Electrochemistry (EN 314) – Spring 2018-19

Problem Set -1

Electrochemical Cells

1. Write the half cell reactions for the following shorthand notations

   a. $AgNO_3$, aq | Ag

   b. $FeCl_2$, $FeCl_3$ aq | Pt

2. Write the shorthand notation for the following reactions/systems

   a. $Fe_{(s)} + Sn^{+2}_{(aq)} \rightarrow Fe^{+2}_{(aq)} + Sn$

   b. Alkaline Battery: $Zn + MnO_2 \rightarrow ZnO + Mn_2O_3$

3. **Indictor electrodes of the First kind**

   If a metal electrode is placed in the solution containing its ions, it is called Indicator electrode of the first kind. A copper electrode is placed in solution containing Cu^{+2} at 25 °C. A saturated Calomel Electrode (SCE) is used to measure the potential of the copper electrode. The cell potential is measured by experiment and compared to that obtained from EMF data tables. If both these cell potentials are different then comment on the concentration of Cu^{+2} in the solution. What are the origins of differences between these two potentials?

4. **Linear Sweep Voltammetry (LSV)**

   In an LSV experiment potential is applied as $E=\nu t$ V, where ν is sweep rate in Vs^{-1} and t is time in s. Obtain the function for the current discharge if R_s is the solution resistance and C_d is the double layer capacitance.

5. Derive the current potential relationship under the conditions of §1.4.2 of the Text book *Electrochemical Methods* by Bard & Faulkner, 2nd Ed. for a system where R is initially present at a concentration C_R^* and $C_O^* = 0$. Consider both O and R soluble.

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