Exercise

Growth of electrodeposited Cu fractals

The aim

This exercise consists in the observation of rapid crystallization process of sodium thiosulfate dihydrate (Na$_2$S$_2$O$_3$·2H$_2$O).

Introduction

Participants will use electric field to grow fractal-shaped Cu structures from aqueous copper sulfate solution. Different growth voltage, solution concentration, electrode geometry and optional magnetic field will result in varying shape of the structures, which will be observed in situ under an optical microscope.

What do you need for experiment?

→ sodium thiosulfate dihydrate, Na$_2$S$_2$O$_3$·2H$_2$O,
→ 2 small and 1 bigger beaker,
→ heater plate,
→ thermocouple or classic thermometer,
→ cotton wool and filter paper,
→ analytical balance.

Exercise

1. Using copper wires prepare sets of electrodes, which will make differently shaped electric fields.
2. Place your electrodes on a microscope glass, if necessary use insulation tape to hold them in place.
3. Connect your electrodes to power supply, remembering that Cu growth will take place on the electrode connected to the negative output of the power supply.
4. Pour a few drops of CuSO$_4$ solution, covering both electrodes with it.
5. Carefully place your microscope glass under the microscope and center it on the negative electrode.
6. Adjust focus, so the image is sharp (the microscope should be close to the sample, nearly touching it).
7. Begin electroplating by slowly rising voltage on the electrodes (visible process should begin at 1–2 V).
8. Try modifying voltage, solution concentration, electrode geometry or applying magnetic field and check how different electrolysis conditions affect the shape of fractals.