Removal of Pb(II) and Cd(II) from aqueous solution using alkaline-modified pumice stone powder (PSP): equilibrium, kinetic, and thermodynamic studies.

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Abstract

Adsorption processes of Cd(II) and Pb(II) from aqueous solutions onto pumice stone powder (PSP) were in-vestigated in batch mode. The inuences of solution pH, contact time, adsorbent dosage, initial metal (M) concentration, and temperature on adsorption process were investigated. The kinetic and isotherm data were analysed using different model equations. The adsorption process was consistent with the Langmuir model for both metal ions with high R2 and low $\chi 2$ values for both Pb(II) and Cd(II). The maximum monolayer adsorption capacities were 28.09 and 27.17 mg g-1 for Pb(II) and for Cd(II), respectively. The pseudo-second order kinetic model explained the kinetic data as evidenced by the calculated qe (cal) values (10.42 mg g-1 for Pb(II) and 2.62 mg g-1 for Cd(II)) agreeing with the experimental values (9.24 mg g-1 for Pb(II) and 2.49 mg g-1 for Cd(II)). Consequently, the present study demonstrated that PSP could be utilised in adsorptive removal of Cd(II) and Pb(II) ions from aqueous solutions.