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Experiment #121907-01

“Supersaturated Sodium Acetate Solution”¹

This is a demonstration of an exothermic reaction caused by the heat of crystallization. The materials and equipment needed are: (1) sodium acetate trihydrate; (2) 250 mL Erlenmeyer flask; (3) hot plate (or a Bunsen burner or alcohol lamp and a burner tripod and wire mesh for supporting the flask); (4) deionized water; and (5) a wash bottle.

1. Put 160 grams of sodium acetate in the flask and add 30 mL of water.
2. Heat gently and stir until the crystals of sodium acetate dissolve. Use a small amount of water dispensed from a wash bottle to rinse down the inside of the flask.
3. Remove the flask from the heat and let it cool slowly to room temperature without disturbing it.
4. Add one or two crystals (that’s right, it only take a single crystal) to the liquid in the flask. Don’t take your eyes off of the liquid as beautiful crystals begin to form inside the flask.
5. Feel the flask... it’s warm! The process of crystallization gives off heat. It’s said to be exothermic. That’s why the solution is used in hand warmers.
6. Alternatively, you can place a couple of crystals of the solid sodium acetate on a large watch glass and slowly pour the cooled solution onto the crystals. When the first drops of the solution come into contact with the crystals on the watch glass they immediately crystallize and continued pouring of the liquid will result in a stalagmite of impressive height.
7. When the crystals are collected and returned to the flask they can once again be heated to return them to a supersaturated solution. The heat energy put into the solution is returned when the solution crystallizes.

Supercooled liquids can be cooled below their normal freezing point without turning solid. Then, at the flick of button, the supercooled liquid is triggered to solidify (crystallize) and at the same time release large amounts of heat. Salt solutions that have been processed in such a way that their temperature can be lowered well below their solidification (or melting) temperature and still remain in liquid are defined as supercooled or metastable liquids.

1. <http://www.stevespanglerscience.com/experiment/00000078>