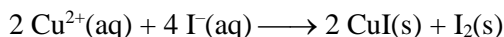
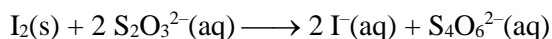


Preparation of copper(I) iodide

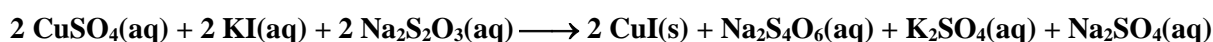
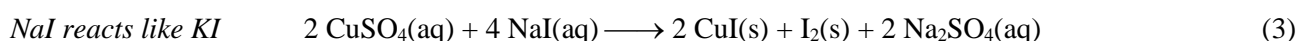
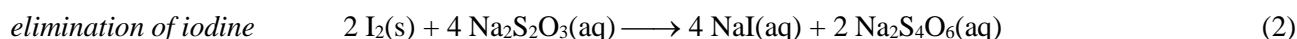
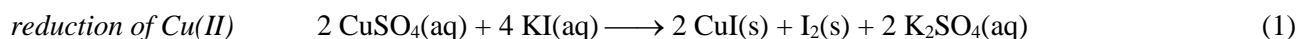
Copper(I) iodide is a nearly white, slightly brown or grey powdered substance. It forms three modifications depending on temperature. Copper(I) iodide is practically insoluble in water ($K_s = 1,26 \cdot 10^{-12}$). With ammonia, hydrogen halides and alkali halides as well as with sodium thiosulphate water-soluble coordination compounds form. By the redox reaction of copper(II) cations with iodide anions the elemental iodine precipitates, which is responsible for colour variations of the product.



Iodine must be eliminated by the reaction with sodium thiosulphate.



The overall reaction of copper(I) iodide preparation may be expressed as follows.



Work

Prepare 4.0 g of copper(I) iodide.

Chemicals

- copper(II) sulphate pentahydrate, light blue crystalline substance,
- potassium iodide, white crystalline substance,
- sodium thiosulphate pentahydrate, white crystalline substance.

Procedure

Dissolve $\text{CuSO}_4 \cdot 5\text{H}_2\text{O}$ in a bigger beaker in sufficiency of water to prepare 3.0 wt% solution. Cool down the solution below the room temperature in an ice bath. Dissolve calculated amounts of KI and $\text{Na}_2\text{S}_2\text{O}_3 \cdot 5\text{H}_2\text{O}$ in water to prepare the solution with molar concentrations $c(\text{KI}) = c(\text{Na}_2\text{S}_2\text{O}_3) = 1,0 \text{ mol dm}^{-3}$. Under stirring add the KI / $\text{Na}_2\text{S}_2\text{O}_3$ solution dropwise to the CuSO_4 solution. Immediately a brown precipitate will form. Once all solution is added the colour of reaction mixture will change slowly to slightly violet or yellow. Although the final colour may vary, it indicates that no more blue copper(II) cations are present in the solution.

Warning! Do not use excess of KI and/or $\text{Na}_2\text{S}_2\text{O}_3$, because soluble copper(I) complexes could form, hence the yield of copper(I) iodide precipitate may be lower.

Under intensive continuous stirring put the reaction mixture carefully on to boil and let it boil for *cca* 5 minutes. Then let the mixture cool slowly to the room temperature. The slower the cooling, the bigger the crystals of product precipitated. Filter out the cooled product and wash it with ice water to remove dissolved impurities. Transfer the product on a watch glass and let it dry freely on air. Finally, weigh the product.

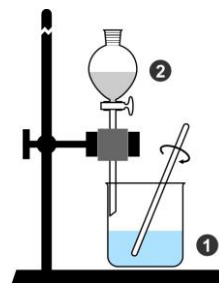


Fig. 1 Apparatus for the precipitation of copper(I) iodide.

1 – CuSO_4 solution,
2 – KI / $\text{Na}_2\text{S}_2\text{O}_3$ solution.

Safety instructions

Copper(II) sulfate pentahydrate – CuSO₄ · 5H₂O

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

Potassium iodide – KI

–

Sodium thiosulfate pentahydrate – Na₂S₂O₃ · 5H₂O

- R36/38** Irritating to eyes and skin.
- S26** In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
- S37/39** Wear suitable gloves and eye/face protection.

Copper(I) iodide – CuI

- R22** Harmful if swallowed.
- R36/37/38** Irritating to eyes, respiratory system and skin.
- R50/53** Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
- S22** Do not breathe dust
- S26** In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
- S61** Avoid release to the environment. Refer to special instructions/safety data sheet.
- S24/25** Avoid contact with skin and eyes.