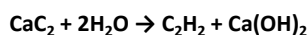


Preparation and properties of ethyne

Theory

Calcium dicarbide reacts with water producing ethyne and calcium hydroxide:



The gas usually contains hydrogen sulfide and phosphine as impurities, caused by the hydrolysis of traces of calcium sulfide and calcium phosphide present in the calcium dicarbide. The impurities, which cause an unpleasant odour, can be removed by bubbling the gas through acidified copper sulfate solution.

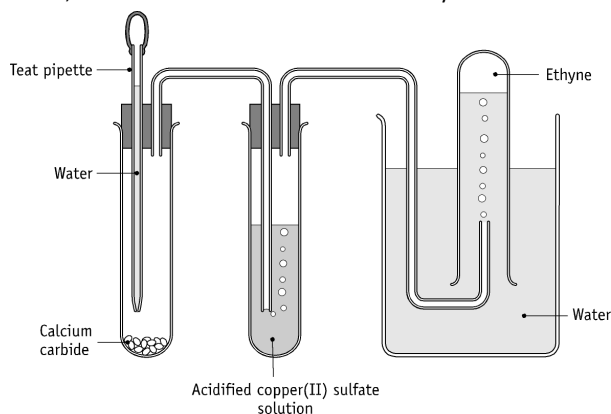
Procedure

NB: Wear your safety glasses.

(1) Preparation

Place 2-3 pieces of calcium dicarbide in a test tube and set up the apparatus as in the diagram.

Add water from the teat-pipette, a few drops at a time, until all the calcium dicarbide has reacted. The gas produced is collected in test tubes by displacement of water, the test tubes being stoppered under water when filled with gas. The first test tube filled can be discarded, as it contains a mixture of air and ethyne.

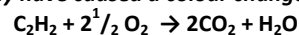


(2) Investigation of Properties

1. Ignite the gas in one of the test tubes. Describe the flame. Add a few drops of limewater to the test-tube and shake well. Describe what happens.
2. Add a few drops of a solution of bromine water to a test tube of gas, stopper quickly and shake well. Describe what you see.
3. Add a few drops of acidified potassium manganate solution to a test tube of gas, stopper quickly and shake well. Describe what you see.

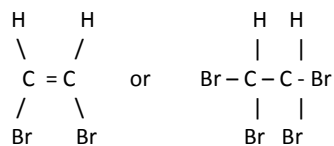
Suggested solutions to student questions

Write an equation for the combustion of ethyne, and select a product, which may have caused a colour change in the limewater.



The carbon dioxide turns limewater milky.

Draw the structural formula of a possible product of the reaction in Investigation 2. What does the observed result indicate?



1, 2 dibromoethene

1, 1, 2, 2, tetrabromoethane

(Allow products with two hydrogen atoms in the molecule and in which there is one OH group to every Br atom.) The decolourisation indicates that the ethyne is unsaturated.

What does the observed result in Investigation 3 indicate?

This also indicates unsaturation.

Why should the first test tube be discarded?

It contains mostly air.

In what way do the products of combustion, as described in the equation, differ from what you observed in Investigation 1? Explain.

The smoky, sooty flame indicates that combustion is incomplete due to insufficient oxygen, and particles of carbon are evident.

Industrial Uses

Industrially ethyne is burned while mixing with pure oxygen. This produces a clear flame with a temperature of about 3000 °C, which is suitable for cutting and welding, and is used in an oxyacetylene torch for those purposes.