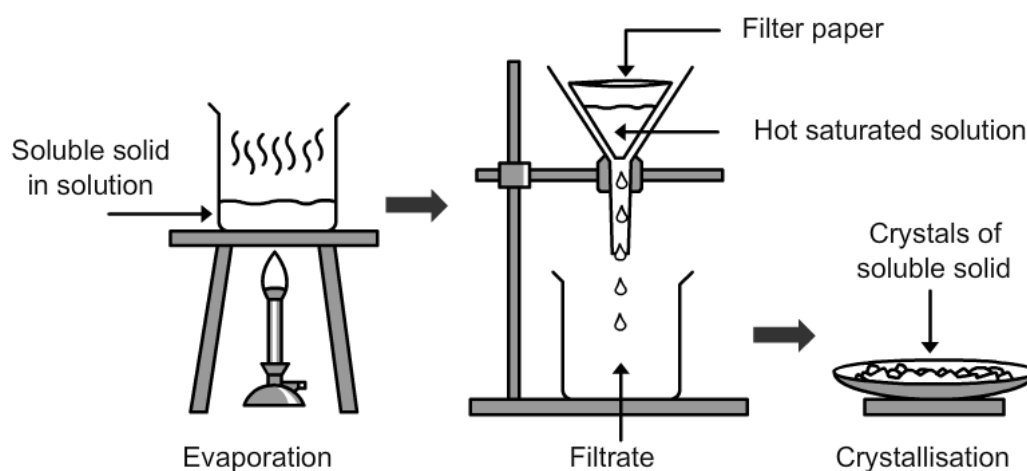


Objective

To demonstrate that crystals of copper sulphate contain water of crystallization.

Theory

Crystallisation is a purification process that is used to separate solids from liquids. Some salts contain a fixed number of water molecules as an integral part of their crystal structure. These water molecules are called the water of crystallisation, and salts that contain them are known as hydrated salts.



Process of crystallization

Fig. 1 Crystallization process

The water of crystallization

A fixed number of water molecules in the formula unit of a salt is referred to as water of crystallisation. Hydrates are crystalline salts that include water throughout the crystallisation process. Water crystallisation is also known as crystallisation water or hydration water. Heat has a strong effect on these crystals.

