

# Experiment 10: Metal crystals

## Notes

When a more reactive metal is added to a solution of ions of a less reactive metal a displacement reaction occurs. If, for example, a strip of copper is added to an aqueous solution of silver nitrate, the silver ions will gain an electron and become silver atoms. The copper loses electrons and forms ions.

When this occurs in aqueous solution the silver crystals that rapidly form on the surface of the copper are readily visible through a microscope. The crystals that form in these conditions are relatively small. Each crystal represents an ordered arrangement of atoms.

Growing crystals in agar can slow down their formation and produce bigger crystals. Agar is a polymer molecule that forms a gel following heating and cooling. It is the jelly like material used as a medium to grow bacteria.

## Equipment

dimpled microscope slide	0.25 g of the following:
microscope	silver nitrate [ $\text{AgNO}_3$ ]
copper foil	copper (II) sulfate
silver nitrate	tin (II) chloride
Pasteur pipette	100 mL beaker
molten agar (approximately 40 mL per plate)	

## SAFETY NOTE:

- Silver nitrate causes burns and stains skin and clothing.
- Copper(II) sulfate and tin(II) chloride are irritants to skin and eyes.

## Procedure

### Part A: Copper

1. Lay the piece of copper on a dimpled microscope slide and place on a microscope stage.
2. Place a few drops of silver nitrate solution on the metal ensuring that at least one edge of the metal is covered with the liquid droplets. Do not flood the slide.
3. Carefully focus the microscope on the edge of the metal where it is touching the solution. Remember there is no coverslip on the liquid so be careful not to touch the microscope lens on the surface of the liquid.
4. Observe for a few minutes and describe the shape of the crystals that form.

## Procedure

### Part B: Zinc

1. Place a zinc strip in a Petri dish.
2. Add about 40 mL of molten agar to 0.25 g of the silver nitrate [ $\text{AgNO}_3$ ] in a 100 mL beaker. Place this dish in the dark as the agar darkens if it remains in the light.
3. You will be able to see the beginning of crystals forming after 15-20 minutes.
4. Repeat the above procedure with copper (II) sulfate, tin (II) chloride and compare the crystals shapes that form over time.

## Processing of results and questions

1. Describe the crystal produced in each of the displacement reactions.
2. Suggest two ways of changing the rate at which the crystals form in part B.
3. When using silver nitrate in step 2 of part B, the petri dish must be placed in the dark. Why does the agar discolour if left in sunlight?

## Investigate

## The task

Your scientist  
She is und  
laminated  
the desk su  
durable wo  
and a piec  
recommen  
Ensure yo  
taken.

## Planning

1. Plan  
labor
2. Mak
3. Mak
4. Writ  
equi
5. Che

## Conduct

1. Cor  
tabl
2. If t

## Process

1. WI
2. WI

## Evaluat

1. EV  
wo  
in
2. D