

Preparation of poly(vinyl alcohol)(PVA)/peat/clay composite beads as adsorbents for the removal of Pb (II) and Zn(II) ions from aqueous solutions

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Abstract

A new type of poly(vinyl alcohol)(PVA)/peat/clay composite bead was prepared and shown to be suitable for use as an adsorbent. The mass transport process for the adsorption of metal ions onto the composite beads in an aqueous system was investigated. In the external mass transport process, the rate of ion diffusion decreased and increased with increasing initial metal ion concentrations for Pb<sup>2+</sup> and Zn<sup>2+</sup> ions, respectively. In the intraparticle diffusion process, the diffusion coefficient decreased with increasing initial metal ion concentrations in the range of  $1 \times 10^{-3}$  to  $4 \times 10^{-3}$  M, and the diffusion coefficient maintained an almost constant value in the range of  $6 \times 10^{-3}$  to  $22 \times 10^{-3}$  M. The rate of ion diffusion within the adsorbent for the Pb<sup>2+</sup> ions was faster than that for the Zn<sup>2+</sup> ions. The adsorption mechanism was controlled by the intraparticle diffusion process. The maximum amount of adsorbed metal ions at adsorption equilibrium for Pb<sup>2+</sup> and Zn<sup>2+</sup> ions in this study was 134.57 and 13.28 mg/g composite bead, respectively.

Keyword : composite beads; poly(vinyl alcohol); peat; clay; metal ions; adsorption