

## Practical Work N° 3: Purification by Recrystallization

### 1. OBJECTIVES

- Purify various solid compounds (naphthalene, copper sulfate pentahydrate , salicylic acid) by recrystallization.
- Understand the principle of recrystallization and the factors influencing the purity of the product.
- Observe the differences in solubility and crystallization depending on the solvent used.

### 2. THEORETICAL PRINCIPLE

Recrystallization is a purification method based on the difference in solubility of a compound in a hot and cold solvent.



#### Steps:

1. Dissolve the impure product in a suitable solvent using heat.
2. Filtration to remove insoluble impurities.

3. Cooling the solution to form pure crystals.
4. Separation of crystals by filtration and drying.

**Notice:**

- \* The choice of solvent is crucial: the product must be poorly soluble when cold and very soluble when hot.
- \* Insoluble impurities are removed by hot filtration, soluble impurities remain in the solvent.

**3. MATERIALS AND REAGENTS****Materials:**

- Beaker (50 mL, 100 mL)
- Erlenmeyer flask (50 mL, 100 mL)
- Glass stirrer
- Büchner funnel
- Filter paper, tweezers (depending on the compound)
- Hot plate, spatulas, - Distilled water

**Reagents:**

- Naphthalene
- Copper sulfate pentahydrate (  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  )
- Salicylic acid
- Solvents: ethanol, distilled water, acetone

**4. Working Conditions**

- Controlled temperature to prevent product decomposition.
- Work under a fume hood for volatile solvents (naphthalene).

**5. Sample Preparation**

- Weigh approximately 1 to 2 g of each compound.
- Identify each sample correctly to avoid any confusion.

**6. EXPERIMENTAL PROTOCOL****A. Naphthalene**

1. Dissolve the naphthalene in a small amount of hot ethanol
2. Filter the hot solution to remove insoluble impurities.
3. Allow to cool to room temperature, then place in ice water to complete crystallization.

4. Filter the crystals and dry.

### **B. Copper sulfate pentahydrate**

1. Dissolve the  $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$  in a small amount of hot water

2. Filter if necessary to remove insoluble impurities.

3. Cool slowly to room temperature.

4. Collect the blue crystals by filtration and dry.

### **C. Salicylic acid**

1. Dissolve the salicylic acid in hot ethanol or an ethanol/water mixture depending on solubility.

2. Filter while hot to remove impurities.

3. Allow to cool slowly to obtain white crystals.

4. Dry the purified crystals.

## **7. Analysis of Results**

-Observation of crystal formation.

-Note the color, shape, and size of the crystals for each compound.

- Calculate the purification yield:

$$\text{Yield (\%)} = (\text{Mass of crystals obtained} / \text{Initial mass}) \times 100\%$$

-Check the purity, possibly by **melting point** or simple chemical test.

## **8. Questions**

1. Why does recrystallization allow the purification of a solid?

2. What is the role of the hot solvent and slow cooling?

3. Why do some impurities remain in the filtrate?

4. Compare the solubility of the three compounds in different solvents.

5. How does the choice of solvent influence yield and purity?