

## Preparation of aqua-tetraamminecopper(II) sulphate

Aqua-tetraamminecopper(II) sulphate forms deep blue crystals, very well soluble in water, less in ethanol. Standing in the air it decomposes and eliminates ammonia. It can be prepared by complex reaction of copper(II) sulphate with ammonia solution.



Because the complex product is well soluble in water, we exclude it from the solution by adding ethanol to the reaction mixture. The excluded crystalline product has different composition in solid state and in a solution.



### Work

Prepare aqua-tetraamminecopper(II) sulphate.

### Chemicals

- copper(II) sulphate pentahydrate,  $\text{CuSO}_4 \cdot 5 \text{H}_2\text{O}$
- ammonia,  $\text{NH}_3$ , concentrated water solution,  $w(\text{NH}_3) = 0,26$
- ethanol,  $\text{CH}_3\text{CH}_2\text{OH}$ , denaturised spirit

### Procedure

**Warning!** Ammonia very strongly irritates human respiration system therefore, we must work with them in a fume hood.

Dissolve 26 cm<sup>3</sup> of concentrated (26%) ammonia in water in the volume ratio 1 : 3. Under continuous stirring add 7,5 g of powdered copper(II) sulphate pentahydrate. After dissolving entire sulphate filter the resulting solution. Add the same volume of ethanol as is the volume of the solution. Filter out the excluded microcrystalline powder on the Büchner funnel and wash it directly on the filter with small amount of ethanol. Store the dry product in a well closed vessel.

### Safety instructions

#### Copper(II) sulfate pentahydrate – $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$

- R22** Harmful if swallowed.  
**R36/38** Irritating to eyes and skin.  
**S22** Do not breathe dust

#### Ammonia – $\text{NH}_3$

- R10** Flammable.  
**R23** Toxic by inhalation.  
**S16** Keep away from sources of ignition – No smoking  
**S38** In case of insufficient ventilation wear suitable respiratory equipment  
**S7/9** Keep container tightly closed and in a well-ventilated place.

#### Ethyl alcohol – $\text{C}_2\text{H}_5\text{OH}$

- R11** Highly flammable.  
**S7** Keep container tightly closed  
**S16** Keep away from sources of ignition – No smoking