

## Electrodialysis

Electrodialysis is an ion exchange process that uses electrical current to separate ions based on their charge. The schematic depicts the process for a simple solution containing sodium chloride, NaCl (table salt). A simple electrodialysis system consists of three sections separated by two semipermeable membranes; one is porous to positive ions while the other is porous to negative ions. An electric current charges the cathode with a negative charge and the anode with a positive charge.

Since opposite charges attract and similar charges repel, positive ions (blue  $\text{Na}^+$  in the schematic) are attracted to the cathode while negative ions (green  $\text{Cl}^-$ ) are attracted to the anode. Pure water, on the other hand, is affected by neither electrodes and passes through the middle section and the concentrated solution is removed.

Electrodialysis is used to deionize water. However, the efficiency of the process is affected by the presence of contaminants that may cause fouling problems. Therefore, pretreatment with sediment and carbon filtration becomes necessary in certain cases.

Electrodialysis is employed in a variety of applications such as food processing, agricultural water, cooling tower water, industrial laundry wastewater and large scale seawater desalination.

