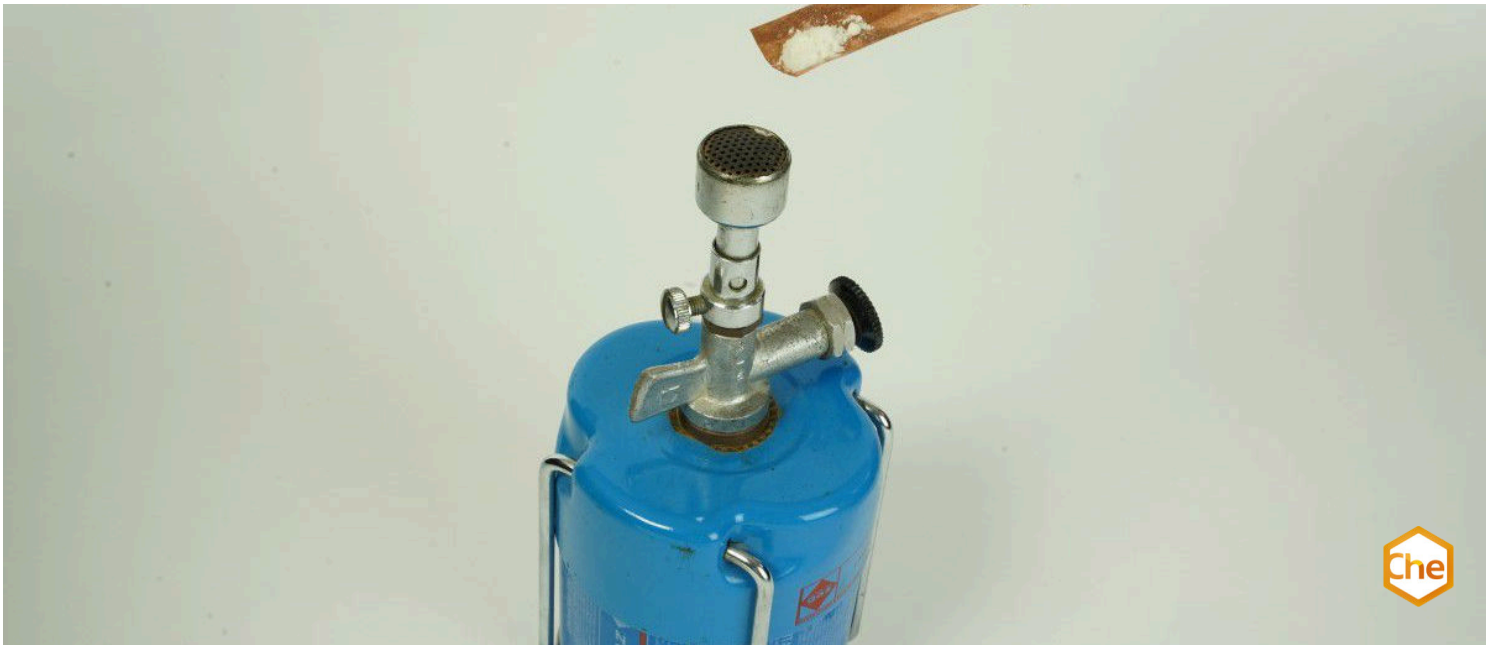
The Beilstein test



Chemistry > Organic chemistry > Basics: Organic chemistry

Difficulty level	Group size	Preparation time	Execution time
easy	2	10 minutes	10 minutes

This content can also be found online at:

http://localhost:1337/c/63430374580cc10003957fbd

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Teacher information

Application

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The experimental setup

The large bonding capacity of the carbon atom enables a multitude of different bonds to other atoms. This is what gives rise to the great diversity of organic substances. The group of halogen-containing organic substances includes several thousand compounds. They are often used as detergents, disinfectants or for surface finishing. Very well-known organohalogen compounds are chloroform and PVC (polyvinyl chloride).

In this test, the chlorine in PVC powder is detected by the Beilstein test.

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Other teacher information (1/3)

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Prior knowledge

Students should have knowledge of the periodic table and basic knowledge of organic compounds. Students should know the concept and methodology of detection reactions.

Students should know the basics of working with chemicals and be able to work a butane gas or Bunsen burner.

Principle

The students detect the presence of halogens in an organic compound via the Beilstein sample and analyse the course of this reaction.

Other teacher information (2/3)

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Learning objective

The students learn about the Beilstein sample for the detection of halogens.

Tasks

Examine the organic compound polyvinyl chloride for its halogen content (Beilstein sample).

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Other teacher information (3/3)

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Notes on set-up and procedure

Preparations:
To save time, ready-cut copper sheets can be provided. Leftover pieces from other experiments (copper letter or similar) can also be used.

Notes on the student experiments:

Make sure to stop heating at the first appearance of flame colouration to minimise the concentration of halogenated organic substances.

This classical detection is only indirect, as it actually detects copper ions and not halogens. Therefore, it does not allow any conclusion about the type of halogen.

Instead of the butane burner, Bunsen burners can still be used.

Safety instructions

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The general instructions for safe experimentation in science lessons apply to this experiment.

Heating the substances produces substances that are harmful to health. Do not inhale! If possible, carry out the experiment under a fume cupboard!

Put on protective goggles!

For H and P phrases, please refer to the safety data sheet of the respective chemical.

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Student information

Motivation

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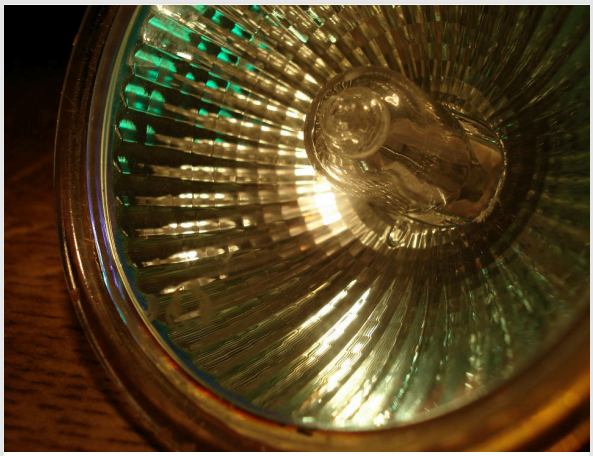

One halogen lamp

When one hears the term "halogens", the first thing that comes to mind is often a halogen lamp. Halogens are elements of the seventh main group, which is an extremely reactive group. Accordingly, several thousand organohalogen compounds are known. They are often used in detergents, disinfectants, cleaning agents or also for surface treatment.

With the Beilstein sample it is indirectly possible to detect halogens by detecting the copper ions produced during salt formation.

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Tasks

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The experimental setup

What other elements can organic compounds contain?

Examine polyvinyl chloride (PVC) for its halogen content (Beilstein sample).

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Equipment

Position	Material	Item No.	Quantity
1	Porcelain dish, 75ml, d = 80 mm	32516-00	2
2	Spoon, special steel	33398-00	1
3	Test tube holder, up to d 22mm	38823-00	1
4	Protecting glasses, clear glass	39316-00	1
5	Scissors, l = 110 mm, straight, point blunt	64616-00	1
6	Copper foil, 0.1 mm, 100 g	30117-10	1
7	Stand.petrol b.p.60-95 C 1000 ml	31311-70	1
8	Butane burner with cartridge, 220 g	32180-00	1
9	Polyvinyl chloride,powder 250 g	31745-25	1

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Set-up

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1. Read the experiment instructions and the safety instructions carefully and completely.

2. Prepare all the necessary materials and substances you need for this experiment and place them under the fume cupboard.

3. Start the experiment.

Procedure (1/2)

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1. Cut a strip about 10 cm long out of the copper sheet. Fold the edges upwards to form a groove (Fig. 1). Put 10 ml of petrol into an evaporating dish (Fig. 2). Grasp the copper sheet with the test tube clamp, hold it in the burner flame and anneal it (Fig. 3).

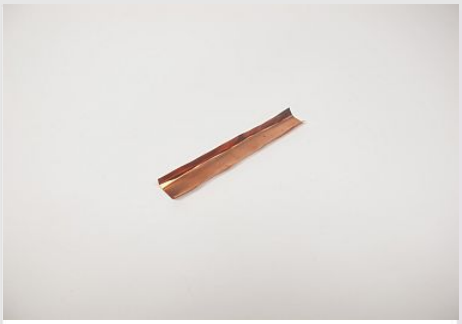

Figure 1

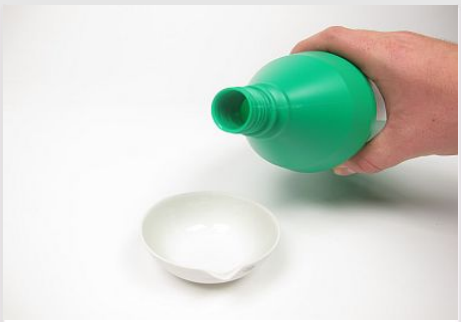

Figure 2

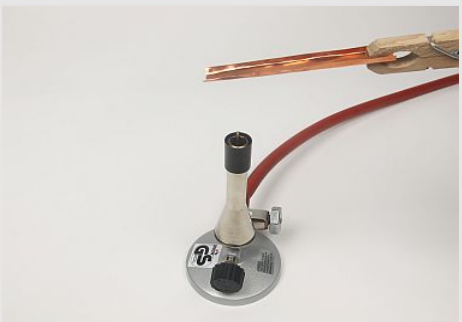

Figure 3

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Procedure (2/2)

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2. Dip the sheet briefly in petrol (Fig. 4), let the liquid drip off and hold the sheet in the flame (Fig. 5). Then anneal it.

3. Put half a spoonful of PVC powder into the evaporating dish, dip the still hot copper sheet briefly into it (Fig. 6) and then hold it in the flame (Fig. 7).

Disposal

- Petrol residues into the collection container for combustible organic substances.
- Dispose of PVC residues as organic solids.

Figure 4

Figure 5

Figure 6

Figure 7

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Report

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Task 1

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Write down your observations.

Task 2

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Which group of substances is most likely present when the flame turns green to blue-green?

- Halogens
- Chalcogenes
- Alkali metals
- Noble gases

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Task 3

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Drag the words into the correct boxes!

If an _____ compound contains a halogen, then this is decomposed in the experiment by _____ and _____ are produced.
These react with the copper and the _____ discolour the flame.

pyrolysis
organic
hydrogen halides
products

Check

Task 4

The Beilstein sample can be used to explicitly determine halogens in organic compounds.

Depending on the halogen present, the flame changes colour differently.

Astat appears the bluest and fluorine the greenest.

○ True ○ False

Check

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Task 4

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