC was then examined as an adsorbent for Cu(II) and Pb(II) removal from aqueous solutions. The effect of solution pH, initial solution concentration, and contact time were studied. Results of batch experiments for precipitation (in absence of AC) showed that removal of both Cu(II) and Pb(II) ions by precipitation was occurred at pH 6 and increased at pH 7 with removal values of 52.5 and 88.1%, respectively. On another hand, higher removal efficiency of metal ions by adsorption (in presence of AC) was achieved with increased solution pH levels. Adsorption values of 72.7 and 78.5% were achieved at pH 5 for Cu(II) and Pb(II), respectively. Complete removal (99 and 99.3% for copper and lead, respectively) of both metals was achieved at pH 7 (adsorption and precipitation). The maximum equilibrium time of adsorption was found to be 30 min for the two metal ions. Kinetics studies revealed that the adsorption of Cu(II) and Pb(II) onto AC followed the pseudo-second-order kinetics and the adsorption equilibrium data were well fitted to Langmuir isotherm model.

\textit{Keywords:} ROFA; Oil fly ash; Activated carbon; CO\textsubscript{2} activation; Heavy metals adsorption; Cu(II) and Pb(II) removal

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