

ESIEX — electrical swing ion exchange: pH control for biomolecule purifications or separations

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ABSTRACT

Due to their amphoteric properties, biomolecules such as amino acids, peptides and proteins are separated as a function of their charges. A classical method to separate these biomolecules is column ion exchange with pH steps. The proper pH is usually obtained in a chemical way with different buffers of variable dilutions, and this is the source of large amount of effluents. The objective of this work is to study the possibility to control the pH in an electrodeionization (EDI) process without using buffer solutions. EDI process is a hybrid technique combining electrodialysis and ion exchange (IEX). In EDI, three types of phenomena are likely to generate protons and hydroxyl ions and to play a role in pH: formation by water oxidation or reduction at electrodes, water splitting and IEX. Two parameters play a role in these processes: the choice of current density and the nature of IEX resins (anion, cation or mixed). To purify a molecule, it is for instance possible to: keep key molecule in feed compartment and generate the other species migration: the choice of resin type and of current density must allow maintaining the pH at isoelectric point of key molecule; generate selective migration of key molecule through an ion exchange membrane: pH must allow this molecule to have the required charge; fix selectively key molecule on ion exchange resin. The experimental method realized in the present work specifically aims at identifying the coupling of processes for a dipeptide fixation on an ion exchange resin placed in one compartment of electrodialysis with bipolar membrane system.

Keywords: Ion exchange; Electrodeionization; Amino acids; Peptides; Bipolar membrane

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