

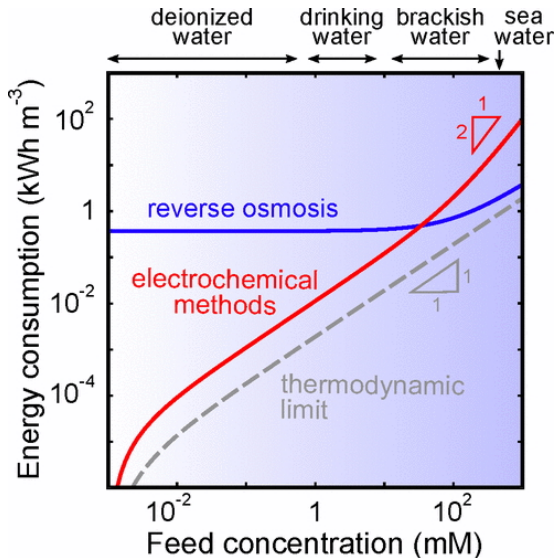
Electrochemical methods for water treatment

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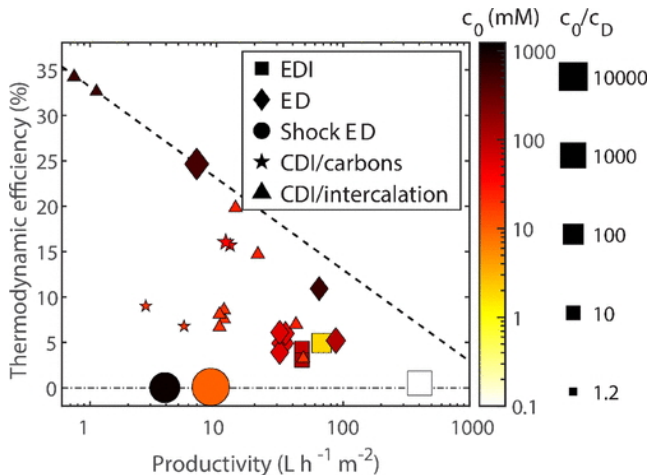
1. Motivation
2. Thermodynamic efficiency of different methods
3. Kinetics of capacitive deionization
4. Transport: Identifying mechanisms of electrosorption

Why the status quo is not enough

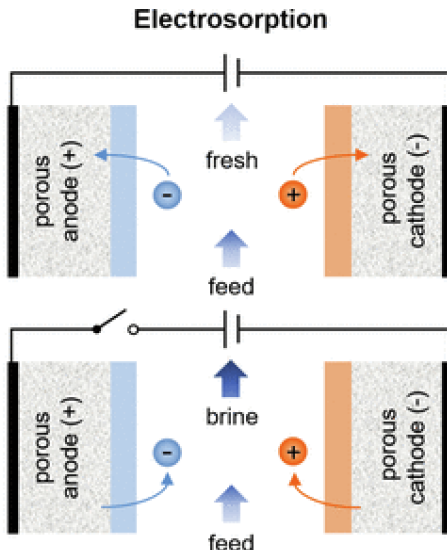


Thermodynamic efficiency of different methods

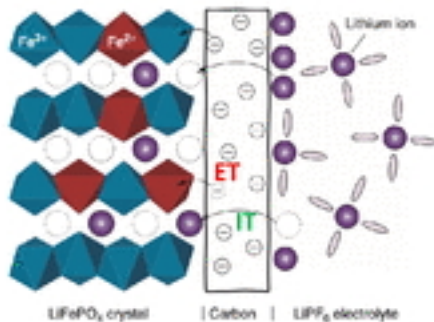
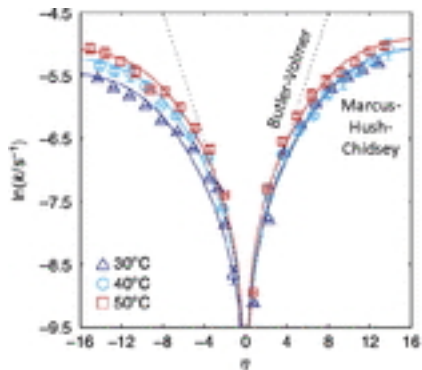
We can plot $\mathcal{P} = \frac{V_D}{nA}$ vs. $\eta = \Delta\hat{G}/\hat{E}$



What electrosorption looks like



A coupled ion-electron transfer mechanism for CDI



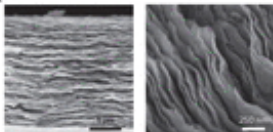
$$\lambda_o = \frac{e^2}{8\pi\epsilon_0 k_B T} \left(\frac{1}{a_0} - \frac{1}{2d} \right) \left(\frac{1}{\epsilon_{op}} - \frac{1}{\epsilon_s} \right)$$

Identifying Faradaic vs. electrostatic electrosorption

Intercalation Materials

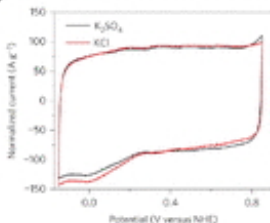
Physical Intercalation

a



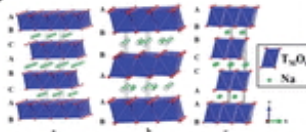
(MoS_2)

b



Redox-Active Intercalation

c



($\text{NaT}_\text{M}\text{O}_2$)

d

$\text{T}_\text{M} = \text{Ti, V, Cr, Mn, Fe, Co, Ni}$

