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Cerium (IV) Arsenovanadate – A Reusable And Highly Efficient Ion Exchange Material For The Recovery of Cobalt, Lead And Manganese From Aqueous Solutions

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ABSTRACT

A new inorganic cation exchanger Cerium(IV) arsenovanadate (CeAsV) has been synthesized by co-precipitation method under different experimental conditions. Ion exchange material synthesized at pH 1.0 shows an ion exchange capacity 1.25 meq/g for Na⁺ ions. Instrumental techniques like XRD, FT-IR, TGA, SEM, EDS and UV-Vis DRS were used to elaborate the structural aspects. Its thermal and chemical stabilities, pH titration curve, and distribution coefficients towards different metal ions were studied systematically. Distribution studies showed that the selectivity of the exchanger towards various metal ions was in the order Co²⁺ > Pb²⁺ > Mn²⁺ > Cd²⁺ > Bi³⁺ > Cu²⁺ > Zn²⁺ > Mg²⁺ > Hg²⁺ > Ni²⁺. The differential selectivity of metal ions on CeAsV has been utilised for some important binary separations such as Co²⁺-Hg²⁺, Co²⁺-Ni²⁺, Co²⁺-Mg²⁺ and Co²⁺-Zn²⁺. The analytical applications of new exchanger were explored by the recovery of Co²⁺, Pb²⁺ and Mn²⁺ metal ions from synthetic wastewater on the column of CeAsV. Effects of pH on uptake of these metal ions on CeAsV also studied to regulate the settings for column operations.

Keywords: Ion exchange material, Ion exchange capacity, Distribution coefficients, Binary separations etc.
