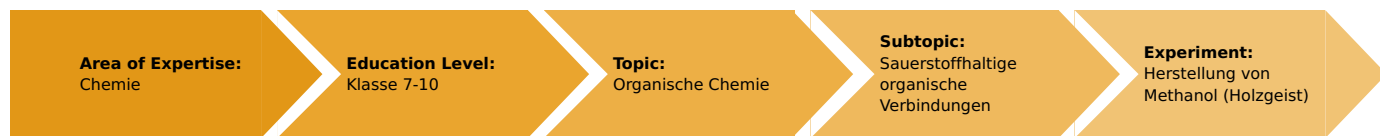


Production of methanol "wood spirit" (Item No.: P7171700)

Curricular Relevance



Difficulty



Easy

Preparation Time



10 Minutes

Execution Time



10 Minutes

Recommended Group Size



2 Students

Additional Requirements:

Experiment Variations:

Keywords:

organic compounds, alkanol, methanol

Task and equipment

Information for teachers

Learning objectives

- Methanol, among other substances, is produced by the dry distillation of wood.
- Methanol is a combustible alcohol with a low boiling point.

Notes on setup and procedure

Preparation:

Coarse, dried sawdust or shavings are particularly suitable for the dry distillation, but other pieces of wood are also usable.

Remarks on the students experiments:

Ensure that the apparatus is free of tension and has no leaks. If the number of work-places available in the fume hoods is too small, then the emerging gas must be continually burnt with a wood splint. Nuisance caused by the smell and danger from emerging methanol are almost completely avoided if a permanent combustion of the gas is maintained.

If the amount of distillate collected is insufficient for the examination, combine the distillate of several groups.



Hazards

- Strongly smelling gases which are harmful to health are evolved during this experiment. Carry it out in the fume hood!
- Wear protective glasses!
- To make glass/rubber connections, wet the glass with glycerol so it can be easily inserted!

Notes

The generated methanol is formed mainly from the methoxy groups of the lignins. Besides methanol (approx. 2%), the aqueous phase contains acetic acid (approx. 6%) and acetone (approx. 0.2%). The combustible gas which emerges consists of methane, hydrogen and small amounts of methanol which has not condensed.

Remarks on the method

The experiment does not directly show that an alcohol has been formed. This fact must be worked out in a corresponding teaching talk. The general data sheet for methanol could be filled in here, but it would appear to be more sensible to do this after dealing with the homologous series and the structural formula of alcohols. General data sheets for methanol and ethanol are included in the evaluation of the experiment "Iodoform test" (P7172000).

Waste disposal

- The Duran test tube can either be re-used for similar experiments or be freed of organic decomposition products by mechanical cleaning followed by glowing it out for some time.
- The test tubes should not be cleaned by the students as the decomposition products contain carcinogenic substances.

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Task and equipment

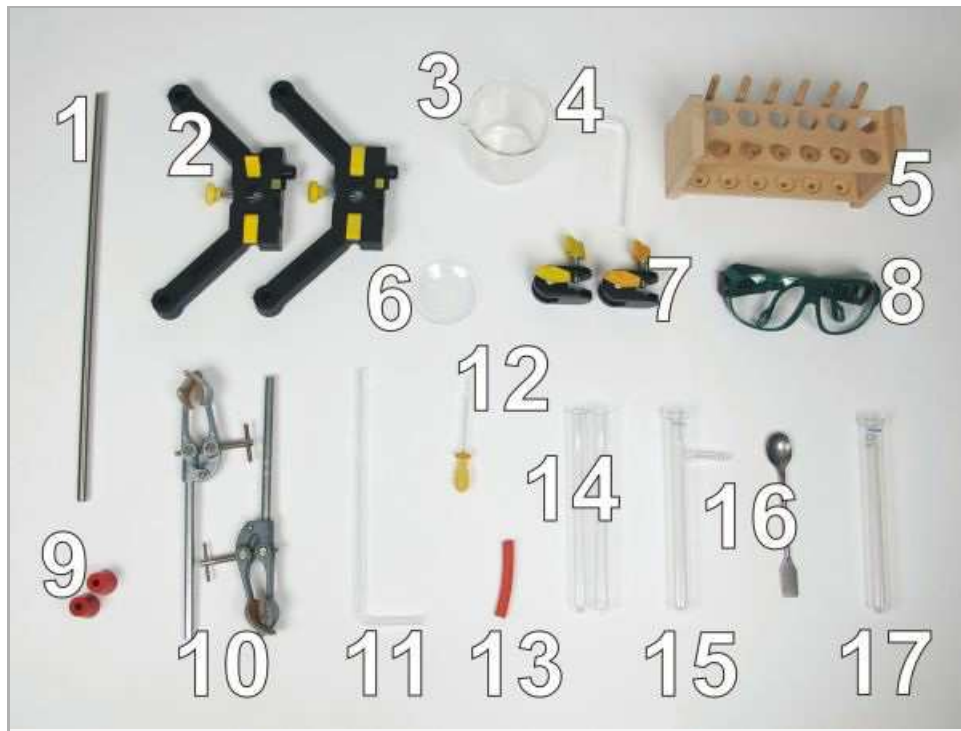
Task

With which methods can further alcohols be prepared?

