Nernst-Planck Equation

\[ J_n(x, t) = -z_n F D_n \frac{\partial c_n(x, t)}{\partial x} - u_n z_n^2 F^2 c_n(x, t) \frac{\partial \psi(x, t)}{\partial x} \]

Continuity

\[ \frac{\partial J_n(x, t)}{\partial x} = -z_n F \frac{\partial c_n(x, t)}{\partial t} \]

Poisson’s Equation

\[ \frac{\partial^2 \psi(x, t)}{\partial x^2} = -\frac{1}{\epsilon} \sum_n z_n F c_n(x, t) \]

Electrolyte solutions → Electroneutrality

if \( t >> \tau_r \) and \( x >> \Lambda_D \) then \( \sum_n z_n F c_n(x, t) = 0 \)