

Additional Teacher Background

Chapter 2 Lesson 4, p. 115

Why does salt make ice colder?

There is a principle in chemistry that comes up in several different contexts.

The simple version is that:

- It takes energy to break bonds
- Energy is released when bonds are formed.

These ideas can be used to help explain why the temperature decreases when salt is added to ice.

If an ice-and-water mixture is placed in a well-insulated container, some ice melts but some water also freezes. The breaking of “bonds” between water molecules to melt the ice uses some energy so the process of melting makes the ice/water mixture colder. But the making of “bonds” between water molecules to form ice is energy-releasing so the process of freezing makes the ice/water mixture warmer. When these two processes happen at the same rate, the ice/water mixture stays at the same temperature. But when salt is added, it dissolves into the water and forms a salt water solution. The salt water does not refreeze as fast as the rate at which the ice melts. The energy used to melt the ice is not balanced by an equal amount of energy released by freezing so the ice/saltwater solution gets colder.

This would actually work with any substance that dissolves well in cold water. Salt dissolves pretty well in cold water and is pretty cheap, so it is a popular choice.