

## Magnesium and Dry Ice Combustion Reactons

### Introduction

Observe the spectacular reaction between burning magnesium and dry ice with this "cool" demonstration! Your students will be impressed by this simple but sensational glowing reaction!

### Concepts

- Metal reactivity
- Reaction of magnesium

### Materials

Magnesium turnings, Mg, large scoopful  
 Dry ice blocks, 12 cm × 12 cm × 5 cm, 2  
 Ceramic fiber squares, 6" × 6", 12  
 Matches or lighter

Propane torch or Bunsen burner  
 Safety shield (optional)  
 Spoon, scoop with handle, or similar tool  
 Zetex gloves (for handling dry ice)



### Safety Precautions

*This activity requires the use of hazardous components and/or has the potential for hazardous reactions. Magnesium is a flammable solid that burns with an intense flame. Have a bucket of sand and a bottle of Flinn "Class D" fire extinguisher on hand for emergency use if needed. Caution students not to look directly at the white glow from the burning magnesium as ultraviolet radiation is produced. Remove all combustible items from the area before igniting the magnesium. Dry ice is an extremely cold solid (−79 °C or −110 °F), which can cause severe frostbite if in contact with flesh. Much smoke is produced; perform this demonstration in a well-ventilated room. Avoid all contact with the skin. Wear chemical splash goggles, a chemical-resistant apron, and Zetex or other insulated gloves. If a safety shield is not available, be sure the audience is wearing safety goggles. Please review current Material Safety Data Sheets for additional safety, handling, and disposal information.*

### Procedure

1. Lay out 12 ceramic fiber squares (or a large, fireproof ceramic sheet) flat on the demonstration table. If available, place a safety shield at the front of the table.
2. In the center of one of the dry ice blocks, make a rough cavity about 1 cm deep and 2 cm in diameter. Make this cavity by scooping the dry ice out with a spoon, a scoop, or similar tool.
3. Fill this cavity with magnesium turnings and place the block on the ceramic fiber squares. *Caution:* Remove all combustible items from the vicinity of the reaction.
4. Ignite the magnesium with a propane torch or a hot Bunsen burner flame. Fan it gently if necessary to get it started. *Note:* The propane torch or burner must be held in your hand and tilted to ignite the magnesium. *Caution:* Do not add any other chemical to the magnesium to aid its ignition.
5. As soon as the magnesium ignites, immediately place the second dry ice block over the first block and observe the spectacular reaction begin. Turn off the room lights to make the demonstration even more dramatic. Stand back while the reaction is taking place. *Caution:* Warn students not to look directly at the bright white glow as there is some ultraviolet radiation produced when magnesium burns.
6. After the reaction has subsided, expose the products for the students to view.

## Disposal

Please consult your current *Flinn Scientific Catalog/Reference Manual* for general guidelines and specific procedures governing the disposal of laboratory waste. The products of the reaction can be disposed of in the solid waste disposal according to Flinn Suggested Disposal Method #26a. Allow excess dry ice to sublime in a well-ventilated room.

## Connecting to the National Standards

This laboratory activity relates to the following National Science Education Standards (1996):

### *Unifying Concepts and Processes: Grades K–12*

Systems, order, and organization

### *Content Standards: Grades 5–8*

Content Standard A: Science as Inquiry

Content Standard B: Physical Science, properties and changes of properties in matter, transfer of energy

### *Content Standards: Grades 9–12*

Content Standard A: Science as Inquiry

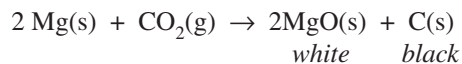
Content Standard B: Physical Science, chemical reactions, interactions of energy and matter

## Tips

- The dry ice needed for this demonstration is often available at a local ice cream shop, an industrial gas supply company, or an ice house.
- The blocks of dry ice should have a thickness of at least 4–5 cm. The blocks should also have a set of smooth matching surfaces. One 30-lb or 40-lb block of dry ice sliced in half (or two 15- to 20-lb blocks) is ideal for this demonstration.
- When performing this demonstration, a safety shield is highly recommended for maximum safety of the audience.
- The ceramic fiber squares make an excellent fireproof surface to protect the tabletop. If these are not available, be sure to perform the demonstration on a fireproof surface.
- If desired, lift the glowing blocks of dry ice (behind a safety shield) so the audience can see the reaction in progress. Be sure to wear insulated gloves.

## Discussion

Magnesium is a white, malleable, and ductile metal that melts at 650 °C. It burns readily in air or oxygen with a brilliant white light, forming magnesium oxide. It is an active metal (and flammable solid) that also readily reacts with many other non-metals, including carbon dioxide. In this demonstration, magnesium reacts with carbon dioxide gas (from the dry ice) to form magnesium oxide and carbon according to the equation below:



The white magnesium oxide product and the black carbon residue can be observed upon separating the two dry ice blocks. The brilliant white glow from the burning magnesium produces both visible light and ultraviolet radiation.

## References

Berger, S.; Hill, A.; Holmquist, R.; Horsch, E. *Element of the Week*; Flinn Scientific: Batavia, IL, 1989; pp 33–36.

## Flinn Scientific—Teaching Chemistry™ eLearning Video Series

A video of the *Magnesium and Dry Ice* activity, presented by Lee Marek, is available in *Combustion Reactions*, part of the Flinn Scientific—Teaching Chemistry eLearning Video Series.

## Materials for *Magnesium and Dry Ice* are available from Flinn Scientific, Inc.

Catalog No.	Description
M0112	Magnesium Turnings, 25 g
AP1245	Ceramic Fiber Squares, 6" × 6", pkg/12
AP3240	Zetex Gloves, 11" length
AP1621	Propane Burner Kit

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.