Produce methanol from wood.



Equipment



Position No.	Material	Order No.	Quantity
1	Support rod, stainless steel, l=370 mm, d=10 mm	02059-00	1
2	Support base, variable	02001-00	1
3	Glass beaker DURAN®, short, 250 ml	36013-00	1
4	Glass tube, right-angled w.tip, 10	36701-53	(1)
5	Test tube rack for 12 tubes, holes d = 22 mm, wood	37686-10	1
6	Watch glass, dia.60 mm	34570-00	1
7	Boss head	02043-00	2
8	Protecting glasses, clear glass	39316-00	1
9	Rubber stopper, d = 22/17 mm, 1 hole	39255-01	2
10	Universal clamp	37715-00	2
11	Glass tubes, right-angled, 10	36701-59	(1)
12	Pipette with rubber bulb	64701-00	1
13	Rubber tubing, i.d. 6 mm	39282-00	1
14	Test tube, 180x18 mm, 100pcs	37658-10	(2)
15	Test tube, 180x20 mm, side arm, PN19	36330-00	1
16	Spoon, special steel	33398-00	1
17	Test tube, 180x20 mm, DURAN, PN19	36293-00	1
	Butane burner f. cartridge 270+470	47536-00	1
	Butane cartridge CV 300 Plus, 240 g	47538-01	1
	Glycerol, 250 ml	30084-25	1
	Sodium chloride 1000 g	30155-70	1
	Iron wool 200 g	31999-20	1
	Wood splints, package of 100	39126-10	1
Additional material			
	Ice		
	Sawdust, dry		

Set-up and procedure

Set-up

Hazards

- Strongly smelling gases which are harmful to health are evolved during this experiment. Carry it out in the fume hood!
- Wear protective glasses!
- To make glass/rubber connections, wet the glass with glycerol so it can be easily inserted!



Setup

Set up the stand as shown in Fig. 1 with two boss heads and two universal clamps. Position the clamps on the support rod at different heights and at right angles to each other.



Fig. 1

Ease the short arm of the large right-angled tube through the stopper for the Duran test tube (Fig. 2). Put the appropriate stopper on the side-arm test tube and ease the long arm of the right-angled tube through it until the tip is about 3 cm above the bottom of the test tube (Fig. 3).



Fig. 2



Fig. 3

Fill the Duran test tube two thirds full with wood shavings/saw dust and fix it horizontally to at the upper clamp (Fig. 4). Connect the two test tubes to each other with the right-angled tube, then fix the side-arm test tube vertically with the second clamp (Fig. 5). Ensure that the two test tubes are well closed but that there is no tension in the connection.



Fig. 4



Fig. 5

Half-fill the beaker with ice and under stirring add several spoonfuls of sodium chloride (Fig. 6). Position the beaker under the side-arm test tube, which acts as condenser, and adjust the high of the apparatus so that the bottom half of this test tube is immersed in the ice (Fig. 7).



Use a piece of rubber tubing to connect the side arm of the test tube to the right-angled tube with tip (with an iron wool plug inserted at the tip to act as a safety device against striking back) so that the tip points upwards (Fig. 8+9).



Procedure

Heat the Duran test tube over its whole length, then heat the wood in the front part strongly. Little by little, move the Bunsen burner towards the bottom of the test tube.

Collect the gas which emerges through the tip and test if it is an explosive mixture (Fig. 10). If it is not, ignite the gas at the tip.



Fig. 10

Stop heating the wood when no more distillate forms in the condenser. Allow the condenser to cool, then remove the beaker. Remove the lighter phase of the distillate with a pipette (Fig. 11) and put it onto a watch glass and try to ignite it with a wood splint.



Fig. 11

Waste disposal

Leave the test tubes for cleaning. Do not clean them yourselves!

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Report: Production of methanol "wood spirit"

Result - Observations

Note the observations you make.

- a) On heating the wood.
- b) On examining the products.

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Evaluation - Question 1

Draw conclusions from your observations.

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Evaluation - