



Endothermic & Exothermic Reactions

It is common knowledge that ice can be used to cool a drink and wood can be burned to keep us warm. These are examples of endothermic and exothermic reactions. The root of those two words, therm, comes from the Greek word meaning “temperature” or “heat.” Endo means “within” while exo means “outside”. Therefore, endothermic reactions absorb heat from their surroundings (e.g. ice melting and “cooling” a drink). Conversely, exothermic reactions release heat to their surroundings (e.g. burning wood in a fireplace). This kit will demonstrate how exothermic chemical reactions can produce heat or endothermic chemical reactions can make things cold.

Contents

- **One-time use hand warmers (4)**
These contain an air-activated chemical reaction that releases heat. These are one-time use hand warmers and illustrate an irreversible process.
- **One-time use ice packs (4)**
When squeezed, the inner pouch ruptures and the two constituents mix producing an endothermic reaction which results in the pack getting cold (absorbing heat). These are typically used to reduce pain and swelling from sprains or bruises. They're quite common at sporting events. These packets are one-time use items and illustrate another irreversible process.
- **Reusable heat packs (4)**
These include supersaturated liquid (sodium acetate) that, when the initiator button is pressed, causes the liquid to slowly turn to a solid and release heat to warm the hands. This packet is reversible and the contents may be turned back to a liquid by placing the packet in boiling water for 15 minutes.

Instructions

Pass the un-activated packs around the class so the students can feel the temperature. Then have each team activate the packets so the students can feel the change in temperature.

Discussion

Discuss the terms endothermic and exothermic reactions and how energy is absorbed or released, depending on the direction of the process. Talk about phase change and how water can move from solid to liquid and liquid to vapor. Introduce the endothermic phase change, sublimation, which occurs when a substance moves directly from the solid to gas phase. Discuss how chemical reactions can produce or absorb thermal energy and how phase changes are used to heat and cool the built environment.

1. What are the advantages and disadvantages of the reusable versus non-reusable hand warmers?
2. What are some examples of exothermic chemical reactions that produce heat?
3. What are some examples of endothermic chemical reactions that create low temperatures?
4. What are some examples of sublimation?