

Butler-Volmer Equation

$$k_f = k^0 \exp \left(-\alpha \frac{nF}{RT} (E - E^{0'}) \right) \quad k_b = k^0 \exp \left((1 - \alpha) \frac{nF}{RT} (E - E^{0'}) \right)$$

$$i(t) = nFA \left(k_f C_O(0,t) - k_b C_R(0,t) \right)$$

At equilibrium $i=0$:

$$\frac{C_R(0,t)}{C_O(0,t)} = \frac{k_f}{k_b} = \exp \left(\frac{nF}{RT} (E - E^{0'}) \right) \quad \text{Nernst Equation}$$