

CHEG 3128 – Chemical Engineering Junior Laboratory
Spring 2017 – Battery I Assignment

Following the laboratory discussion and demonstration period, the team will need to build and test their own electrochemical cells. The team is required perform the following tasks:

1. Recreate and document your progress with regards to two aspects of the in-laboratory demonstration. First, the team will assemble the identical Al can battery as assembled in class and measure the open circuit cell voltage. Second, the team should use a resistor box to run current through the cell at a series of resistances spanning at least 4 orders of magnitude. Measure and record the “steady-state” voltage
2. In the Al cell, change the electrolyte to bleach. Repeat the same experiments as above, measuring the open circuit voltage and investigating the impact of the load on the cell behavior.
3. In the cell, change at least 3 components of the cell (anode/cathode/electrolyte) – what you change is entirely up to your group – and again repeat the same experiments as above, measuring the open circuit voltage and investigating the impact of the load on the cell behavior.

Each of these experiments should be performed no less than three times (assembling new cells each time) in order to understand cell-to-cell variability. The reporting format for this laboratory is flexible; however, you are required to show all of the data that you collected as attached plots and/or tables with legible text and captions. You also will need to discuss the following questions:

1. When you made changes to the system, the open circuit voltage sometimes changed (for instance when bleach was substituted for salt water), but perhaps not always. Why? Use thermodynamic arguments to explain the observed phenomena.
2. At the end of the resistor box experiments, you should have voltage vs. resistance data for several systems. From here, you can determine the power that was extracted from the cell. Discuss why you think that the voltage decreases when a smaller load is applied to the cell. Also, why does the power output of the cell change as you make changes to the cell? Also, why does the power curve (P vs. current) have a peak?
3. How repeatable were each of your experiments? What are the factors do you think that impacted repeatability?

The due date for the above assignment report is approximately four weeks after your team runs the Battery I lab. The official due date for each team is given in the syllabus. The team will almost certainly need to read outside references to sufficiently understand and answer the questions above. The team should have no less than 5 references in your writeup and analysis. Also, the team should know that the discussion need not be lengthy; concise and correct is always preferred to long-winded and guessing. Also, please feel free to engage the faculty and TA’s with questions or any other needed support!