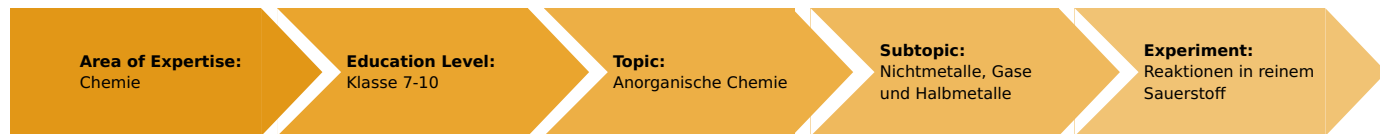


Reactions in pure oxygen (Item No.: P7153600)

Curricular Relevance



Difficulty



Easy

Preparation Time



10 Minutes

Execution Time



10 Minutes

Recommended Group Size



2 Students

Additional Requirements:

Experiment Variations:

Keywords:

reaction behaviour, reaction in pure oxygen

Task and equipment

Information for teachers

Learning objectives

- In pure oxygen, substances burn considerably more violently than in air; this fact is also used industrially.
- In the reaction of elements in oxygen, oxides are produced.

Notes on set-up and procedure

Preparation

For this experiment the apparatus set up in the previous experiment can be used to generate and supply oxygen. However, if this is done, the test tubes are moist; this makes adding the sand more difficult. To save time, the test tubes can be filled with oxygen directly from a steel cylinder.

Remarks on the students' experiments

The experiments can also be performed in groups to save time; subsequently, the results are exchanged. Ensure that the hot combustion spoon is held as nearly in the middle of the test tube as possible, as moist test tubes can crack otherwise. Cut small pieces, approximately 2 mm wide, out of the zinc sheet.



Hazards

- On combustion in pure oxygen, high temperatures are produced!
- Wear protective glasses!

Remarks on the method

In these experiments, formulation of reaction equations in words are required for the first time; this will be consolidated and practised in further experiments. If the fact that molecular oxygen consists of two atoms has already been discussed and the chemical symbols are known, the word equations requested above can be supplemented by the corresponding reaction equations.

Note

In these experiments, metal powder must not be used; because, if it is, the reactions occur as explosions!

Waste disposal

Dump the contents of the porcelain dish into the container for heavy metal wastes.

Reactions in pure oxygen (Item No.: P7153600)

Task and equipment

Task

How do combustible substances react in pure oxygen?

Burn the previously investigated metals and non-metals in pure oxygen.



Equipment



Position No.	Material	Order No.	Quantity
1	Boss head	02043-00	2
2	Universal clamp	37715-00	2
3	Protecting glasses, clear glass	39316-00	1
4	Support base, variable	02001-00	1
5	Test tube brush w. wool tip, d25mm	38762-00	1
5	Combustion spoon, l=300 mm	33346-00	1
6	Support rod, stainless steel, l=370 mm, d=10 mm	02059-00	1
7	Spatula, powder, steel, l=150mm	47560-00	1
8	Rubber stopper 26/32 , without hole	39258-00	2
9	Porcelain dish, 75ml, d = 80 mm	32516-00	1
10	Test tube, 200x30 mm	37660-01	2
	Butane burner f. cartridge 270+470	47536-00	1
	Butane cartridge CV 300 Plus, 240 g	47538-01	1
	Zinc, sheet 250x125x0.5 mm, 200 g	30245-20	1
	Charcoal, small pieces 300 g	30088-30	1
	Copper turnings 250 g	30263-25	1
	Iron wool 200 g	31999-20	1
	Standard sand, fine 2500 g	31825-79	1
Additional material			
	Oxygen		

Set-up and procedure

Set-up

Hazards

- On combustion in pure oxygen, high temperatures are produced!
- Wear protective glasses!



Set-up

Set up the support stand according to Fig. 1 - Fig. 2.

