

Magnetic field reinforced Electro-dialysis desalination

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As society grows bigger, the demand for pure water also has increased. Because of tremendous water consumption, Desalination becomes a reasonable way to provide pure water. Electro-dialysis is one of the desalination processes which use Lorentz force. Charged salt ions are pulled by the electric field during separation. However, Electro-dialysis is not a common way of desalination. Generating and sustaining a high power electric field is very expensive.

Recent research about the Hall effect proved that a magnetic field on an ionic fluid causes a concentration gradient. Charged particles moving in an electro-magnetic field experience a force related to the velocity of the particle and the magnitude of the field.

In this paper, we simulate a concentration gradient in a fluid channel caused by a magnetic field with a modified Nernst-Planck equation. A perpendicular magnetic field on the channel moves anions and cations in opposite directions by Lorentz force, which makes an ion concentration difference between the center and the edge.