ELECTROPERMUTATION OF A MIXTURE OF HEAVY METALS IN DILUTED SOLUTION

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Key Words: Electropermutation, ion-exchange resin, heavy metals, diluted solution, cation mixture

A water treatment process based on coupled techniques of electroextraction and electrodeposition is proposed. It allows the efficient removal of heavy metals at low concentration from domestic and industrial effluents, producing simultaneously an effluent according to the international norms [1], and a concentrate solution from which metals are eliminated by electrodeposition. Electropermutation is an electroextraction process combining the conventional ion exchange with a modified electrodialysis procedure [2,3]. The cell consists of three compartments in which the cation-exchange resins are placed in the central compartment. In the central compartment, the polluted effluent flows continuously as single pass system. Under an applied current, the metal cations are fixed by the ion-exchange resins, substituted by protons provided by the acidic solution contained in the regeneration compartment and transferred into the receiver compartment where they are concentrated. The process feasibility is tested using low concentration solution of Zn²⁺, Cd²⁺ and Cu²⁺ ions. Solutions containing only one cation and mixtures of the cations are used under various experimental conditions. The results of elimination and reconcentration ratios of the divalent cations were analysed in terms of current density, flow rate, salt concentration and nature of regenerating acid solutions. The competition between the electroextraction of the metallic cations Zn²⁺, Cd²⁺ and Cu²⁺ was investigated for different concentration mixtures (either with equal concentrations of metallic cations or with one predominant metallic cation) and pre-established experimental conditions. The electromutation results are therefore analyzed with respect to the cations’ transfer into the receiver compartment. This study has demonstrated the possibility to treat by electromutation a mixture of metallic cations with an efficient removal (≥ 97%).

References