KINETIC AND THERMODYNAMIC PROCESSES ON WEAK ACID RESINS IN METALS REMOVAL FROM WASTEWATER

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Abstract.
The chemical and metallurgical industries are the main producers of metal-bearing liquid effluents that due to the toxic character of many of the metals contained in them need to be treated before the final discharge. The removal of Cr^{6+} from aqueous solution by an ion-exchange resin is described. Ion-exchange resins Purolite A 500 shows a remarkable increase in sorption capacity for Cr^{6+}, compared to other resins. The sorption process, which is pH dependent shows the maximum removal of Cr^{6+} in the pH range 1–5 for an initial Cr^{6+} concentration of 1 g/L. The sorption of Cr^{6+} on these cation exchange resins follows first-order reversible kinetics and pseudo-first-order kinetics.

Key words: ion-exchange; heavy metals; liquid effluents; environment, Cr^{6+}

Introduction

Chromium, occurring as Cr^{3+} or Cr^{6+} in the environment, is an important material resource, an essential micronutrient or toxic contaminant too. Cr^{3+} is necessary for the normal development of human and animal organisms but Cr^{6+} activates teratogenic processes, disturbs DNA synthesis and can give rise to mutagenous changes leading to malignant tumours (Cavaco et al., 2009). Natural sources of chromium include weathered rocks, volcanic exhalations and biogeochemical processes and, in the man-polluted environment, mainly waste after processing and utilization of chromium compounds. Chromium is an important and widely used element in industry. The hexavalent and trivalent chromium are often present in electroplating wastewater. Other sources of chromium pollution are leather tanning, textile, metal processing, paint and pigments, dyeing and steel fabrication. To remove toxic chromium compounds from sewages several methods are used such as: precipitation, coagulation, solvent extraction and various kinds of membrane processes, ion flotation, adsorption and ion-exchange (Dąbrowski et al., 2004). The maximum limit in drinking water is of 0.05 mg/L. The drinking groundwater chromium content ranges on the average from 0.07 to 2 mg/L.

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