Electrocoagulation: a new approach for the removal of boron containing wastes

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Received 25 November 2005; Accepted 13 December 2008

ABSTRACT

Using electrocoagulation (EC) as a new method to treat boron containing effluent/wastes has been studied. With combined mechanisms of adsorption and precipitation, the EC is very effective to remove boron; 82% of boron from model waters ([B]₀ = 250–500 mgL⁻¹) can be removed at a current density of 62.1 Am⁻² (equivalent to 3.3 as molar ratio of Al:B). In the treatment of industrial effluents, the EC can effectively remove boron and arsenic simultaneously, the [As] was reduced from 15 to <0.1 mgL⁻¹. A multistage EC configuration was even more effective and the boron removal percentage was >99.9%, i.e., after the fifth stage EC treatment, boron concentration can be decreased from 500 mgL⁻¹ to less than 0.5 mgL⁻¹. Chemical adsorption with freshly formed Al(OH)₃ flocs played a dominant role in the removal of boron from the wastes. Pre-pH adjustment was not necessary with the EC in the treating of low pH wastes, whilst all other technologies need to raise the solution pH to neutral status.

Keywords: Adsorption; Boron removal; Electrocoagulation (EC); Precipitation; Wastewater treatment