

ZEBOUDJI, B., DROUCHE, N., LOUNICI, H., MAMERI, N., GHAF FOUR, N.

The Influence of Parameters Affecting Boron Removal by Electrocoagulation Process

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ABSTRACT:

Boron removal in seawater desalination presents a particular challenge. In seawater reverse osmosis (SWRO) systems boron removal at low concentration (0.5 mg/L) is usually achieved by a second pass using brackish water RO membranes. However, this process requires chemical addition and important additional investment, operation and maintenance, and energy costs. Electrocoagulation (EC) process can be used to achieve such low boron concentration. In this work, the removal of boron from aqueous solution was carried out by EC process using aluminum and iron electrodes. Several operating parameters on the removal efficiency such as initial pH, current density, initial boron ion concentration, feed concentration, gap between electrodes, and electrode material, were investigated. In the case of bipolar electrocoagulation (BEC), an optimum removal efficiency of 96% corresponding to a final boron concentration of 0.4 mg/L was achieved at a current density of 6 mA/cm² and pH = 8 using aluminum electrodes. The concentration of NaCl was 2,500 mg/L and the gap between the electrodes of 0.5 cm. Furthermore, a comparison between monopolar electrocoagulation (MEC) and BEC using both aluminum and iron electrodes was carried out. Results showed that the BEC process has reduced the current density applied to obtain high level of boron removal in a short reaction time compared to MEC process. The high performance of the EC showed that the process could be used to reduce boron concentration to acceptable levels at low-cost and more environmentally friendly.