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## Current Efficiency and Transport Phenomena in Systems with Charged Membranes

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### Abstract

The interaction between the current efficiency of electrodialytic separation with ion-exchange membranes and all the fluxes depressing selectivity, i.e., electric transport of coions, electroosmotic flow of water, diffusion, and osmosis, are described and experimentally examined. A simple method for the determination of current efficiency for any concentration difference across the membrane and current density is presented. A simple relationship between the current efficiency and the efficiency of energy conversion in the desalination process is shown.

### INTRODUCTION

In this paper we present a simple definition of the current efficiency (CE) for a single ion-exchange membrane system. It allows for the estimation of CE from a determination of concentration changes in cathode and anode solutions. With the proposed definition, CE can be expressed as a simple function of different kinds of transport taking place in the system. This fact makes it possible to examine the effects of these transports on current efficiency, that is, to calculate the losses of CE due to: