



# Hand Warmers

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In wintertime, do you often find your hands very cold even though you have put on plenty of clothes? Back in the old days, people used to wear gloves to keep their hands warm. Today, there is an alternative : hand warmers, which can provide heat in seconds and keep our palms and fingers warm in cold weather.

In general, there are two common types of hand warmers.

## The Disposable Iron Powder Hand Warmer

This type of hand warmer makes use of the exothermic (放熱的) chemical reaction between iron and oxygen. When the hand warmer packet is taken out of the air-sealed package, the iron powder inside is oxidized (氧化) by the oxygen in the air. The heat energy that is given out can last for several hours. As the reaction between iron and oxygen is irreversible (不能倒置的), the hand warmer becomes useless when all the iron powder is used up.



## The Reusable Sodium Ethanoate Hand Warmer

This type of hand warmer makes use of the exothermic crystallization process of a highly concentrated (濃縮的) sodium ethanoate solution. This solution inside the hand-warmer gets crystallized when a small metal disc in the packet is bent. As the solution crystallizes, heat energy is produced. Boiling the packet for a few minutes will make the crystal dissolve (溶解) again. This kind of hand warmer can therefore be used many times.



## Making Your Own Hand Warmer

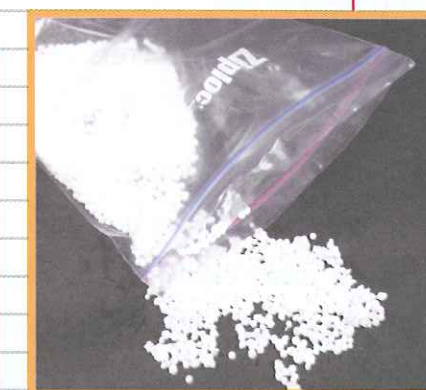
To do this experiment, you will need

- A calcium chloride dehumidifier
- A large and a small zipper storage bag
- some water

## Procedures



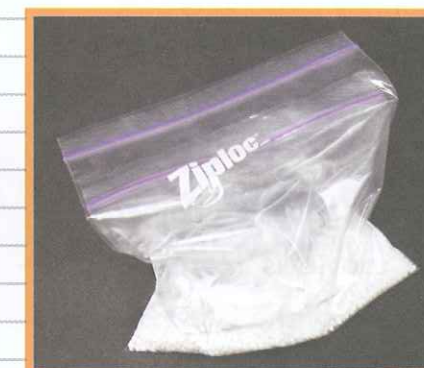
1. Disassemble (拆開) the dehumidifier and take the calcium chloride powder out.



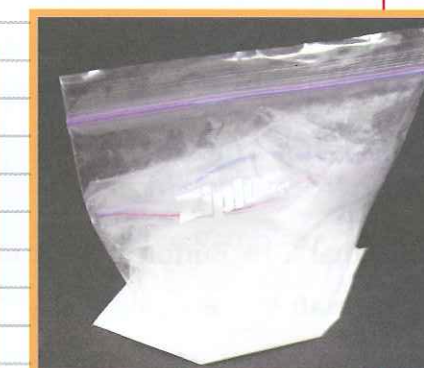
2. Put the calcium chloride powder into the large zipper bag.



3. Fill the small zipper bag with cold water and zip it up halfway, allowing an opening.



4. Carefully put the small zipper bag into the large one and zip it up.



5. Gently squeeze the bag to make the water pour out so that it mixes with the calcium chloride powder.

Mixing calcium chloride with water is an exothermic reaction. When the calcium chloride dissolves in water, heat is released and the pack gets warm.