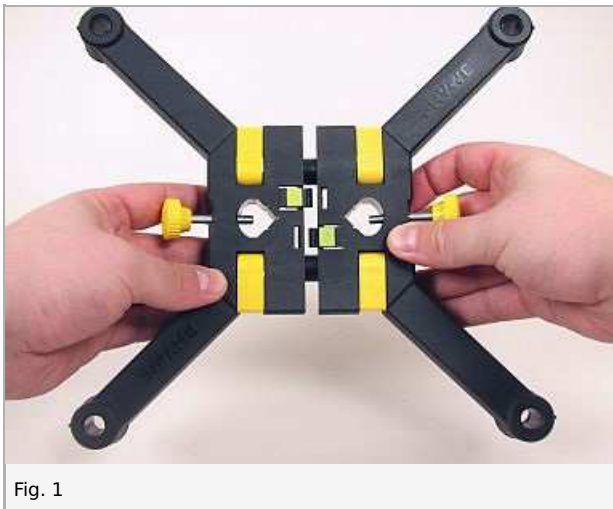


Fig. 1



Fig. 2

Attach two bossheads with universal clamps at approximately the same height to the support rod. Then attach the test tubes to the universal clamps (Fig. 3 - Fig. 8).



Fig. 3



Fig. 4



Fig. 5



Fig. 6



Fig. 7

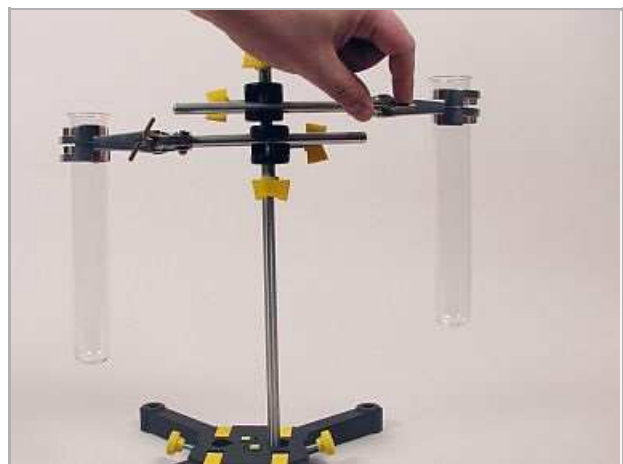


Fig. 8

Fill the two test tubes with pure oxygen; add a spatulaful of sand to each (Fig. 9). (If the test tubes are moist, ensure that the bottom is covered with sand.) Seal the test tubes with the rubber stoppers (Fig. 10 + Fig. 11).

