Student's Card 1 Separation of copper and iron

Module 1

Objective: Precipitation and Leaching

Introduction

This module illustrates a method to separate metals, one from another. This is a very important task in refining primary raw materials as well as recycling. Students are shown thatefficient recycling is a fascinating and complex work field that offers many opportunities.

In this module we focus on topics, used during Chemistry:

- Solubility
- Reaction equations
- Qualitative analysis

Further topics

- Law of mass action
- Acid – base reactions
- Equilibria

Necessities

Reagents	Formula	!	Quantity (g) or Concentration (M)
Iron (III) chloride hexahydrate	$FeSO_4 \times 7\ H_2O$	GHS 05, GHS 07	c = 0,14 mol x L^{-1}
Copper (II) sulphate	$CuSO_4 \times 6\ H_2O$	GHS 07, GHS 09	c = 0,13 mol x L^{-1}
Sodium hydroxide	NaOH	GHS 05	c = 10 %
Ammonia solution	NH_4OH	GHS 05, GHS 07, GHS 09	c = 25 %
Distilled water	H_2O		

List of materials/tools

- Test tubes
- Glass funnel
- Test tubes
- Test tube holder

Student's Card 1 Separation of copper and iron

Lab Procedure

Preparation of stock solutions

Please prepare the stock solutions A to C as described below.

A) Weigh 0,014mol $FeSO_4 \cdot x\ 7\ H_2O$, place it in an 100 mL volumetric flask and add approximately half of the flask's volume of distilled water. Shake the closed flask thoroughly to dissolve the salt. Add distilled water to the clear solution until the marking of the flask is reached. Then mix well again.
B) Weigh 0,013 mol $CuSO_4 \cdot 5H_2O$ and proceed like described above.
C) To prepare the combined solution please weigh 0,014 mol $FeSO_4 \cdot x\ 7\ H_2O$ and 0,013 mol $CuSO_4\ x\ 5\ H_2O$, place both in a flask and dissolve the combined salt portions as described in A.

Label the stock solutions with the letters A to C.

Experimental procedure

Place a sample of the solution A and B in separate test tubes (approx. two cm high). Now add sodium hydroxide solution dropwise with a pipette to both of the test tube. Now filter the content of the test tubes. Collect the residue on the filter papers in fresh test tubes and add ammonia solution dropwise with a pipette.

Now place a sample of solution C in a fresh test tube and repeat the steps mentioned above.

Questions

- What happens on addition of sodium hydroxide? Postulate reaction equations for each sample.
- What happens on addition of ammonia solution to the filter residues?
- Can you think of an easier procedure to get to the same results for solution C?