The removal of boron from the aquatic environment—state of the art

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ABSTRACT

Boron is emitted into the environment in a natural (weathering of rocks) and anthropogenic (wastewaters coming from industry, agriculture) way. It is a micronutrient for plants and animals, as well as a useful component in many branches of commercial activities. However, an excess of boron is toxic for both plants and animals. Extremely narrow is the range between permissible and harmful doses both to people and plants. It is often necessary to remove it from water and wastewater. The acceptable content of boron in drinking water and wastewater discharge into the environment is 1 mg/L. Removal of boron from the aquatic environment can be carried out in the following ways: ion exchange and adsorption onto boron-selective resins; reverse osmosis, in multistage configurations with RO and sorption; hybrid systems combining sorption onto fine resins with membrane filtration and polymer-enhanced ultrafiltration; processes with application of ion exchange membranes. The work presents a comprehensive review of the literature on boron removal with above-mentioned methods. The fundamentals of each process and the effect of experimental parameters are discussed.

Keywords: Boron removal; Ion exchange and adsorption; Reverse osmosis; Polymer-enhanced ultrafiltration; Electrodialysis and Donnan dialysis

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