Fear of Water

Purpose

To illustrate the hydrophobic effect.

Materials

- Hydrophobic sand
- Ethanol
- Water
- Filter paper
- Funnel
- (2) 400 mL beakers

Safety

- Read the SDS sheet for ethanol.
- Wear safety glasses and gloves.
- Alcohol is highly volatile and flammable. Ensure no open flames are present (candle, Bunsen burner).
- Avoid inhalation of alcohol vapors

Procedure

1. Pour 200 mL of water into a 400-mL beaker.
2. Sprinkle some hydrophobic sand onto the water.
3. Try to push the sand down with your finger.
4. Sprinkle more sand into the beaker so that some falls to the bottom.
5. Pour 200 mL of ethanol into a second 400-mL beaker.
6. Sprinkle hydrophobic sand into this second beaker and observe.

Results

- The hydrophobic sand remains on the surface of the water when a small amount is sprinkled on the water.
- The sand appears to stick to the finger when submerged.
- When large amounts of sand are added, intestinal shapes form at the bottom of the beaker.

Follow-up Teaching Notes

- The non-polar sand does not mix with the polar water molecules.
- The sand appears to bond together in water, giving rise to the concept of hydrophobic bonding.
- Effect disappears with ethanol, or if regular sand is used in water.

Connections

- Hydrogen bonding, hydrophobic bonding, surface tension.

Extension

- Can explore the effects of detergents on surface tension of water.

Disposal/Clean-up

- Recollect the sand for reuse by filtration.
- The used water can be washed down the drain.
- The used alcohol can be washed down the drain with lots of water.