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IONIC TRANSPORT PROCESSES

in Electrochemistry and Membrane Science

Kyösti Kontturi, Lasse Murtomäki, and José A. Manzanares

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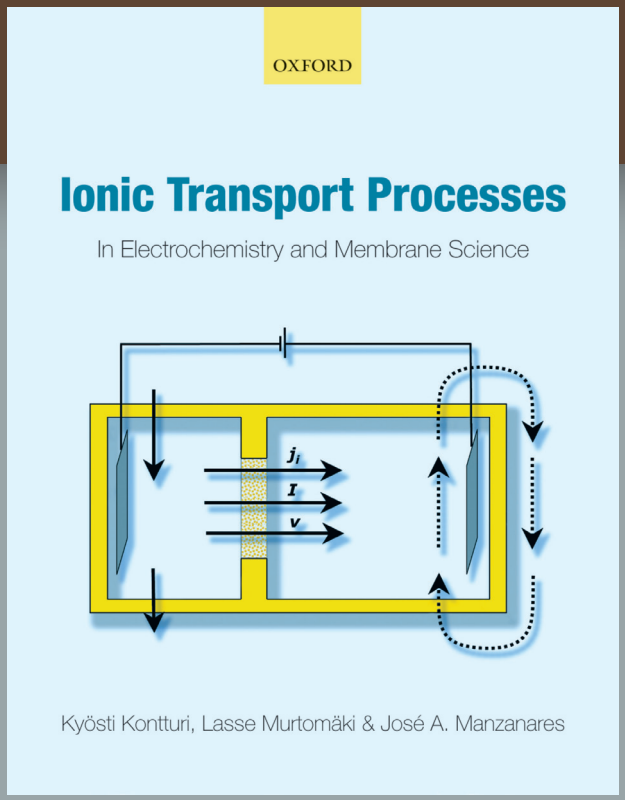

Modeling of heterogeneous processes, such as electrochemical reactions, extraction, or ion-exchange, usually requires solving the transport problem associated to the process. Since the processes at the phase boundary are described by scalar quantities and transport quantities are vectors or tensors, coupling them can take place only via conservation of mass, charge, or momentum. In this book, the transport of ionic species is addressed in a versatile manner, emphasizing the mutual coupling of fluxes in particular. Treatment is based on the formalism of irreversible thermodynamics, i.e. on linear (ionic) phenomenological equations, from which the most frequently used Nernst-Planck equation is derived. Limitations and assumptions made are thoroughly discussed.

The Nernst-Planck equation is applied to selected problems at the electrodes and in membranes. Mathematical derivations are presented in detail so that the reader can learn the methodology of solving transport problems. Each chapter contains a large number of exercises, some of them more demanding than others.

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