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Commentary

Mechanism of Electro Dialysis and its Characteristics

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DESCRIPTION

Electro Dialysis (ED) is a technique for moving salt ions from one solution to another solution by using ion-exchange membranes and an applied electric potential difference. This is accomplished in a technology is known as an Electro Dialysis (ED) cell. The cell is divided into two compartments: A feed (dilute) compartment and concentrate (brine) compartment, which are separated by an anion exchange membrane and a cation exchange membrane placed between two electrodes. Mostly all practical electro dialysis procedures utilize multiple electro dialysis cells arranged in a stack, with alternating anion and cation-exchange membranes forming the multiple electro dialysis cells.

Distillation techniques and other membrane-based methods such as Reverse Osmosis (RO) is differ from electro dialysis techniques in that dissolved minerals are moved away from the feed water rather than closer. Because the concentration of dissolved organisms in the feed water is further less than that in the fluid, electro dialysis has the important advantages of significantly higher feed recovery in many applications. The Dilute (D) feed stream, brine or Concentrate (C) stream, and Electrode (E) stream all are allowed to pass through the appropriate cell compartments established by the ion-exchange membranes in an electro dialysis sequence. Negatively charged ions (for example chloride) in the dilute stream move toward the positively charged anode as a result of an electric potential difference. These ions pass through the anion-exchange membrane, which is positively charged.

The positively charged organisms in the D stream (for example, sodium) move towards the negatively charged cathode and pass through the negatively charged cation-exchange membrane. The positively charged anion-exchange membrane prevents these cations from moving towards the cathode. Electric current flows between the cathode and anode as a result of anion and cation mobility. Because an equal number of anion and cation charge equivalents are transferred from the D stream to the C stream, the charge balance in each stream is maintained. The electro dialysis method causes an increase in charge density in the concentrate stream while reducing ions in the dilute solution feed stream.

Electro Dialysis (ED) is a membrane process that transports ions across a semipermeable membrane under impact of an electric potential. The membranes are cation or anion-selective, which means that positive or negative ions can pass through. Cation-selective membranes are negatively charged polyelectrolytes that reject negatively charged ions while allowing positively charged ions to pass through. Ions can be removed from wastewater by arranging multiple membranes in a sequence that alternately allows positively or negatively charged ions to flow around. Ion concentration will occur in some sections, while ion removal will occur in others. The concentrated saltwater flow is circulated until it reaches a temperature appropriate for precipitation. The flow is discharged at this point. This method can be used to remove ions from water. Molecules along with an electrical charge are not removed. Sulphonated polystyrene is used in cation-selective membranes, while polystyrene with tertiary ammonia is used in anion-selective membranes.

The electrode stream is the E stream, which provides water for every electrode in the stack. This stream could be the same as the feed stream (for example sodium chloride) or it could be a separate solution containing a different species (e.g., sodium sulfate). Anions and cations from the electrode stream may be transported into the C stream, or anions and cations from the D stream are sometimes transported into the E stream, depending on the stack configuration. This transport is required in each case to carry current across the stack and maintain electrically isolated stack solutions.

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