Universidad de Concepción
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CATIONIC POLYELECTROLYTES.

SYNTHESIS, CHARACTERIZATION AND APPLICATION IN ANALYSIS AND REMOVAL OF ARSENIC

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ABSTRACT

Arsenic occurs in a variety of forms and oxidation states and is a very toxic element. The main arsenic species present in natural waters are arsenate (oxidation state V) and arsenite ions (oxidation state III). The efficiency of arsenic extraction depends strongly on the ability to convert As(III) into more easily extractable As(V) species.

This research proves that it was possible to remove arsenate from aqueous solutions by the liquid-phase polymer-based retention (LPR). The LPR technique using an ultrafiltration membrane enables the separation of ionic species, which are retained by the $(R)_4N^+X^-$ functional groups of water-soluble polyelectrolytes. The ions do not pass through the membrane and are separated from the aqueous solution.

On the other hand, this research shows that nanocomposite electrode materials synthesized by incorporation of Pt^0 and Pd^0 nanoparticles dispersed in poly(pyrrole-alkylammonium) matrix present strong electrocatalytic properties towards the oxidation of arsenite to arsenate. The nanocomposite films modified electrodes can be use for As(III) analysis. The capability of these nanocomposite electrode materials deposited onto carbon felt macroelectrodes for exhaustive electrocatalytic oxidation of arsenite solutions was also demonstrated.

The use of water-soluble poly(quaternary ammonium) salt acting both as supporting electrolyte and as agent to remove As(V) species allowed to combine the electrocatalytic oxidation (EO) of As(III) with a LPR process to efficiently remove arsenic. The results show almost the complete retention of As(V) previously electro oxidized.

Keywords: Electrocatalysis; Polymer-metal nanocomposite; Liquid-phase polymer-based retention; Water-soluble polyelectrolyte; Arsenic removal.