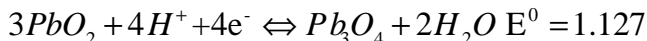
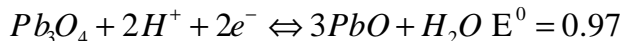
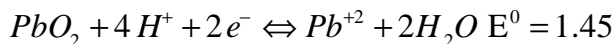
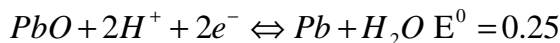
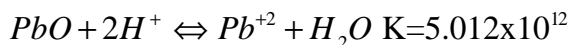
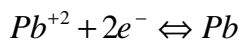
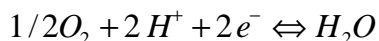
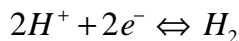
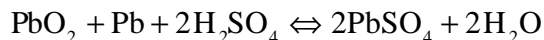


Ohio University  
 Department of Chemical Engineering  
 ChE-455/ChE-555: Analysis of Electrochemical Systems  
 Winter Quarter 2009

**Homework 3**

Due: February 17, 2009

1. Propane is being considered for use as the fuel in a fuel cell. The overall reaction should include propane and oxygen to produce water and carbon dioxide. It is expected that the propane fuel cell will operate in an acidic electrolyte.
  - a. Can propane and oxygen be in the same compartment? Justify your answer with a short discussion.
  - b. Write down the anodic and cathodic reactions. Show a schematic diagram of the cell. Identify the signs of the electrodes, flow of electrons and flow and sign of the current
  - c. Calculate the standard potential of the propane fuel cell
  - d. Calculate the potential of the cell at 80 °C.
  - e. What would be the cell potential at 80 °C and 3 atm? Would it be favorable to work at these conditions?
  
2. Build the Pourbaix diagram for the lead acid battery using the reactions given below. Under what conditions would be favorable to operate according to the diagram if the overall reaction for the lead acid battery is:



- a. What would be the reaction favored during discharge?
- b. Would it be safe to overcharge the battery? What reactions could take place if the battery is overcharge? Explain according to diagram
- c. What would happen if your pH increases? Would it affect the performance of the lead acid battery? (Discuss according to diagram).