

Oxygen, cause of oxidations



Chemistry

Inorganic chemistry

Air, Combustion & Gases



Difficulty level

easy



Group size

2



Preparation time

10 minutes



Execution time

10 minutes

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Teacher information

Application

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Experiment set-up

In this experiment the students learn that atmospheric oxygen is the cause of oxidation.

Most base metals react with the air surrounding them when heated and are oxidised in the process. The oxygen in the air serves as an oxidizing agent.

Oxygen has the tendency to take up two electrons and build up a stable valence electron shell with a total of eight electrons. This means that oxygen oxidizes metals and is itself reduced.

Other teacher information (1/2)

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Prior knowledge



- Oxidation is a chemical reaction.
- During oxidation, electrons are released and the oxidation number is increased.
- Every oxidation also includes a reduction

Scientific principle



In this experiment the students can prove that atmospheric oxygen is the cause of oxidation.

Preparations

- To save time, ready-cut copper sheets can be used.
- The edges as well as the copper sheet should be pressed tightly together.

Other teacher information (2/2)

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Learning objective



1. Metals react with the surrounding air when heated.
2. This fact can be demonstrated, inter alia, by the principle of exclusion.

Tasks



- The students heat metals and examine whether a chemical reaction has taken place.
- Students investigate the causes that are responsible for the chemical reaction of metals during heating.
- They consider what similarities and differences there are in oxidation reactions of metals.

Safety instructions

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- Wear protective goggles!
- Heat carefully! Easily flammable and unpleasant smelling vapours may be produced.
- The general instructions for safe experimentation in science lessons apply to this experiment.

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Student Information

Motivation

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Combustion of coal

Oxidation is the chemical reaction of a substance with oxygen.

Many examples of oxidation reactions are known from everyday life. All combustions of carbonaceous substances under atmospheric oxygen, such as the combustion of coal, wood, natural gas or petrol are typical oxidations. Another example of oxidations is food, which is oxidized in the body to carbon dioxide and water.

In this experiment the property of oxygen to cause oxidation is investigated.

Tasks

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How do metals change during heating?

- Investigate the causes of the chemical reaction of metals during heating.
- Then note your observations in the table in the protocol.
- Think about the similarities and differences in oxidation reactions and answer the questions in the protocol.

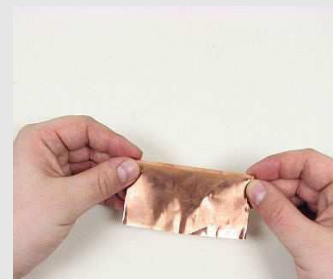
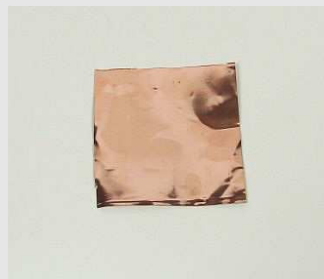
Equipment

Position	Material	Item No.	Quantity
1	Porcelain dish, 75ml, d = 80 mm	32516-00	1
2	Wire gauze with ceramic, 160 x 160 mm	33287-01	1
3	Crucible tongs, 200 mm, stainless steel	33600-00	1
4	Test tube, 180x18 mm,100pcs	37658-10	1
5	Test tube rack f. 6 tubes, wood	37685-10	1
6	Test tube brush w. wool tip,d20mm	38762-00	1
7	Test tube holder, up to d 22mm	38823-00	1
8	Protecting glasses, clear glass	39316-00	1
9	Scissors, l = 110 mm, straight, point blunt	64616-00	1
10	Copper foil, 0.1 mm, 100 g	30117-10	1
11	Butane burner with cartridge, 220 g	32180-00	1
12	Liquid paraffin, thick, 250 ml	30180-25	1

Structure

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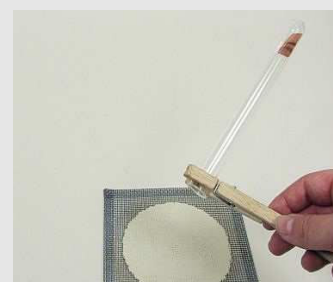
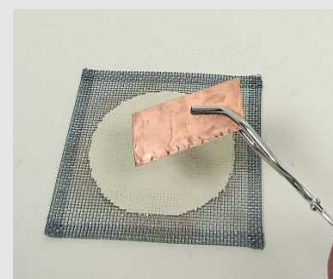
- Cut out a piece of copper sheet metal measuring about 10 cm x 10 cm.
- Fold the cut out piece of copper sheet metal in the middle.
- Bend the open edges and carefully tap them with a hammer to create a closed "copper letter".



Procedure (1/3)

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- Take the copper letter with the crucible tongs and heat it for about 1 min in the non-luminous burner flame.
- Let the copper letters cool down.
- Then open it and compare the inside and outside.
- Cut off a small piece of copper sheet, put it in a test tube and heat it vigorously.
- Allow to cool briefly, then pour it onto the wire netting and look at it closely.



Procedure (2/3)

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- Cut out a small piece of copper sheet metal.
- Fill the second test tube about 2 cm with paraffin.
- Fold the copper sheet together so that it is completely submerged in the paraffin and place it in the test tube.
- Heat the paraffin with the copper piece inside it until it boils.
- After cooling, pour the paraffin into the evaporation dish and remove the copper piece with the crucible tongs. Unfold it and examine it for changes.



Procedure (3/3)

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Disposal

- Store paraffin wax in marked bottles for reuse.
- Collect pieces of copper plate for disposal.

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Report

Task 1

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Write down your observations

Task 2

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The copper sheet always changes colour when it comes into contact with air during heating.

Task 3

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Complete the cloze text to formulate a memoir sentence!

Copper reacts during of with this or an to form a new .

Task 4

Develop an experiment that could prove this fact in another way.

If the change in copper is based on a reaction with or an , no such should occur when copper is heated in a or under other than air, for example.

gases

reaction

air component

air

vacuum

 Check

Slide	Score/Total
Slide 16: Colour change of the copper sheet	0/5
Slide 17: Reaction with copper	0/4
Slide 18: Oxidation on copper	0/5

Total amount  0/14 Solutions Repeat Exporting text