NANO@HOME

Surface Reactions

Many chemical reactions in nature and in engineering take place between molecules and surfaces. In this activity, you will use ping-pong balls to represent molecules and a shallow tray to represent a surface. Velcro will be used to represent bonding between the molecules and surfaces.

What you need

- ☐ Ping-pong balls
- ☐ Velcro adhesive sheets or strips or dots
- ☐ Two shallow trays
- ☐ Double sided tapes

Tray Velcro

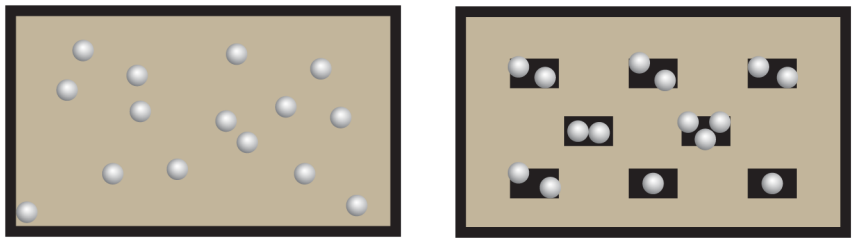
Ping Pong balls with Velcro

What to do

1. Place the bare ping-pong balls in the bare tray and shake it horizontally. Observe where the balls go.
2. Cut some Velcro into small pieces and stick a piece on each ping-pong ball, or use small dots.
3. Cut some Velcro of the opposite type (use the hook side if you used the loop side for the balls), and stick some at specific locations in the second tray.
4. Place the ping-pong balls with Velcro into the tray with Velcro spots, and shake them around horizontally. Observe where the balls go, and the difference with the bare tray.

What you'll see

In the bare tray, the ping-pong balls will be randomly distributed and move around. However, in shallow tray B, the Ping Pong balls will prefer to stay still with the Velcro sticking together.



Bare tray Velcro-covered tray

What's going on?

We assume the Velcro Ping Pong balls as molecules. In the bare shallow tray, there is no spot on the surface can react with the molecules, so the balls will move freely and distribute randomly. However, in the Velcro-covered tray, the surface can react with the molecules (Velcro at the bottom of the tray and the surface of ping-pong balls can stick together). Then the balls will stay still and the stick Velcro represents the bond between the surface and the molecules.

How is this related to nanotechnology?

The mechanism and progress of surface reactions are very important to understanding important applications in engineering like catalysts for making different chemicals. They can be studied at nanoscale with the help of specialized equipment such as atomic force microscopy.

Learn more

Reactions on surfaces:
https://en.wikipedia.org/wiki/Reactions_on_surfaces

Atomic Force Microscopy:
https://en.wikipedia.org/wiki/Atomic_force_microscopy