Instant Ice Pack

Background

“Ice-packs” have been around since the early 19th century and used for a multitude of purposes. Snow stuffed bags were used in the early 1800s to numb soldiers before amputations took place. From the 1890s to the 1950s ice was gathered and kept in boxes to keep food from spoiling. In the late 1950s scientists began experimenting to find substitutes for natural ice. The attempts by scientists in the 1950s and 1960s were mildly successful and created a small “ice-pack” which could keep food and drink cold outside of an ice-box. It wasn’t until the 1970s that an ice-pack was created to conform to the body and, subsequently, that ice-packs began to be used in the medical field for cold-therapy.

Ice packs have been made with many different combinations of ingredients. While some were far more successful than others, you will see through this experiment how scientists were able to use trial and error to design a long-lasting ice-pack. The reaction you will perform today creates an “ice-pack” for only a short amount of time, but this information eventually led scientists to the cold packs of present day!

Hazards

* Over exposure to citric acid can cause shortness of breath, sore throat, and/or cough.
* Baking soda has very few hazards unless ingested in large quantities.

Materials

-containers,(I.e. plastic bags or beakers) -water source, (I.e. faucet)

-Citric acid

-Sodium Bicarbonate, (Baking soda)

-Stirring device, (stir rod, stick, stir bar)

Procedure

1. Add 40 grams citric acid to 50ml of water

2. Stir

3. Add 55 grams sodium bicarbonate to solution

(if reaction does not take place, stir until you see bubbles)

Chemistry Involved

In this experiment we will look at a mild endothermic reaction between sodium bicarbonate (NaHCO3) and citric acid (H3C6H5O7). The reaction is as follows, but it MUST take place in water to work: H3C6H5O7(aq) + 3NaHCO3(aq) --> Na3C6H5O7(aq) + 3CO2(g) + 3H2O(l)).

Lesson Implementation

This would be a good demo to use when talking about endothermic vs exothermic reactions. Definitions of each reaction type could be given, then students would be asked to determine which reaction shown was endothermic and which reaction shown was exothermic.

This would also be a great demonstration to help students identify gas formation reactions and/or understand the law of conservation of mass.

References

<https://www.nytimes.com/2014/07/13/magazine/who-made-that-ice-pack.html?_r=0>