Desalinating Water Using Electric Fields

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There is an acute shortage of accessible freshwater. Desalination can create freshwater from seawater, but current techniques are expensive and require energy and maintenance. This research, a continuation of prior research, tested three cost-effective methods of capacitive desalination to see if electric fields could desalinate water more simply and efficiently: Method 1: A rotating plastic “armature” held sets of carbon electrodes, which were alternately used and flushed as it turned. DC electricity was applied across the electrodes used for desalination, and then switched to the next pair while the former was flushed. Method 2: Flat desalination “cells” with bronze sheet electrodes were driven with alternating on-and-off electric fields to draw ions to the sides, to capture slightly desalinated water from the center. A transformer and rectifier and a signal generator were used to create low-voltage signals of various frequencies and shapes. Method 3: A rotating external electric field with “stripes” of positive and negative electrodes was used to draw salt ions through a spiral of water-filled tubing, to concentrate them at one end of the tubing. This method did not attempt to separate and collect positive and negative ions from the water. All three desalination techniques were tested on brackish water, using an optical refractometer to measure the salinity before and after each trial. All three successfully lowered the salinity by 5-20% across the various trials, and these techniques have few or no moving parts and require less maintenance and energy than typically used evaporation or reverse osmosis techniques.

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