STEM SUBJECTS: SCIENCE ☑ TECHNOLOGY ☐ ENGINEERING ☑ MATHS ☐

JAMES DYSON FOUNDATION

BURNING CUSTARD

CHALLENGE 41

THE BRIEF

USE CUSTARD TO FIND OUT HOW THE SURFACE AREA OF FUEL AFFECTS HOW IT BURNS.

MATERIALS

Custard powder, a funnel, 1m length of hosepipe, Bunsen burner (with adult supervision) and goggles.

THE METHOD

Connect the hosepipe to the base of the funnel.

Light the Bunsen burner and set it to full (the blue flame).

Put a small amount of the custard powder into the top of the funnel.

Wearing goggles, and staying clear of the flame, hold the funnel next to the Bunsen burner with the opening facing the flame.

Blow hard into the end of the hosepipe.

THERE WILL BE A LARGE FIREBALL OF BURNING POWDER WHEN IT HITS THE FLAME

LOCATION
This activity must be done in a science lab or large open space with adult supervision

HOW DOES IT WORK?

Custard powder burns rapidly because it has a high total surface area to volume ratio, which allows oxygen in the air to come into contact with the fuel easily. When you have a large lump of wood, the oxygen can only touch the outside and so it burns from the outside in. If you turned that lump of wood into sawdust, the surface area would be greatly increased. This increase in surface area allows the oxygen to reach more places at once and so burn quicker when on fire.

Challenge designed by: Hannah, at Dyson

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STEM SUBJECTS: SCIENCE ☑ TECHNOLOGY ☑ ENGINEERING ☐ MATHS ☐

JAMES DYSON FOUNDATION

COPPER PLATING

CHALLENGE 42

THE BRIEF

COAT A NAIL IN COPPER USING HOUSEHOLD ITEMS.

MATERIALS

Copper sulphate, water, a glass bowl, a piece of pure copper, nail, a D-cell battery, wires, and crocodile clips.

THE METHOD

Fill the bowl with about 4cm of water.

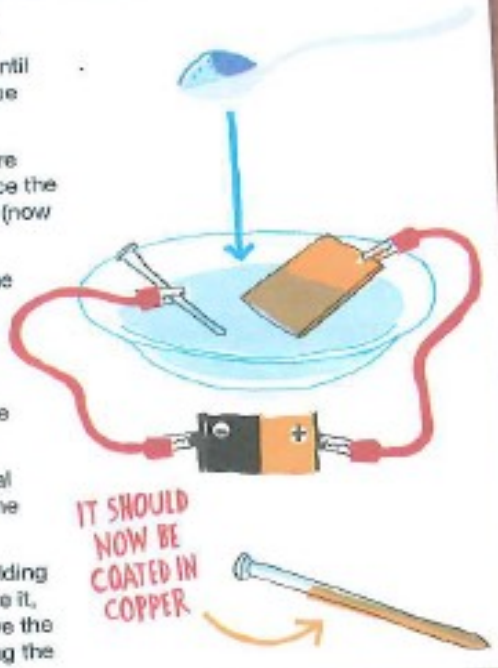
Mix copper sulphate with the water until no more can be dissolved, it should be dark blue.

Connect one crocodile clip to the pure copper and the other to the nail. Place the copper (now the anode) and the nail (now the cathode) into the water.

Don't let the crocodile clips touch the water – as they will become coated in copper too. Make sure to keep the anode and the cathode as far away from each other as possible. They must not touch as it can cause the battery to overheat.

Connect the anode to the + terminal of the battery and the cathode to the – terminal.

You should start to see copper building up on the nail. The longer you leave it, the thicker it will get. After you have the desired thickness of copper, unplug the battery and remove the nail.



IT SHOULD NOW BE COATED IN COPPER

HOW DOES IT WORK?

The copper sulphate solution is an electrolyte, conducting electricity from the anode to the cathode. When the current is flowing, oxidation (loss of electrons) happens at the copper anode, adding copper to the solution. The ions are then carried on the electric current to the cathode, where reduction (gain of electrons) happens, plating the nail in copper ions.

Challenge designed by: Ciaran, design engineer at Dyson

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