

Preparing and testing ethyne – teacher notes

In this experiment, students produce ethyne or acetylene gas inside a plastic Petri dish by reacting calcium carbide and water. The gas is tested using a solution of potassium manganate(VII) in propanone, which turns from purple to brown. When the reaction has finished, students test the residue of the calcium carbide with a drop of full-range indicator solution.

Topic

Ethyne

Timing

20 minutes

Equipment

Apparatus

- Eye protection
- Clear plastic sheet (eg ohp sheet)
- Plastic pipettes
- Plastic Petri dish, 5.5 cm diameter (eg Philip Harris ref: Y 36340)
- Beaker, 10 cm³
- Scissors
- Tweezers

Chemicals

Solutions and liquids should be contained in plastic pipettes. See the accompanying guidance on apparatus and techniques for microscale chemistry (<https://rsc.li/3hi2bOT>), which includes instructions for preparing a variety of solutions.

- Propanone
- Water
- Calcium carbide, small lumps
- Potassium manganate(VII) crystals

Teaching notes and expected observations

Calcium carbide reacts vigorously with water. The ethyne gas produced turns potassium manganate(VII) from purple to brown indicating ethyne is unsaturated. The residue turns full-range indicator solution purple owing to the presence of the alkaline calcium hydroxide.

This experiment illustrates an interesting link between inorganic and organic chemistry. However, calcium carbide is an expensive material. It is prepared by heating a mixture of calcium oxide and coke to around 2000 °C in an electric furnace.

Students could also be told about Wohler's experiment in 1828 on heating ammonium cyanate and obtaining urea thus demolishing the vital force theory (that organic compounds could only be obtained from living things).

Health, safety and technical notes

- Read our standard health and safety guidance (<https://rsc.li/3fdUne8>).
- Wear eye protection throughout (splash-resistant goggles to BS EN166 3) and work in a well-ventilated area.
- Propanone is highly FLAMMABLE. See CLEAPSS Hazcard HC085A.
- Calcium carbide, $\text{CaC}_2(\text{s})$, can produce flammable gasses when in contact with water, which may ignite spontaneously. Wear splash-proof goggles and ensure sufficient ventilation. See CLEAPSS Hazcard HC019C.
- Potassium manganate(VII) is an OXIDISER, harmful if swallowed and toxic to aquatic life. Avoid direct contact and store in the dark, stains glass, plastic, clothing and skin. See CLEAPSS Hazcard HC081.