

# Mechanisms of Boron Removal with Electrocoagulation

Article in Environmental Chemistry 3(5) · January 2006

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Abstract



Various environmental regulation organizations have set up standards or guidelines to regulate the boron concentration in drinking water, as a result of concern for human and animal health. In 2004, the World Health Organization Guidelines for Drinking Water Quality recommended boron values of no more than  $0.5 \text{ mg L}^{-1}$  in drinking water. Preliminary studies on boron removal with electrocoagulation have been carried out. However, in order to enhance boron removal using this method, and to meet the stringent guidelines set in place by the World Health Organization, there is a need to obtain a better understanding of how boron is removed from water by electrocoagulation. Abstract. This study aims to explore the mechanisms of boron removal by electrocoagulation (EC). The results demonstrate that adsorption and precipitation of boron by Al flocs are dominant mechanisms in boron removal using EC. The Al flocs that result from the EC process are found to be mainly composed of polymeric  $\text{Al}_{13}$  polymers (43%) and to have a long-lasting positive charge. These characteristics of the flocs contribute to the high levels of boron removal observed using EC. The maximum boron adsorption of the Al flocs is  $200 \text{ mg g}^{-1}$  and the solubility product constant ( $K_{sp}$ ), which represents the boron precipitate  $\text{Al}(\text{OH})_2\text{BO}_2 \cdot n\text{H}_2\text{O}$ , is  $2.6 \times 10^{-40}$  (at  $20^\circ\text{C}$ ).