

Desalination via Electrodialysis: A Newly Designed Fixed Bed Reactor Powered by Renewable Energy Source

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Abstract : The problem of drinking water shortage is becoming more crucial nowadays as a result of the increased demand due to the population growth and the rise in the standard living. In recent years, desalination using electrodialysis powered by solar energy (PV-ED) is being widely used to help provide treated water and reduce the scarcity in water supply. In the present study, a water desalination laboratory scale ED cell with a fixed bed circulation system was designed, developed, and tested. The effect of three parameters (namely, cell voltage, flowrate, and salt concentration) on the removal percentage of salt ions was studied. The cell voltage was adjusted at 3, 4 and 6 V. A flow rate of 5, 10, and 20 ml/s and an initial salt concentration of 2000, 5000, and 7000 ppm were investigated. The maximum salt percentage removal obtained was 52.5% at the lowest initial concentration (2000 ppm) and at the highest cell voltage (6 V). There was no significant effect of the flow rate on the removal percentage. A model of PV module has also been developed to calculate the dimensions of a solar cell based on the amount of energy consumed and it was calculated from the Overall ED cell voltage.

Keywords : desalination, electrodialysis, solar desalination, photovoltaic electrodialysis

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