



## Optimization of the electrocoagulation process for the removal of lead from water using aluminium as electrode material

Wided Bouguerra<sup>a,\*</sup>, Afef Barhoumi<sup>b</sup>, Nesrine Ibrahim<sup>b</sup>, Khaled Brahmi<sup>a</sup>,  
Limam Aloui<sup>b</sup>, Béchir Hamrouni<sup>a</sup>

<sup>a</sup>Faculté des Sciences de Tunis, Département de Chimie, U.R. Traitement et Dessalement des Eaux, Manar II, Tunis 2092, Tunisia, Tel./Fax: +216 71871282; email: [bg\\_wided@yahoo.fr](mailto:bg_wided@yahoo.fr) (W. Bouguerra)

<sup>b</sup>Faculté des Sciences de Gafsa, Département de Chimie, U.R. Matériaux, Environnement et Energie, Campus Universitaire Sidi Ahmed Zarroug, Gafsa 2112, Tunisia

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### ABSTRACT

Lead is a priority substance in the framework of the European water policy (Water Framework Directive 2000/60/EC and Water Environmental Quality Standards Directive 2008/105/EC), since it presents a significant risk to biota and humans, given its persistence, toxicity and bioaccumulation characteristics. This study is devoted to focus on lead removal by means of electro coagulation (EC). The performance of EC process with aluminium electrodes for removal of lead on laboratory electrochemical cell was studied. The effects of various parameters such as electrochemical treatment time, solution pH, current density ( $J$ ), electrolyte concentration and electrical energy consumption on the percentage of lead removal were investigated. The optimum conditions for EC process were identified as pH 5, current density of  $2.67 \text{ mA cm}^{-2}$  and electrolyte concentration of  $0.5 \text{ g L}^{-1}$ . Effect of EC reactor design parameters such as the surface-area-to-volume ratio and the distance between electrodes were investigated. The obtained experimental results showed that optimal lead removal was achieved with distance between electrodes of 0.5 cm and surface-area-to-volume ratio ( $S/V$ ) of  $11.2 \text{ m}^{-1}$ . Under optimal conditions with 30 min treatment, the lead removal efficiency was about 99%. The optimal operating conditions can achieve efficient removal in a relatively short reaction time and low energy consumption. In the light of these results, EC could be regarded as a potential technique for the treatment of industrial wastewater containing lead.

*Keywords:* Electro coagulation; Lead removal; Aluminium electrodes; Chemical parameters; Reactor design parameters; Water treatment

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\*Corresponding author.

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