Heat in a Bag

The Action
Once the materials are added to the Ziploc bag and the water from the vial is allowed to mix with the chemicals, a fizzing mixture forms and the bag expands and heats up.

Grade Level
Grade 10 - Chemical Change

Materials
- Ziploc bags
- Small canister (film container)
- 2 measuring spoons
- Baking soda (NaHCO3)
- Calcium chloride (CaCl2)
- Measuring vial

Instructions
- Measure 1 tsp of baking soda and 2 tsp. of calcium chloride into the Ziploc bag.
- Measure 10 mL of water into the small container. Place the container in the Ziploc bag standing upright and then seal the bad making sure to squeeze out all the air.
- Once the bag is sealed, tip over the vial of water and allow the materials to combine.

Safety
Students must wash their hands thoroughly after this experiment. Safety glasses are recommended when working with chemicals.

Hints
Make sure there are no holes in the bag before starting the experiment. Also, ask students to compare the temperature before the reaction and after the reaction so they are aware of the heat being produced.

Science Principle
This is a simplified equation of the chemical reaction that is occurring:
$NaHCO_3(s) + CaCl_2(s) + H_2O(l) \text{ Þ } CaCO_3(s) + CO_2(g) + NaCl(aq) + HCl(aq)$
The calcium chloride, baking soda and water combine to form carbon dioxide gas. The calcium chloride and water produce heat. An indicator, such as phenol red, may be added to the water. With the indicator, the reaction mixture will change from red (basic) to bright pink to orange to yellow (acidic) indicating the formation of an acid. Initially the presence of baking soda causes the reaction to be more basic. The carbon dioxide gas and hydrochloric acid that are formed are acidic, resulting in the yellow colour. The overall reaction is really made of several smaller reactions that occur in a cascade.