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Opinion Article

Energy Efficiency of Reverse Electro Dialysis

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ABOUT THE STUDY

Reverse Electro Dialysis (RED) is the salinity gradient energy retrieved from the difference in the salt concentration between sea and river water. In Reverse Electro Dialysis (RED) is a salt solution and fresh water are let through a stack of alternating cation and anion exchange membranes. The chemical potential difference between salt water and fresh water generates a voltage over each membrane and the total potential of the system is the sum of the potential differences over all membranes. The procedure works through difference in ion concentration instead of an electric field, which has implications for the type of membrane needed. In reverse electro dialysis, as in a fuel cell, the cells are stacked. A module with a capacity of 250 kW has the size of a transport container. Reverse electro dialysis is practically a salt battery that uses the transport of ions through membranes. It consists of an array of alternating positively charged exchange and negatively charged exchange membranes. Each and every membrane has fresh water on one side and salt water on the other side.

Reverse Osmosis (RO) and Electro Dialysis (ED) are the two important membrane technologies for water desalination and treatment. Their desalination and transport mechanisms are different, but on a closer look also have many similarities. Electro dialysis is a membrane-based technique involving transport of ions through semipermeable membranes using an applied electric field. The applications employing electro dialysis consist of desalination, table salt production, wine stabilization, and pickling bath recovery. Electro Dialysis (ED) is a slow process, depending for its speed on the differences in particle size and diffusion rates between the colloidal and the crystalloid constituents, and may be accelerated through heating, if the crystalloids are charged, through applying an electric field. The classical electro dialysis involves the alternating arrangement of cation- and anion-exchange membranes between the electrodes, while membrane electrolysis utilizes a single membrane as separator between cathode and anode compartments. Electro dialysis is generally used for desalination of low TDS brackish waters (<5000 mg/L). Unlike BWRO flowers, Electro Dialysis Reversal (EDR) plants generally perform at 85%–90% recovery.

Electro dialysis is a separation technique using ion-exchange membranes and an electrical potential as a driving force. Ion-exchange membranes contain charged functional groups and may be synthesized as heterogeneous membranes. The major advantage of electro dialysis is the high recovery, especially in the water recovery. Another benefit is the fact that not high pressure is applied which implies that the effect fouling is not significant and consequently no chemicals are required to fight against them. Desalination is a separation technique used to reduce the dissolved salt content material of saline water to a usable level. In this procedure Electro dialysis of colloidal solution is carried under the effect of electric field and some potential is applied between the metal screens that support the membranes. Due to this potential, the velocity of the ions moving in the direction of opposite electrodes is increased.

Electro Dialysis (ED) is a technique controlled through an electric field gradient that allows the separation of minerals from feed water solution. It moves dissociated ions through ion-perms elective membranes and forms different desalinated flow is known as dilate and a concentrated flow is known as brine. It is applied for the removal of dissolved ionic substances from water. Amongst different desalination processes, which includes ion exchange, nano-filtration and reverse osmosis, the main advantages of electro dialysis are high water recovery, selective desalination, low chemical demand and low energy demand.

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