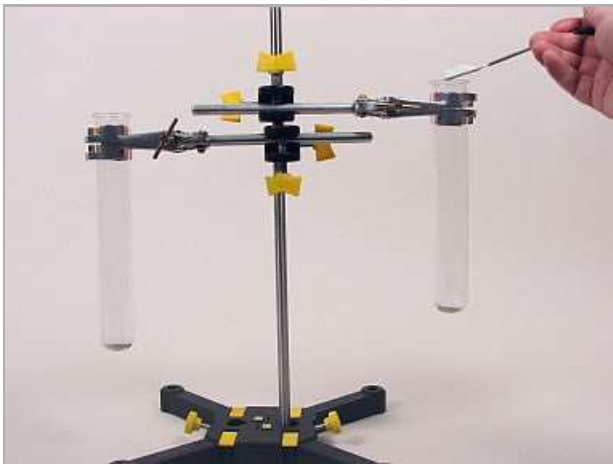


Fig. 9

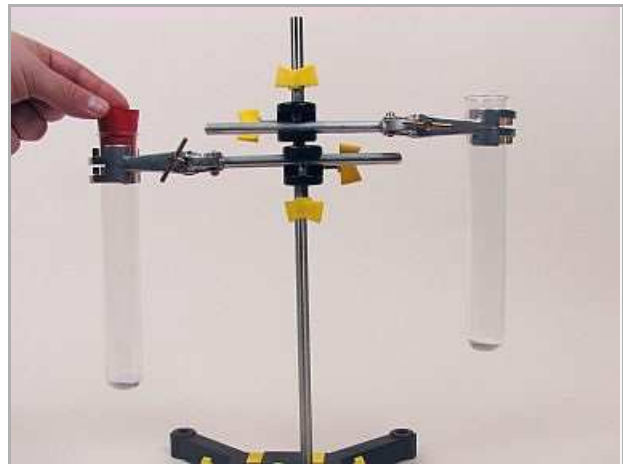


Fig. 10

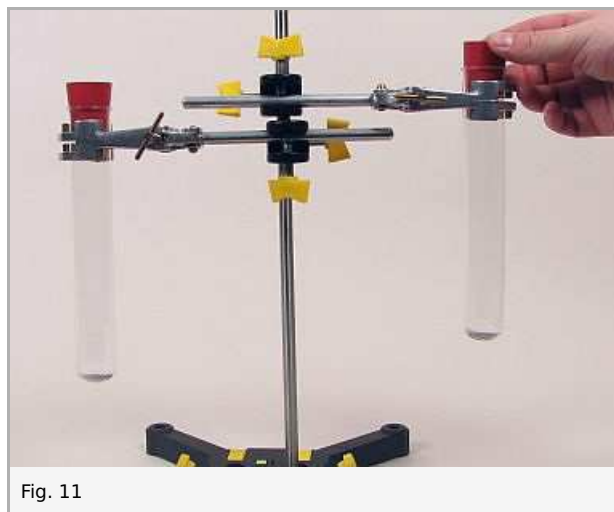


Fig. 11

Procedure

Procedure

Put a small amount of iron wool into the combustion spoon (Fig. 12). Heat it in a non-luminous burner flame (Fig. 13) until it begins to flare up.



Fig. 12



Fig. 13

Remove the stopper of the first test tube (Fig. 14) and insert the combustion spoon containing the red-hot iron wool into the test tube (Fig. 15). After this part of the experiment has been completed, empty the contents of the combustion spoon into the porcelain dish and clean the combustion spoon by calcining it.

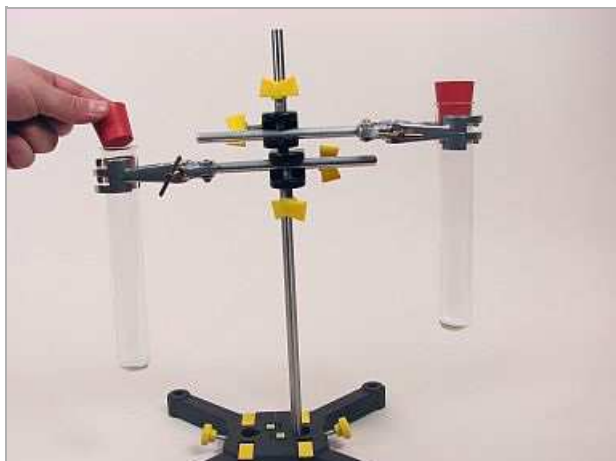


Fig. 14



Fig. 15

Put a small piece of charcoal in the combustion spoon (Fig. 16); heat it red hot; open the second test tube (Fig. 17) and insert the combustion spoon with the brightly glowing charcoal into it (Fig. 18). Clean the combustion spoon as described above.



Fig. 16



Fig. 17

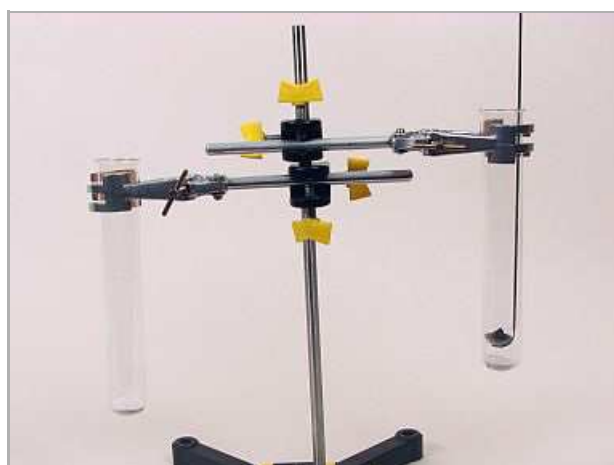


Fig. 18

Clean the used test tubes. In the process, put the sand in the porcelain dish and refill them with oxygen, whereby the test tube bottoms must again be covered with sand. Now, repeat the experiment in the same manner with pieces of zinc sheet and the copper turnings.

Waste disposal

Dump the contents of the porcelain dish into the collection container for heavy metal wastes.

Report: Reactions in pure oxygen

Result - Table 1

Note your observations and compare them with the reaction of the corresponding substances in air into Table 1.

Substance	Reaction in oxygen	Reaction in air
Iron	1	
Charcoal	1	
Zinc	1	
Copper	1	

Evaluation - Question 1

Based on the occurrences in these reactions, name the special property of oxygen again. Using it, give reasons why oxygen tents ("rooms" containing air greatly enriched with oxygen) are used in hospitals. Also comment on the industrial use of oxygen.

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Evaluation - Question 2

The substances produced in the reaction of elements with oxygen are termed oxides. Formulate an equation in words for all the reactions which occurred.

- A)
- B)
- C)
- D)