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Exploring Materials—Hydrogel

Can a pinch of powder trap a lot of water?

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Exploring Materials—Hydrogel

Try this!

1. Fill a small cup about half full with water.
2. Put a stir stick in the cup. Place the bottom of the stick about half an inch from the side of the cup, and rest the top of the stick against the side of the cup.
3. Sprinkle in a quarter spoonful of the white powder. What happens?

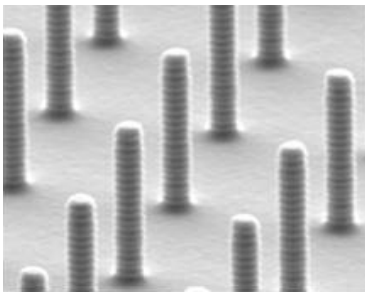
What's going on?

The powder absorbs all the water, expanding into a gel and moving the stir stick! The powder is a *polymer* called sodium polyacrylate that can absorb up to 1,000 times its weight in water!

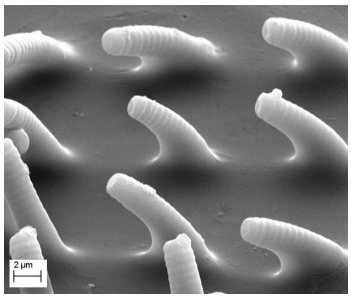
A polymer is a long chain-like molecule made up of many repeating "links." The links of this particular polymer can attract and hold many water molecules. It's used in baby diapers to make them absorbent, and in plantings to help soil retain water.

Researchers are experimenting with similar materials called *hydrogels*. For example, a group at Harvard University is using hydrogels as "muscles" to control micro-sized structures.

The gels can be designed to respond to changes in their environment, such as pH, temperature, or humidity. When the gels get bigger or smaller, they move tiny structures around them.



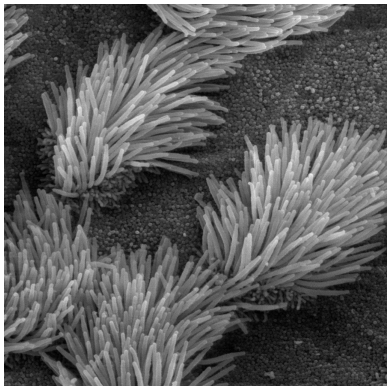
Posts surrounded by hydrogel
2,000 nm wide



Posts moved by hydrogel
2,000 nm wide

How is this nano?

The way a material behaves on the macroscale is affected by its structure on the nanoscale. Some polymer crystals can absorb a lot of water, because they're made of long, chain-like molecules with many smaller "links" that attract water molecules.



Cilia keep our lungs clean
300 nm wide

Nanotechnology takes advantage of different properties—like super-absorption—at the nanoscale to make new materials and tiny devices smaller than 100 nanometers in size. (A nanometer is a billionth of a meter.)

For example, researchers are using hydrogel "muscles" to move tiny structures. This research is inspired by the way muscles move parts of the human body, such as the tiny cilia that help sweep away dust from our lungs.

Nanotechnology allows scientists and engineers to make things like smaller, faster computer chips and new medicines to treat diseases like cancer.