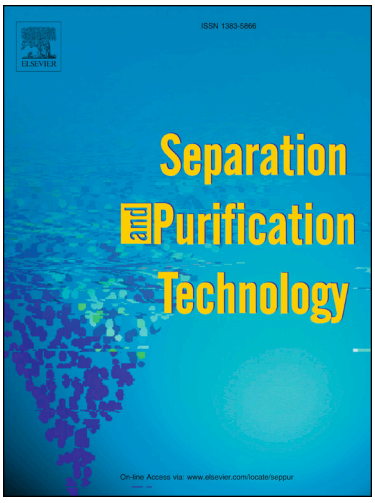

Iron removal from waters by electrocoagulation: Investigations of the various physicochemical phenomena involved

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Iron removal from waters by electrocoagulation: Investigations of the various physicochemical phenomena involved

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Abstract:

Electrocoagulation (EC) is an electrochemical technique for removal of various pollutants - in particular metal cations - from waste or groundwaters. In comparison with other metal cations, iron can be under divalent and trivalent forms, with different physicochemical properties, so various physicochemical phenomena are to occur for its removal. For the case of Fe^{2+} ions removal from a synthetic aqueous solution by EC with aluminium electrodes, we investigated both occurrence and significance of the various phenomena encountered e.g. formation of divalent iron hydroxide, adsorption of Fe species on Al(III) flocs formed and oxidation phenomena. Designed experiments have been conducted with an electrochemical cell at various current densities below 10 mA cm^{-2} and pH, and depending on the nature of the gaseous atmosphere, or in an electroless stirred vessel. Analysis of the data showed that, in addition to direct Fe^{2+} adsorption on generated solid aluminium hydroxide, Fe(II) hydroxide formed near the cathode surface, precipitates jointly on the Al flocs. Fe(II) oxidation by air oxygen in the liquid phase in EC runs was predicted to be little significant, whereas solid $Fe(OH)_2$ is oxidized more efficiently to $Fe(OH)_3$. However, Fe(II) oxidations improve only little its removal from the water treated by electrocoagulation, as shown by EC tests in anoxic conditions.

Keywords: Electrocoagulation; water treatment; Fe(II) species; air oxidation; precipitation.

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