Desalination and Water Treatment
www.deswater.com
doi: 10.1080/19443994.2014.981414

56 (2015) 2689–2698
December

Taylor & Francis
Taylor & Francis Group

Removal of zinc ions from synthetic and industrial Tunisian wastewater by electrocoagulation using aluminum electrodes

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Received 3 December 2013; Accepted 28 May 2014

ABSTRACT

Electrocoagulation (EC) is an efficient technique for cleaning waste water containing heavy metals before discharge in the environment. The performance of electro coagulation for zinc ions removal using aluminum electrodes was investigated in this paper. Several electrochemical parameters such as pH, current density, electrolyte doses, energy consumption, initial concentration, EC time, the state of the aluminum plates, and heavy metal ions concentration were studied in an attempt to achieve high zinc removal efficiency. Optimum conditions for zinc removal were found at a pH value of 7, a current density of 7.35 mA cm^{-2}, an inter-electrode potential of 5 V, a conductivity of 5.3 mS cm^{-1}, and an EC time of 30 min. These operating conditions can simultaneously achieve a good mix, good flotation, high flocs stability, and thus efficient removal in a relatively short reaction time and low cost with a removal percentage up to 98.96. The testing of zinc removal from industrial waste water showed that the removal by EC using aluminum electrodes was effective and the removal efficiency of zinc reached 100% in the first 5 min of treatment with a very low power consumption of 1.02 kW h m^{-3} for an initial pH over 5. In the light of these results, this method promises interesting industrial applications.

Keywords: Industrial wastewater treatment; Electrochemistry; Electrocoagulation; Zinc removal

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Presented at the 4th Maghreb Conference on Desalination and Water Treatment (CMTDE 2013) 15–18 December 2013, Hammamet, Tunisia