

In Desalination, from 1987 to 2009, The birth of a new seawater pretreatment process: electrocoagulation – An overview

Ali Saiba^a, Sidali Kourdali^a, Badiaa Ghernaout^b, Djamel Ghernaout^{a*}

^aChemical Engineering Department, Saad Dahlab University of Blida, Blida 09000, Algeria

Tel./Fax +213 (25) 43 36 31; email: djamel_andalus@yahoo.fr

^bAlgerian Waters, Medea Area, Medea 26000, Algeria

Received 14 July 2009; Accepted 16 December 2009

ABSTRACT

In the first journal in the desalination world, *Desalination*, during the last 20 years, there is the birth of a new seawater pretreatment process: electrocoagulation (EC). In order to note some facts of this birth, relate its context, and understand its circumstances, this review concerns a brief description of the application of EC as a new seawater pretreatment process throughout the work of Sanfan and Qinlai (1987) until the work of Yi et al. (2009) via the work of Sanfan (1991); all of them are published in *Desalination*. The first paper (1987) discusses the mechanism of removing some ions from the brackish water using EC method. Experiment results present some major parameters for the EC process. The most important one in operation is electric current density (CD). Moreover, the first paper suggests the method of selecting optimum density and some ways could raise economic property of EC and could reduce handling costs. In the paper of Sanfan (1991) the further research results of improving economic property of EC method are discussed. In order to reduce the cost and raise the handling efficiency, five different technological processes are set up and studied. The best one was using Fe electrode and aerating for raw water combined with reusing flocs. It can reduce 60% of handling cost in comparison withal electrode and remove 75% of hardness. Finally, Yi et al. (2009) use a simple and new effective electrochemical method (EM) prior to reverse osmosis for seawater desalination. The influences of three main factors in EMs—CD, operating time and sedimentation time on the efficiency of pretreatment—have been investigated. It is shown that the EM is very effective for removal of turbidity. The qualities of the raw and the treated seawater have been measured using UV–Vis spectrometry. The morphologies and the particle size distribution of the resulted sludge have been characterised by scanning electron microscopy (SEM) and a particle size analyser, and the mechanism of the EM has been analysed theoretically. Raw seawater with a turbidity of 54.1 NTU, 94.48 mg L⁻¹ SS after EM pretreatment at 26.30 mA cm⁻² CD for 40 min reduces the turbidity to 1.00 NTU. The time taken for the same depletion of turbidity in case of 39.45 mA cm⁻² CD is 35 min, and the absorbance of the curve decreases when EM treatment is applied. The experimental results reveal that particular size in seawater agglomerate and get bigger after EM treatment, and the turbidity removal is enhanced by charge neutralisation and sweep coagulation. The sludge generated from the process is found to have larger specific surface areas at higher CD from SEM observation, leading to better treatment efficiency.

Keywords: Seawater; Desalination; Pretreatment; Coagulation; Electrocoagulation; Boron

* Corresponding author.