

Self-Assembly

Find out how molecules can put themselves together.



Materials

(See end of activity for sources of some materials.)

- clear bowl or other container
- water
- plastic fork
- aluminum coins

Alternative materials

paper clips (especially round ones) or wine corks sliced into 1/8" rounds

To Do and Notice

1. Fill the bowl with water.
2. Use the plastic fork to gently lower the coins onto the surface of the water one at a time. The coins should float on the surface of the water and should be attracted to each other, forming a close-packed hexagonal pattern.
3. If your coins don't immediately self-assemble, use the fork to gently move some closer together, and notice how they interact.

What's Going On?

Small objects resting on the surface of water attract one another. This is due to the surface tension of the water, which causes the surface to behave like an elastic skin. The coins slightly depress the skin of the water in the same way that an object can depress a sheet of plastic wrap



that's stretched over a container. (If you look closely, perhaps from the side of the bowl, you'll be able to see the depression in the water's surface.) The coins are drawn together as they seek to lower their gravitational energy level.

Coins and round paper clips will self-assemble into a hexagonal shape. Regular paper clips will assemble into a less symmetrical shape, but most of them should line up parallel to each other.

What's the Nanoscale Connection?

Molecules, too, try to reach their minimum energy state, and they'll form bonds, change their orientation, or do whatever they can to accomplish this. That makes self-assembly possible at the nanoscale. Scientists are exploring self-assembly of nanostructures to produce new and improved materials.

Current research includes self-assembled monolayers (SAMs), in which a layer of molecules forms on a surface in an orderly, close-packed fashion that's similar to the way the coins self-assemble.

Where to Purchase Materials

Aluminum coins can be purchased from Educational Innovations:
www.teachersource.com/Density/FloatingAndSinking/FloatingCoins.aspx

You might also find some at a local coin shop—ask to see the junk box. Make sure the coins are all the same size.



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