

Extension activity

Playing with fire: stoichiometric reactions and gas combustion

Visualizing explosion versus implosion

This part is more dangerous. This activity is not usually done in class; it was developed as a demonstration for the Science on Stage Festival. If the teacher has safety concerns, they can [watch the video](#) instead.

The activity demonstrates that the combustion of dihydrogen creates an air flow (implosion) rather than gas expansion (explosion). This part should take 10 minutes.

Materials

- Plexiglas tube 2 cm in diameter and 20 cm high containing a sealed car spark plug
- Stand, clamps, and nuts to secure the explosion area
- Container of water
- Modified piezoelectric gas lighter

Procedure

1. Dip the Plexiglas tube into the container of water and watch the internal volume fill up.
2. Add equal volume amounts of O_2 and H_2 to the tube: this means that the O_2 will be in stoichiometric excess.
3. Trigger the spark from the car spark plug connected to the piezoelectric gas lighter.

Safety note



- The tube and the car spark plug must not be allowed to detach.
- Be careful to provide an excess of O_2 , which acts as an air bag to avoid generating a water hammer from the water inlet. A water hammer would propel the tube upwards and damage the ceiling.

Observations

The combustion of hydrogen (explosion: flame) is immediately followed by the condensation of water (cloud) and the massive and violent entry of water from the container to occupy the free space (implosion).

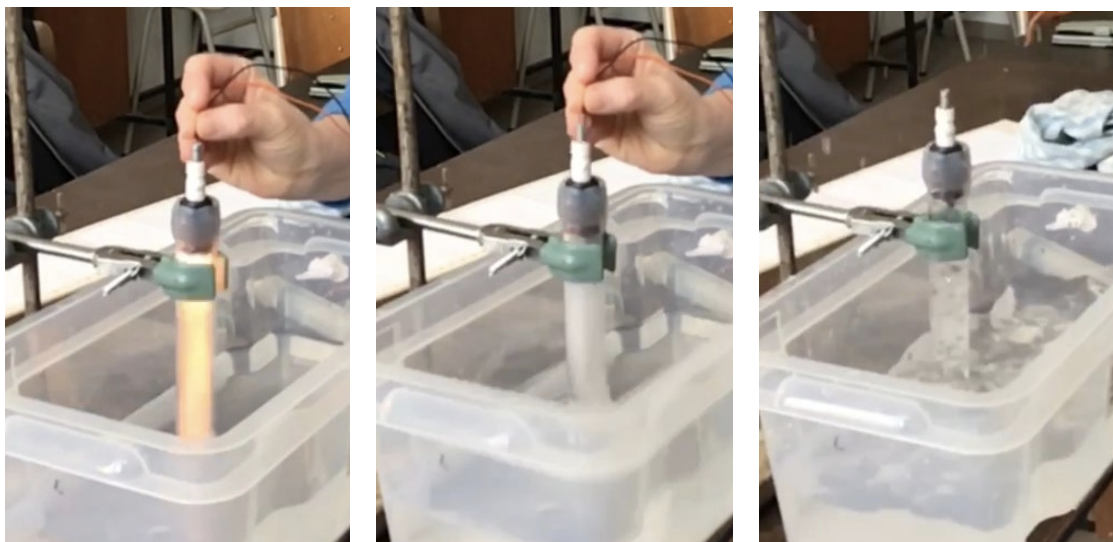


Image courtesy of Isabelle Paternotte and Philippe Wilock