

Water Glass & Metal Crystals

Overview: *Water Glass* is another name for *sodium silicate* (Na_2SiO_3), which is one of the chemicals used to grow underwater rock crystal gardens. *Metal* refers to the metal salt seed crystal you will use to start your crystals growing. You can use any of the following metals listed. Note however, that certain metals will give you different colors of crystals.

What to Learn: The physical properties of the crystals in lab are due to specific chemicals in each mineral.

Materials

- Clean glass jar
- Sodium silicate
- Rubber gloves
- Safety glasses
- Sand
- One (or more) compound for different colors:
 - White – calcium chloride (found on the laundry aisle of some stores)
 - Purple – manganese (II) chloride
 - Blue – copper (II) sulfate (common chemistry lab chemical, also used for aquaria and as an algicide for pools)
 - Red – cobalt (II) chloride
 - Orange – iron (III) chloride

Lab Time

1. We're working with chemicals today, so keep in mind our safety measures and practice good lab habits so that no accidents occur.
2. Put on safety goggles and protection for hands, like rubber gloves.
3. Observe the size of the crystals and the grains. If the grain is fine, like a powder, we'll need to grow a seed crystal. Dissolve the chemical into your pan of hot water. Add until no more solids can be dissolved (supersaturated). From this batch, wait until you have a seed crystal. This should take a few days.
4. Add a layer of sand to the bottom of your container to grow your crystals.
5. Measure 1/4 ratio of sodium silicate to water, according to how much solution you'll make. Mix it thoroughly, since it won't easily come together with the water.
6. Pour the solution carefully into your container with the sand.
7. Place your seed crystals in the container, but don't add more than a few crystals.
8. Put the container aside, and observe your crystals growing over the next few days. Carefully pour out your water, but keep in mind that your crystals will be very fragile.

Water Glass & Metal Data Table

Time	Est. Number of Crystals	Color/ Chemical?
1 day		
3 days		
5 days		

Reading

Your crystals begin growing the instant you toss in the seed crystals. These crystals are especially delicate and fragile – just sloshing the liquid around is enough to break the crystal spikes, so place your solution in a safe location before adding your seed crystals.

After your garden has finished growing to the height and width you want, simply pour out the sodium silicate solution and replace with fresh water (or no water at all). Due to the nature of these chemicals, keep out of reach of small children, and build your garden with adult supervision.

The seed crystals are metal salts that react with the water/sodium silicate solution to climb upwards in the solution, as the products are less dense than the surrounding solution.

Troubleshooting: If you add too many seed crystals, your solution will turn cloudy and you'll need to start all over again! Add your seed crystals sparingly – you can always add more later. This lab may be fun to allow the students to guess which compound has been added to their crystals. Simply use a key to allow the students to record the correct chemical in their worksheet, further improving good observation skills.

Exercises

1. What is the solution called when no more solids can be dissolved?
2. What is the main solute in this experiment?
 - a. Sodium silicate
 - b. Sodium chloride
 - c. Magnesium sulfate
 - d. Cobalt (II) chlorate
3. What are the main types of elements that give crystals and minerals their color?
 - a. Noble gases
 - b. Metals
 - c. Hydrocarbons
 - d. Volatile compounds

Answers to Exercises: Metal Crystals

1. What is the solution called when no more solids can be dissolved? (supersaturated)
2. What is the main solute in this experiment? (sodium silicate)
3. What are the main types of elements that give crystals and minerals their color? (metals)