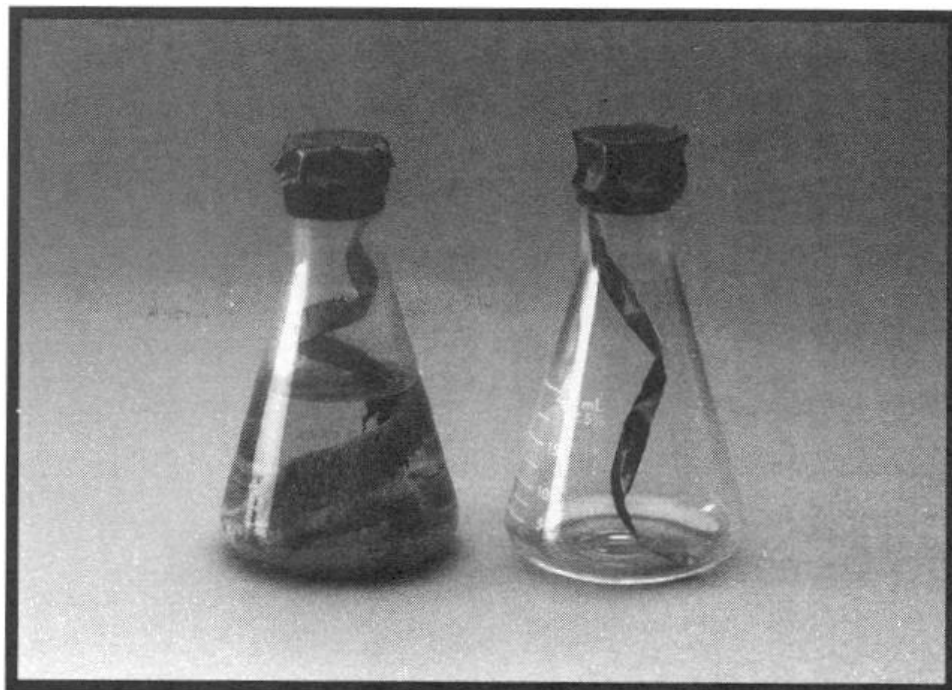




SIDE DISPLAY

# Silver Crystals

*Visitors observe a stoppered flask containing a blue solution and a piece of copper wire covered with silver crystals. Visitors read the copy explaining the chemical reaction that produced the crystals.*



## OBJECTIVES:

Visitors learn that metals can form crystals, and that a solid can form from atoms present in a solution (though invisible to the naked eye). They learn that one kind of atom can replace another in a chemical reaction. They also learn that the kind of atom in a solution can affect the color of the solution.

SCIENCE TOPICS	PROCESS SKILLS	VOCABULARY
Properties of Metals	Observing	Chemical Reaction
Chemical Reactions	Inferring	Compound
Properties of Solutions	Comparing/Contrasting	Solid
Properties of Crystals		Solution
Properties of Ions		

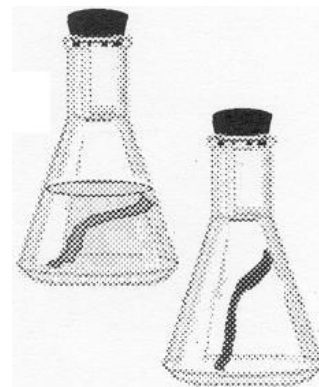




# Silver Crystals

## To do and notice:

1. Look in the bottom of the flask with liquid  
What do you see?
2. Look at the liquid in this flask.  
What color is it?
3. Compare the metal strips in each flask.



## What is going on?

What are the crystals?

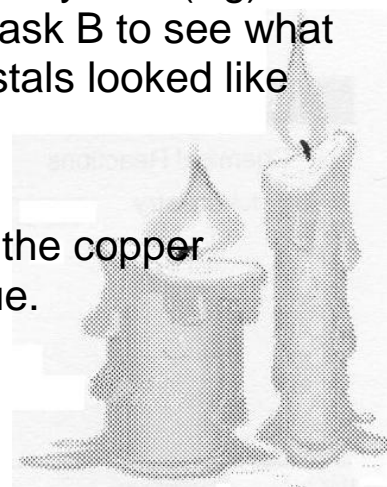
The shiny crystals on the bottom of flask A are pure silver.

Where did the crystals come from?

The crystals form when copper metal (Cu) is added to a solution of silver nitrate ( $\text{AgNO}_3$ ). The copper replaces the silver in the solution, and solid silver crystals (Ag) form on the surface of the copper. Look in flask B to see what the copper looked like before silver crystals looked like before silver crystals formed on it.

Why is the solution blue?

Copper is orange/brown as a solid, but the copper that replaced the silver in solution is blue.





**MATERIALS**

See *Materials Prep*  
for more details

**(with amounts to have on hand)**

- Two 250-ml flasks
- Two rubber stoppers for flasks
- 3.4 g  $\text{AgNO}_3$  (silver nitrate) (keep 100 g on hand)
- $\text{dH}_2\text{O}$  (deionized water)
- two pieces of clean copper strips, each about 6 in. long by  $\frac{1}{4}$  in. wide

**Setup/Takedown Procedures****ORIGINAL SETUP**

- ☐ Take one of the flasks and arrange one piece of the copper strip so that it hangs down to the bottom of the flask.
- ☐ Wear protective eyewear, chemical safety gloves, and an apron or a lab jacket.
- ☐ Pour 200 ml of the  $\text{AgNO}_3$  (silver nitrate) solution (see Materials Prep) into the flask and stopper it securely.
- ☐ In the second flask, add the other piece of copper and stopper it securely.
- ☐ Tape both stoppers closed with electrical tape. Crystals will immediately begin to grow in the first flask.

**WEEKLY SETUP**

- ☐ Set the display (the two flasks) behind a Plexiglas barrier so that visitors can observe, but not shake, the flasks. Put the public copy beside the display in a Plexiglas stand.

**DAILY SETUP**

- ☐ Check to make sure the flasks have not been tampered with.
- ☐ Redo original setup as needed.

**WEEKLY TAKEDOWN**

- ☐ This setup can be saved and set out indefinitely.

**RUNNING SUGGESTIONS**

- ◇ Relate to the Unit 1 “Trading Places” experiment.

**EXTENSIONS**

You can try this with other combinations of metals and nitrates (e.g.,  $\text{Cu}(\text{NO}_3)_2$  (copper nitrate) with zinc metal would give copper crystals).

Refer to a metal activity table, found in most chemistry textbooks, to see what other combinations might work.

**SAFETY & DISPOSAL**

$\text{AgNO}_3$  (silver nitrate) is a hazardous substance; follow handling and disposal instructions in Original Setup and Materials Prep.

Consult Material Safety Data Sheets (MSDS) for additional information.

To dispose of flask contents, run a water faucet and pour the solution into the sink. Empty the crystals and copper strips into the trash.

**MATERIALS PREP**

To prepare 200 ml 0.1M  $\text{AgNO}_3$  (silver nitrate) solution:

- ☐ Wear protective gloves, protective eyewear, and lab coat.
- ☐ Measure 3.4 g of  $\text{AgNO}_3$ .
- ☐ Add to 200 ml of  $\text{dH}_2\text{O}$  (deionized water).
- ☐ Stir until dissolved.