Review on the Science and Technology of Water Desalination by Capacitive Deionization and Demineralization

Shehdeh Jodeh[1], Rachid Salghi[2], Jamal Amarah[1], Ismail Warad[1], Sobhi Samhan[3], Diana Jodeh[4], Belkher Hammouti[5], Smaail Radi[5]

[1]*Department of Chemistry, An-Najah National University, P.O. Box 7, Nablus, Palestine*
[2] *Laboratory of Materials and Environment, University Ibn Zohr, B.P. 8106, 80000, Agadir, Marco*
[3]*Director of Research and Development Palestinian Water Authority, Ramallah, Palestine.*
[4]*Department of Medicine, An-Najah National University, P.O. Box 7, Nablus, Palestine*
[5]*LCAE-URAC18, COST, Department of Chemistry, Faculty of Sciences, Mohamed 1st University, P.O. Box 717, Oujda 60000, Morocco*

sjodeh@hotmail.com

Abstract

One of the most environmental friendly technique for water purification is electrochemical techniques like capacitive deionization ttechnology (CDI). Water with different species like anions, metals and other contaminants is introduced to an electrochemical cell to purify it from contaminants including salt. During polarization, ions are electrostatically removed from the water and adsorbed in electric double layers at the surfaces of electrodes. The output of this process is cleaned water without contaminants.

CDT with carbon aerogel considered to be a new and famous technique where 80% of saline water transferred to pure water with low energy consumption, without producing pollutants like NO_X, SO_2, or other volatile organics.

This experiment based on applying current with two anions, Na^+ and Cl^- which distributed between the two electrodes of carbon aerogel which they have high surface area.

The absorption of NaCl by the aerogel carbon electrodes reached more than 50% by varying the experimental parameters like voltage, pH, concentration, distance between electrodes and flow. The best conditions were using: 2V, pH =5, and a 0.4 cm distance between electrodes. When the distance between electrodes decreased the absorption of ions increased due to the formation of electrical double layer and increasing potential between electrodes. For the best removal results a flow of 80 mL/min was used. From our results we can conclude that using capacitive desalination technology (CDI) enhanced the removal of salts from brackish water.