

<b>EXPERIMENT NUMBER</b>	<b>5</b>
<b>THE NAME OF THE EXPERIMENT</b>	<b>AMMONIUM COPPER(II) SULPHATE</b>
<b>FORMULA</b>	<b><math>(\text{NH}_4)_2\text{SO}_4 \cdot \text{CuSO}_4 \cdot n\text{H}_2\text{O}</math></b>

### EXPERIMENTAL PROCEDURE

4 g of  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  and 2 g  $(\text{NH}_4)_2\text{SO}_4$  are dissolved in 10 mL hot water. The solution is cooled and the crystals formed are filtered through the funnel. The crystals obtained are dried between the filter paper. The filtrate is evaporated to a volume of approximately 5 mL. The solution is cooled, the secondary crystals formed are filtered off and dried in the air. The total amount of product is found by storing the primary and secondary crystals separately and the %yield is calculated.

### QUESTIONS

1. Write and balance the chemical equation.
2. Give information about the electronic structure of the compound.
3. How to determine the  $n$  mole of  $\text{H}_2\text{O}$  in the structure.
4. Write the Lewis formulas of  $\text{NH}_4^+$  and  $\text{SO}_4^{2-}$  ions, determine the hybridization types of the central atoms, draw and explain their geometric structures.
5. Write the sequences of  $\text{NH}_4^+$ ,  $\text{Cu}^{2+}$  and  $\text{SO}_4^{2-}$  ions in a crystal lattice.
6. Calculate the yields of primary and secondary products.
7. Determine the percentage of copper in the primary product (Gündüz, T.; *Kantitatif Analiz Laboratuvar Kitabı, "Bakır Tayini"*, page: 145.

Working rate: 1/4

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<b>EXPERIMENT NUMBER</b>	<b>6</b>
<b>THE NAME OF THE EXPERIMENT</b>	<b>AMMONIUM NICKEL(II) SULFATE HEXAHYDRATE</b>
<b>FORMULA</b>	<b><math>(\text{NH}_4)_2\text{SO}_4 \cdot \text{NiSO}_4 \cdot 6\text{H}_2\text{O}</math></b>

**EXPERIMENTAL PROCEDURE**

4.5 g of nickel sulfate hexahydrate and 2.0 g of ammonium sulfate are dissolved in 15 mL of hot water. The solution is cooled and the primary crystals formed are separated by vacuum filtration. The crystals are dried between two filter papers. The filtration is evaporated to half of the volume and secondary crystals are obtained. After separating in secondary crystals by vacuum filtration, the product is dried between two filter papers. The product is a dark blue-green colored, monoclinic crystals. It dissolves in cold water (10.4 g /100 mL) and in hot water (30 g/100 mL). It is insoluble in alcohol.

**QUESTIONS**

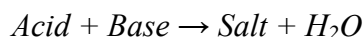
1. Give general information about salts and classify the salts according to their structure.
2. Give information about the electronic structure of the compound.
3. What is the geometric structure of  $\text{NiSO}_4 \cdot 6\text{H}_2\text{O}$  and why is it green?

Working rate: 1/4

**GENERAL INFORMATION**

*Salts and Classification of Salts*

A salt is an ionic and electrically neutral compound which is made up of two groups of oppositely charged ions (cations and anions). The ion with a positive charge is called a cation, and the ion with a negative charge is called an anion. A salt is produced by the reaction between an acid and a base. This reaction is a neutralization reaction.



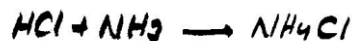
All salts have some characteristics: 1. Ionic bond, 2. High melting point, 3. Electrical conductivity when melted, and 4. Crystalline structure.

1. **NEUTRAL SALTS:** The salts formed from a strong acid and a strong base;



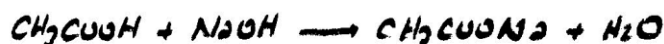
This type of salt does not hydrolyze in water. The solution is neutral.

2. **ACIDIC SALTS:** The salts formed from a strong acid and a weak base;



This type of salt hydrolyzes in water. The solution is acidic.

3. **BASIC SALTS:** The salts formed from a weak acid and a strong base;



The anion of this type of salt hydrolyzes in water. The solution is basic.

4. **NEUTRAL SALTS:** The salts formed from a weak acid and a weak base;



Both the anion and the cation of this type of salt hydrolyzes in water. The solution is neutral.