Electrolysis Problems Set II

Note: show all your work to answer these questions.

1. The half-reactions at an electrode is Mg^{2+} (molten) + 2e- $\rightarrow$ $Mg_{(s)}$
   Calculate the number of grams of Mg that could be produced by passing 1.00 F through the electrode. (ans. 12.15g)

2. Consider the electrolysis of molten lithium chloride.

   (a) Write the electrode reactions.

   $\rightarrow$

   $\rightarrow$

   (b) How many grams of lithium metal can be produced by passing 0.50 A for 30 minutes? (ans. 0.064 g)

3. Explain why different products are obtained in the electrolysis of molten $ZnCl_2$ and in the electrolysis of an aqueous solution of $ZnCl_2$.

4. How many Faradays of electricity are required to produce:

   (a) 0.84 L of O_2 at exactly at 1.0atm and 25^{o}C from aqueous H_2SO_4 solution; (ans. 0.14 $\mathcal{F}$)

   (b) 6.0g of Sn from molten $SnCl_2$?

   (ans. 0.10 $\mathcal{F}$)

5. Calculate the amounts (in grams) of Cu and Br_2 produced at inert electrodes by passing a current of 4.50 A through a solution of $CuBr_2$ for 1.0 hour. (ans. 5.33g; 13.42g)

6. The passage of a current of 0.750 A for 25.0 min deposited 0.369 g of Cu from a $CuSO_4$ solution. From this information, calculate the molar mass of copper. (ans. 63.29g/mol)

7. Chromium plating is applied by electrolysis to a bumper according to the following half-reaction:

$$Cr_2O_7^{2-}{}_{(aq)} + 14\ H^+_{(aq)} + 12\ e^- \rightarrow 2\ Cr_{(s)} + 7\ H_2O_{(l)}$$

Assume that the electrolytic cell is operating at 25.3 A, how long (in hours) will it take to plate out 18 g of Cr onto an automobile bumper? (ans. 2.2 hours)