

C1 ACTIVITY 2: FIRE CLOUDS (A TEACHER DEMONSTRATION ONLY)

Background

This activity is a spectacular demonstration of the energy released from a powder. It provides an early introduction to **variables** that affect **reaction rates** and to the role of **effective surface areas**. Dried milk powder contains **carbohydrates** and **fats** that **release energy on combustion**.

There are two parts to this activity. First, a small pile of the dried milk is burned and secondly a similar quantity is sprinkled onto a glowing splint. The pile will burn slowly as the effective surface area is small, whereas the sprinkled powder has a much greater surface area and so a fire ball effect is created.

Ensure that the activity is carried out behind a safety screen and in compliance with the school's safety procedures. This is not an outdoor activity. Consider that the height from which the powder is sprinkled will determine the height of the resultant fire ball.

This activity can be used to illustrate why chewing food aids digestion, and why some foodstuffs are finely cut before cooking. It also highlights the dangers posed by dust from granary silos, coal mines, paper making factories, etc. It should be mentioned that carefully controlled dust explosions are commonly used by pyrotechnicians, special effects artists, etc.

A safer but less spectacular alternative investigation could be carried out by the students to compare the dissolving rate of jelly crystals to that of gelatine.

Suggested approach:

- Before demonstrating the activity, show the class the two piles of milk powder and tell them that you are going to light one pile as it is but will sprinkle the second pile. Ask them to **predict** the outcome and to **explain** the reasons for their predictions.

Equipment required:

- Safety goggles for each person in the room
- Safety screen
- Approximately 60 g of milk powder
- Measuring spoon (a 5 ml measure)
- Spatula
- Retort stand and clamp
- Bunsen burner
- Heatproof mat
- Metre stick
- A long splint
- Tape or a bulldog clip

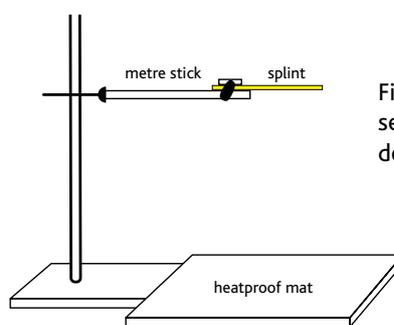


Figure 3: Experimental setup for Fire Clouds demonstration

What to do:

Ensure that all students are behind the safety screen and wearing the safety goggles throughout.

1. Fix a long splint to the end of the metre stick using the tape or clip.
2. Measure about two heaped spoons of the milk powder into a pile on the heatproof mat.
3. Try to ignite it by holding the Bunsen burner to it.
4. Fix a long splint to the end of the metre stick and light it.
5. Clamp the splint on the retort stand so that the splint can burn freely above the heatproof mat as shown in Figure 3.
6. From a height (no greater than the top of the safety screen), sprinkle the milk powder over the burning splint.

🔍 *Can the students explain the difference between the reactions?*

Resources:

- This activity is available on page 17 of <http://www.scienceonstage.ie/resources/>.

C1 ACTIVITY 2 DISCUSSION POINTS: DUST

1. The **Fire Clouds** activity illustrates the dangers posed by dust from granary silos, coal mines, paper making factories, etc. Having observed and discussed the activity, the topic of dust explosions and their containment can be explored.
2. Students might also research how pyrotechnicians and special effects artists make use of controlled dust explosions.