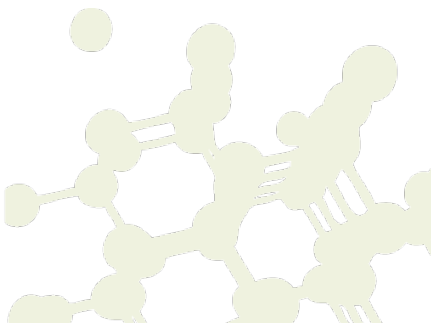
NanoDays

Exploring Properties—Surface Area

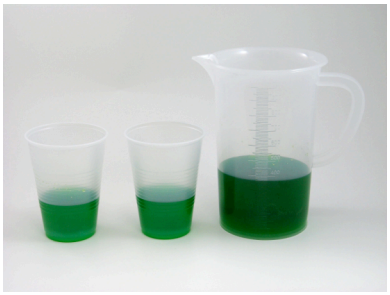
What's different at the nanoscale?



Exploring Properties—Surface Area

Try this!

1. Pour about 50 ml of colored water from the pitcher into each cup.
2. Remove two antacid tablets from their wrapper. Break one in half, and drop it into a cylinder. Break the other tablet into many small pieces, and put it in the other cylinder.
3. At the same time, pour the water from each cup into a cylinder.
4. Which fizzes up more, the tablet you broke in half or the tablet you broke into lots of pieces?



What's going on?

The crushed tablet fizzes faster than the halved tablet. That's because it has a greater *surface area to volume ratio.* For the same amount of antacid (one tablet), the crushed tablet has more surface—or exterior—to react with the water. Because the water can reach more of the antacid immediately, the chemical reaction (fizzing) happens faster.

Small things have more surface area for their volume than larger things do. Some things that aren't reactive at all in big pieces are very reactive when they're tiny. Steel wool catches fire, but you can't easily light a lump of metal on fire!

How is this nano?

A material can act differently when it's nanometer-sized. Things on the nanoscale have a lot of surface area, so they react much more easily and quickly than they would if they were larger.

When you crush the tablets, you create smaller pieces. The smaller the pieces, the faster the reaction. If you could crush the tablets all the way into nanometer-sized particles, they'd be way too small to see, but they'd react really fast with the water! (A nanometer is a billionth of a meter.)

Nanotechnology takes advantage of different material properties at the nanoscale—like reactivity—to make new materials and tiny devices. Nanotechnology allows scientists and engineers to make things like smaller, faster computer chips and new medicines to treat diseases like cancer.