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Fly ash-based geopolymer for Pb removal from aqueous solution

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Abstract: The aim of this work was to synthesis highly amorphous geopolymer from waste coal fly ash, to be used as an adsorbent for lead Pb(II) removal from aqueous wastewater. The effect of various parameters including geopolymer dosage, initial concentration, contact time, pH and temperature on lead adsorption were investigated. The major components of the used ash in the current study were SiO₂, Al₂O₃ and Fe₂O₃ representing 91.53 wt% of its mass. It was found that the synthesized geopolymer has higher removal capacity for lead ions when compared with that of raw coal fly ash. The removal efficiency increases with increasing geopolymer dosage, contact time, temperature, and the decrease of Pb²⁺ initial concentration. The optimum removal efficiency was obtained at pH 5. Adsorption isotherm study indicated that Langmuir isotherm model is the best fit for the experimental data than Freundlich model. It was found also that the adsorption process is endothermic and more favorable at higher temperatures.