doi:10.1351/goldbook.P04540

phenomenological equation

In the following only media which are isotropic with respect to mass transport (i.e. the transport coefficients are independent of direction) are being considered. In the linear range (not too far from equilibrium), for uniform temperature and neglecting external fields such as the earth's gravitational field, the flux density of species B is related to the gradients of the electrochemical potentials of all species by the phenomenological equation:

$$N_{\mathrm{B}} - c_{\mathrm{B}}\, v_{\mathrm{A}} = -\sum_{\substack{i \\ i \neq A}} L^{\mathrm{A}}_{\mathrm{B}\,i}\, \nabla \mu_i$$

with

$$i = \mathrm{B},\ \mathrm{C},\ \ldots$$

where $\nabla \mu_i$ is the gradient of the electrochemical potential of species i. The proportionality factors $L^{\mathrm{A}}_{\mathrm{B}\,i}$ are called phenomenological coefficients. Their values depend on the frame of reference. The latter is taken here to move with the velocity v_{A} of species A, and hence:

$$L^{\mathrm{A}}_{\mathrm{A}\,i} = 0.$$

Source:
PAC, 1981, *53*, 1827 *(Nomenclature for transport phenomena in electrolytic systems)* on page 1830

