

Plating Metals

Recommended for Chapter(s): 11

Demo #034

Materials NOT in box

1. Safety goggles

Procedure

1. (Prep) Make up 40 mL of 1.0 M FeSO_4 (this solution does not keep, so it must be made no more than a day prior to using). This can be made by dissolving 11.1 g of ferrous sulfate heptahydrate ($\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$) in enough water to make 40 mL of solution.
2. (Prep) Pour ~40 mL of the 1.0 M CuSO_4 solution into one of the 100 mL beakers.
3. (Prep) Pour ~40 mL of the 1.0 M FeSO_4 solution into the other 100 mL beaker.
4. Ask students to predict what will happen when Fe (nail) is put into the beaker containing CuSO_4 and Cu (strip) is put into the beaker containing FeSO_4 .
5. Put the copper into the beaker containing FeSO_4 . No reaction will occur.
6. Put the nail (Fe) into the beaker containing CuSO_4 . Copper will be plated onto the nail after about 10 sec.

Safety

1. Wear safety goggles.
2. Copper and iron are heavy metals.

Clean Up

1. Put the CuSO_4 back into the CuSO_4 bottle. This solution can be reused.
2. Put the FeSO_4 into the waste bottle and put on the date.
3. Return the materials to the cart in the demonstration library room.

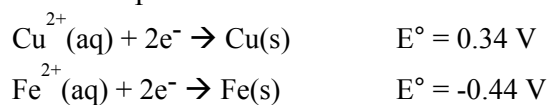
Stockroom Notes

1. Sand down the nail so that no rust or copper are on the nail.
2. Put the nail back into the demonstration box.
3. Replace glassware with clean glassware.
4. Take out the waste FeSO_4 and put in a new waste bottle
 - a. The new waste bottle tag should read.
 - i. Faculty Name: Feldwinn
 - ii. Department: Chemistry
 - iii. Phone: x2127
 - iv. Start Date: Leave blank (will fill out when chemicals are put in bottle)

- v. Proper chemical name and concentration: ferrous sulfate 1.0 M
 - vi. Physical State: liquid
5. DO NOT REMAKE THE FeSO₄ SOLUTION.
 6. Return items to demonstration tub.
 7. Return tub to the demonstration library.
 - a. Return goggle to goggle box

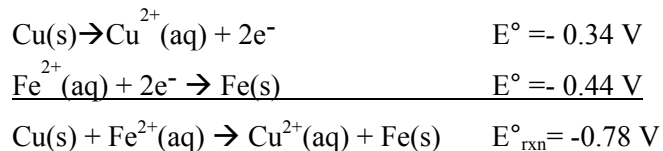
Discussion

If students are given the following data they should be able to predict whether the reaction will be spontaneous or not.



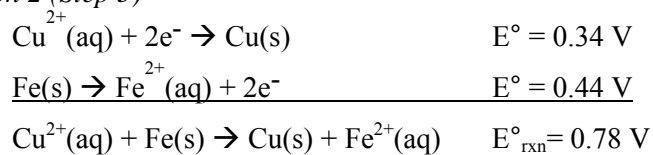
Reactions are spontaneous when E°_{rxn} is positive.

Reaction 1 (Step 4)



Since the E°_{rxn} is negative, students should know that iron will not plate onto the copper.

Reaction 2 (Step 5)



Since the E°_{rxn} is positive, students should know that copper will plate onto iron.

Materials for demo 034

1. Bottle for 1.0 M FeSO₄
2. 1.0 M CuSO₄
3. Two 100 mL beakers
4. Copper strip
5. Paper Towels
6. Waste bottle
7. Nails
8. Sandpaper