

## 63. Chemistry of Airbags

**Classroom Activity:** Students learn about the chemical reactions that trigger the release of an airbag.

**Grade:** 5

**Strand(s):** Understanding Matter and Energy

This task addresses the following overall expectations:

- evaluate the social and environmental impacts of processes used to make everyday products;
- conduct investigations that explore the properties of matter and changes in matter;
- demonstrate an understanding of the properties of matter, changes of state, and physical and chemical change.

and the following specific expectations:

- evaluate the environmental impacts of processes that change one product into another product through physical or chemical changes;
- assess the social and environmental impact of using processes that rely on chemical changes to produce consumer products, taking different perspectives into account;
- follow established safety procedures for working with heating appliances and hot materials;
- use scientific inquiry/experimentation skills to investigate changes of state and changes in matter;
- use scientific inquiry/experimentation skills to determine how the physical properties of materials make them useful for particular tasks;
- use appropriate science and technology vocabulary, including mass, volume, properties, matter, physical/reversible changes, and chemical/irreversible changes, in oral and written communication;
- use a variety of forms (e.g., oral, written, graphic, multimedia) to communicate with different audiences and for a variety of purposes;
- identify properties of solids, liquids, and gases;
- describe chemical changes in matter as changes that are irreversible;



- explain how changes of state involve the release of heat or the absorption of heat;
- identify indicators of a chemical change.

### Assessment Categories:

- Knowledge and Understanding
- Thinking and Investigation
- Communication
- Applications
- Teambuilding skills

**Type of Activity:** Classroom

Time needed to plan: 4 hours

Time needed to complete activity: 1 hour

### Materials/Resources for teachers:

Very small Ziploc bags  
Margarine containers  
Eggs  
Vinegar  
Baking soda  
Metre sticks - one per group  
Paper towels  
Markers

### Activity Description:

To begin, discuss restraint systems in cars such as seat belts and airbags. This always opens up an excellent discussion with the students - many have stories to tell about family members or friends who were saved by seat

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belts or airbags.

Explain how an airbag really works. [Http://auto.howstuffworks.com/airbag.htm](http://auto.howstuffworks.com/airbag.htm) is an excellent information source. Teams are divided into groups of 3 or 4. Each is provided with an empty margarine tub (with lid), a Ziploc bag, some vinegar, baking soda, metre stick and an egg. Note - one or more students may need to be excused if they have egg allergies.

Each team is told how much vinegar and baking soda they are to place in the Ziploc bag. When combined, they form carbon dioxide gas, which fills up the Ziploc bag. Assign different groups different amounts so they can see how the various amounts fill the bags. It is a good idea for the EIR to test this at home first. Note - the bags do leak, after combining the ingredients and zipping the bag shut, they should test it by gently pressing on the bag. If it leaks, provide them with another bag.

The students then personalize their egg by drawing a face on it. This is their "crash test dummy."

Each group then places the bag on the bottom of the margarine container with the egg on top and then attaches the lid. They drop the container from increasing

heights until their "crash test dummy" breaks. After all the eggs are broken, each group is asked to identify how high their margarine tub was dropped before the egg broke. The EIR can then compare the different values from the groups. If time and materials allow, you can provide additional bags and materials to let the students retest.

At the conclusion of the activity, it is VERY IMPORTANT that the students wash their hands after handling raw eggs.

Have a discussion period afterwards, including such questions as:

1. Why would baking soda and vinegar not be used in real airbags?
2. Why did the mixture get cold, when both components were room temperature to begin?
3. Why is there a little liquid left in the bottom of the bag?