

Atoms and Bonding ▪ *Enrich***Oil Spills**

Each year over 907,000 metric tons of crude oil are spilled in Earth's oceans. This is enough oil to fill 100 school gymnasiums! It is important to clean up crude oil as soon after a spill as possible, because spilled crude oil has negative effects on the environment. Oil on ocean surfaces is harmful to ocean life because it blocks sunlight and reduces the level of dissolved oxygen in the water. In addition, many birds and fish die from contact with crude oil because the oil damages feathers and gills.

Two methods used to clean up oil spills are:

1. A floating barrier is placed around the spill to keep it from spreading. Because oil floats on water, the oil can be skimmed off the top of the water. Skimming the top of the water using a net with extremely small holes allows the water to escape but not the oil.
2. Chemicals that act like detergents are sprayed onto the surface of the spill. These chemicals break up the oil into tiny droplets. The small particles of oil spread over a large area have less effect on marine life than larger particles.

Both of these methods work because of the chemical properties of oil molecules. Oil molecules are nonpolar, so they will not mix with polar water molecules. Detergents are long molecules that have a polar end and a nonpolar end, like the molecule shown in Figure 1. The polar end of the detergent attracts water molecules, and the nonpolar end attracts oil molecules. Figure 2 shows how detergent molecules cause the formation of droplets of water, detergent, and oil molecules.

Figure 1
Detergent Molecule

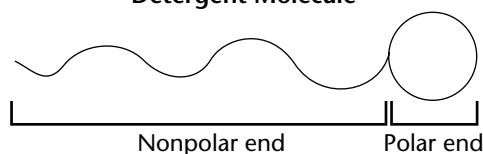
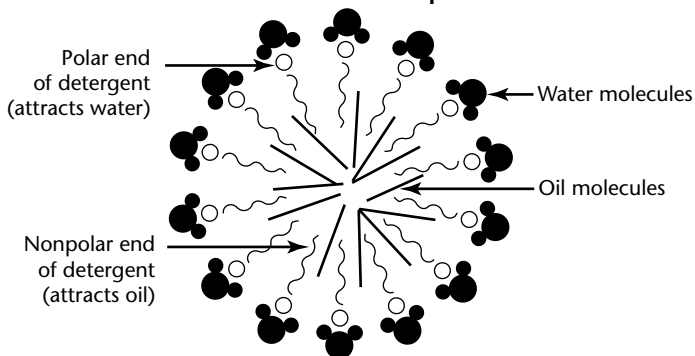


Figure 2
Formation of Oil Droplets



Answer the following questions on a separate sheet of paper.

1. Explain how the nonpolar character of oil molecules helps when removing oil from water using nets and floating barriers.
2. The long "tail" on a detergent molecule is made up mostly of carbon atoms bonded to other carbon atoms. Why would you expect the tail to be nonpolar?
3. How does detergent sprayed on an oil spill break up the spill?
4. The action of waves can break up large sections of an oil spill. The oil looks like it has mixed with the water, but has it? Explain your answer.