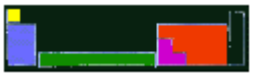
Revised August 2009



HONORS LAB 14b: Citrus Fruit Cells

Aim To investigate the electrochemical properties of metals and citrus fruit

Apparatus Digital multi-meters

Chemicals Citrus fruits (lemon, lime, orange), metal strips (Fe, Mg, Al, Sn, Cu, Fe)

Method

1. Clean the metal strips with steel wool until they are shiny. Wash them off with some distilled water and then dry them completely with a paper towel.

2. Using the table on page two as a guide to the combinations, insert two different metal strips into the fruit to a depth of approx. 2cm, so they are not touching one another.

3. Ensure that the multi-meter is set to read volts AND that is on an appropriate scale (usually measuring voltages between 0.00 and 2.00 V).

4. Using the multi-meter terminals, touch the metal electrodes that are in the fruit and observe the voltage reading. If the reading is negative, reverse the multi-meter terminals to obtain a positive voltage.

5. Record the voltage in the results table.

6. Look carefully for any visible reactions that occur around the electrodes.

7. If time, repeat the experiment with a different fruit and note any significant changes in voltages.

Results

Positive Electrode	Negative Electrode	Voltage
Cu	Mg	
	Zn	
	Al	
	Fe	
	Sn	
Sn	Mg	
	Zn	
	Al	
	Fe	
Fe	Mg	
	Zn	
	Al	
Al	Mg	
	Zn	
Zn	Mg	

Conclusion/Calculation

1. Given that the fruit contains citric acid, in addition to the two metals present, which other half-reaction may be in play in these experiments?

2. Was there any observable evidence to suggest that your answer to #1 may be correct?

3. Which pairs of metals produced the largest voltages? Suggest a reason.

4. Do the voltages correlate well with voltages that you may predict from the SERP table? If not, why not?

5. Write half-cells, chemical reactions and calculate standard voltages, for the reactions that take place between the following combinations;

   (a) Mg half-cell and the hydrogen half-cell.

   (b) Mg half-cell and the copper half-cell.

   (c) Sn half-cell and the hydrogen half-cell.