Assignment (combined between this and the prior week’s activity; due Tuesday, May 28, 2019 at 9:30am PT) (You must show your work for credit on all problems.)

(1) Using data that you obtained during last week’s lab activity (Lab #6), do the following.
   a. Part C: Acid-Generated Donnan Potential Data
      i. Which ion(s) dominated formation of the measured electric potential differences and why were potentials measured between fritted reference electrodes about half as large as those measured between Ag/AgCl wires?
      ii. For each of the four conditions studied (C/C’1 – 4), calculate the theoretical total electric (Donnan) equilibrium potential across the membrane and the electrochemical potential difference for H+ and Cl– across the membrane.
      iii. For each of the four conditions studied (C’1 – 4), calculate the difference between the theoretical total Donnan potentials and the experimental electric potentials measured between fritted reference electrodes and indicate what is a likely cause of any differences in these values.
      iv. Assuming Nafion has effectively 1 M sulfonate groups in its hydrated regions, calculate the theoretical concentration of Cl– in the hydrated regions on each side of Nafion under the last condition studied (C/C’4).
   b. Part D: Salt-Generated Liquid-Junction Potential Data
      i. Which ion(s) dominated formation of the measured electric potential differences and were the cells under steady-state or equilibrium conditions?
      ii. For each of the three conditions studied (D1 – 3), calculate the theoretical electric (liquid-junction) potential across the membrane.
   c. Part E: Base-Generated Donnan Potential Data
      i. For each of the four conditions studied (E1 – 4), calculate the theoretical total electric (Donnan) equilibrium potential across the membrane.
   d. Part F: Acid-Generated Donnan Potential Data
      i. Which ion(s) dominated formation of the measured electric potential differences and why were the potentials measured between Ag/AgCl wires immersed directly into the electrolyte solutions close to zero?

(2) Using data that you obtained during this week’s lab activity (Lab #7), do the following.
   a. Part A: H2 Evolution CV Data
      i. Submit a Tafel plot of your data obtained in the presence of iron and label each region where the observed current was dominated by electrocatalysis or mass transport. Also, what redox reaction(s) occurred near \( E_{app} = -1.2 \) V?
      ii. Submit one Tafel plot of your data containing three different H2 evolution labeled datasets. Also, calculate the Tafel slope and the exchange current density for your data obtained during H2 evolution at pH 1.
   b. Part B: O2 Evolution CV Data
      i. Submit a Tafel plot of these data and indicate on the plot the theoretical reversible standard-state potential for the O2 evolution reaction. Also, explain whether electrodeposition of NiFeO2 could have been performed using a three-electrode setup.