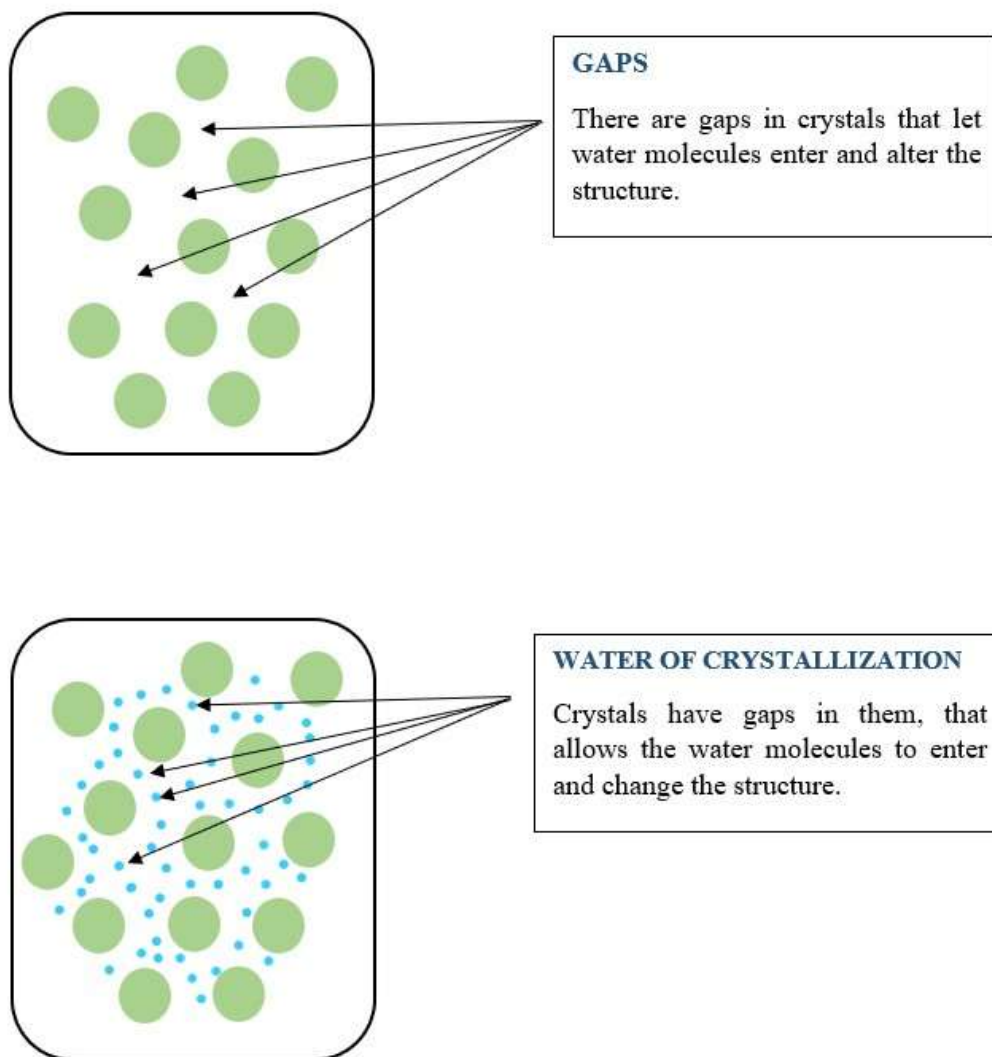


Fig. 2 Water of crystallization in crystals

Examples of water of crystallisation include washing soda, gypsum, proteins with more than 50% water of crystallisation, and copper sulphate pentahydrate, which contains five molecules of water of crystallisation.

Hydrated Copper sulphate is represented as $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ It means 5 water molecules are associated with each formula unit of CuSO_4 associated each other.

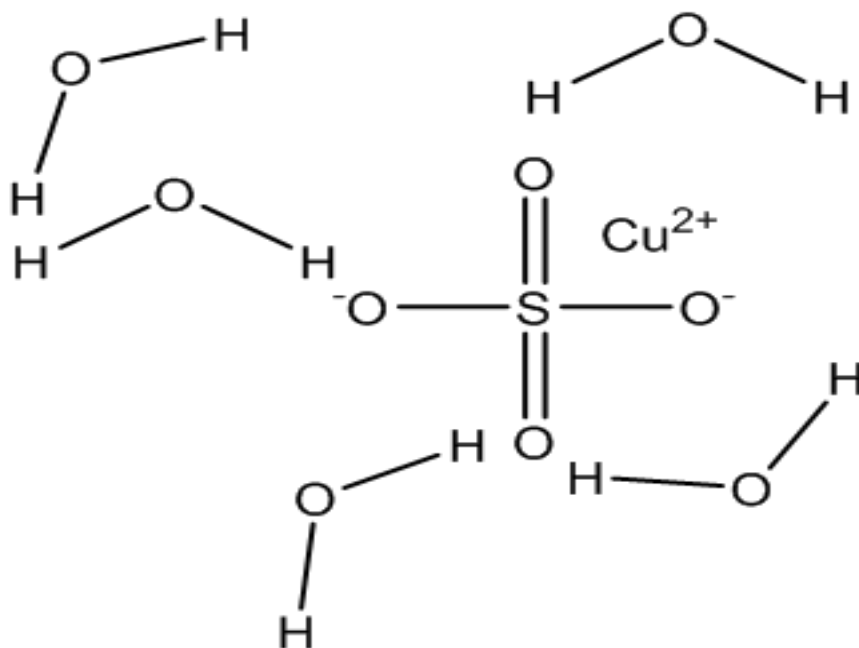
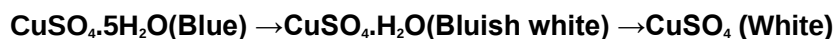
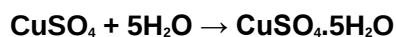


Fig. 3 Structure of Hydrated Copper (II) Sulfate

Blue crystals of copper sulphate contains water of crystallization. These crystals dehydrate on heating to lose water of crystallization at a particular temperature and change their colour.



If the dehydrated copper sulphate solid material is allowed to cool in air, then it regains blue colour after gaining water molecules from the atmosphere.



Learning outcomes

Students will be able to-

- Define the term “Crystallisation” through experiment.
- Explain the changes that occur during heating and cooling in crystallisation.