Nano-effervescence

Discover how surface area affects reaction rates.

Materials

- antacid tablet, Alka-Seltzer or similar
- 2 white translucent film cans
  (You might want to have extras in case one doesn't seal tightly.)
- metal spoon
- a partner
- 2 pairs of safety glasses
- 2 plastic tumblers partly filled with water
- a plastic dishpan to contain possible spills (or do the activity outdoors)

To Do and Notice

1. Break an antacid tablet into four approximately equal pieces. Put one piece into a film can. Crush another piece with the back of the metal spoon, and put the crushed antacid into the other film can.
2. You and your partner should put on your safety glasses. Then each of you should take a film can and do the following at the same time: Pour water into the film can until it's about half full, then immediately snap the lid on tight and put your film can in the dishpan. Stand back and observe.

3. Which film can was the first to explode? What does this tell you about particle size and reaction rates?

What's Going On?

The antacid reacts with water to produce carbon dioxide gas. The gas expands until there is so much pressure that the lid of the film can pops off. The rate at which the gas is produced determines how quickly, and with what force, the lid will fly off the film can.

The crushed antacid has much more surface area than the uncrushed piece. This greater surface area means that there is much more antacid in contact with the water, which causes a faster reaction rate, so the lid on the film can containing the crushed antacid pops off first.

What's the Nanoscale Connection?

At the nanoscale, surface area is huge compared to volume, and many nanotechnology applications take advantage of this. Reactions involving nanoparticles happen much more quickly than those with larger particles. Nanoparticles can also serve as catalysts to speed up reactions involving macroscale materials.

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