

Zeolites Procedure

The goal of this demonstration is to show how a zeolite can work as a “cage” to trap certain molecules selectively.

Materials Needed:

Microscale:

- 1 Buchner Funnel
- 1 125 mL Filter Flask
- 1 Piece of Filter Paper
- 1 Pump
- 1 Filter Adapter
- 125 g container of Zeolite
- 3 Vials
- 1/2 tsp Zeolite in one vial filled with water
- 1/2 Vial of Bipyridine
- 1/2 Vial Diluted Fe(Bipyridine) solution
- 3 Squirt Bottles
 - 1 Blue Squirt Bottle w/ Water
 - 1 Blue Squirt bottle with $\text{Cu}(\text{NH}_3)_6$
 - 1 Red Squirt bottle with Diluted Iron Bipyridine

Macroscale:

- Smaller plastic balls
- Larger plastic balls
- Plastic tub with wooden insert (with holes cut-out)

Zeolites Museum Show

Set-up Microscale

- Check to make sure you have all the supplies.
- Set up pump, filter flask, adapter, and funnel with paper.
- Fill 1 vial halfway with Iron Bipyridine, a.k.a. Fe(Byp) (red solution.)
- Fill another vial halfway with the $\text{Cu}(\text{NH}_3)_6$, (blue solution.)

Set-up Macroscale

- Have all materials on the table.

The Demonstration:

Microscale

1. Point out that you have this neat white powder called a zeolite that has very interesting characteristics. This zeolite is actually in many commercial laundry detergents. You can get it by taking a cup of detergent, adding some water to dissolve most of the other ingredients and waiting for the zeolite to settle out.
2. Show them the container with the zeolite. Put 1/2 teaspoon of zeolite into the third empty vial and fill with water. Put lid on vial have an audience member shake vigorously.
3. Turn on the pump and wet filter paper. Pour zeolite mixture onto paper and rinse vial with water. Allow all of the water to be sucked through the filter.

4. Show the red solution to the audience and try to get them to guess what will happen when you pour the red solution on the zeolite. Pour red solution ($\text{Fe}(\text{By})$) onto the zeolite. Point out the water coming through the filter is clear and the zeolite is pink. Allow all of the solution to go through the filter.
5. Show the blue solution to the audience and ask them to guess what will happen when you pour this solution over the zeolite. Pour Blue solution ($\text{Cu}(\text{NH}_3)_6^{+2}$) onto the zeolite. Point out the water coming out is red now and the zeolite is blue.
6. Explain that the zeolite has many tiny holes which trap the colored molecules in the water, but it likes to trap some molecules over others and therefore the blue solution takes the place of the red solution (it is selectively traps the blue molecules.)

Microscale

1. Have visitors add larger red balls to the tub and shake them around. Show how they will stay in the holes. Ask the visitors what this is similar in the micro scale demo.
2. Then ask a visitor to put in the smaller blue balls and get another visitor to shake. Ask them what this is similar to in the micro scale version of the demo. Ask them what is going to happen. Which balls will be held in the holes? Then open the box to reveal the smaller blue balls in the holes, with the larger red ones lying loose on top.

Clean-up:

All solutions are safe for sink (sewer) disposal.

1. Pour solutions from filter flasks down a sink.
2. Throw away zeolite and filter paper.
3. Rinse funnel and vials.
4. Put filter set up back together for next demonstration.
5. Gather all materials and return to storage.