

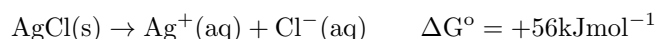
Electrochemistry Homework

Thermodynamics of Electrochemical Processes

Homework 3

◦ This homework covers material from Chapter 2, which you should read.

1. The ΔG° for the dissolution of silver chloride is $+56 \text{ kJ mol}^{-1}$:



Does this *technically* mean that no AgCl will dissolve? Explain.

2. According to the the wikipedia entry on a spontaneous process:

“The second law of thermodynamics states that for any spontaneous process the overall ΔS (entropy change) must be greater than or equal to zero.”

In chemistry, we typically use the free energy ΔG as a measure of spontaneity, with $\Delta G < 0$ a spontaneous process. The free energy ($G=H-TS$) has components from enthalpy (H) and entropy (S). Why doesn't the second law of thermodynamics make mention of enthalpy? Does the second law apply to chemical reactions? Explain.

3. Give an example of a process carried out near the condition of thermodynamic reversibility and illustrate that carrying it out in this manner yields the greatest possible work.

- Problems from Bard and Faulkner

- 2.1 b, c, h (note there are questions above and below the listing of reactions)

- 2.2 (Hint: To find E° , construct a complete reaction with the hydrogen reduction half reaction and then calculate ΔG° using appropriate formation energies). You can ignore the part of the question asking to calculate net work per gram and per mole. These are simple calculations once you know the cell potential and hence free energy of the reaction with oxygen.

- 2.4 a,c,f