The reaction between zinc powder and sulfur

A reaction between zinc and sulfur can be used to demonstrate that chemical changes are often accompanied by a large change in energy

Introduction

The reaction between iron and sulfur is often used to demonstrate that the properties of the products of a chemical reaction are quite different from the reactants, are difficult to separate to form the reactants, unlike mixtures, and there is often a large change in energy involved in the formation of the product. The reaction between iron and sulfur is suitable for a class practical. It often helps to reinforce the ideas by demonstrating the reaction between zinc and sulfur.

Lesson organisation

This experiment works well as a class demonstration. The demonstration takes about 5 minutes.

Apparatus and chemicals

Eye protection

Access to a fume cupboard

Test tube Pyrex (or boiling tube)

Metal test tube holder

Bunsen burner

Weighing boat

Spatula (2)

Top pan balance (1 dp)

0.1 g Zinc powder (**Highly flammable**, Refer to SSERC or CLEAPSS Hazcard (see Technical note 1)

0.1 g Sulfur powder (**Low hazard**, Refer to SSERC or CLEAPSS Hazcard (see Technical note 2)

10 g Mineral wool

Technical notes

1 Zinc powder or dust can be very reactive. It may be supplied in different states of fineness, and it may have become oxidised and be mainly zinc oxide. For that reason the reactivity seen from any given sample can be very different.
2 Sulfur may be supplied as crushed roll sulfur, flowers of sulfur, precipitated sulfur or resublimed sulfur. All are suitable, but resublimed sulfur seems to react more vigorously.

Procedure

HEALTH & SAFETY: Wear eye protection, do reaction in a fume cupboard

The demonstration

a Measure out 0.1 g of zinc powder into a weighing boat.
b Measure out 0.1 g sulfur powder into the weighing boat.
c Mix the two powders to form a uniform mix.
d Put the powder into a Pyrex test tube.
e Fit a mineral wool plug to the top of the test tube.
f Light the Bunsen and adjust to a blue working flame.
g Holding the tube with the test tube holders, heat the mixed powders and direct the mouth of the tube towards the inner corner of the fume cupboard, until the reaction occurs.

Disposal

Put the remnants from the reaction into a beaker of 500 cm^3 of dilute hydrochloric acid (0.1 molar) and leave for an hour or so (stirring from time to time). This will dissolve any remaining metal (and the oxide). Then neutralise the acid and wash to waste with plenty of running water.

Teaching notes

The reaction between fresh zinc powder and sulfur can give a very bright flash. On this scale it is harmless, but makes an impressive comparison. If the reaction is not impressive, the zinc has oxidised.

Do not be tempted to increase the scale of this reaction – to do so would be in breach of the Explosives Regulations 2014. The reaction between magnesium or aluminium powder and sulfur can be explosive and should not be attempted.

Reference

This experiment was written by Mike Thompson on behalf of the RSC

Credits

Health & safety checked January 2018

Page last updated August 2018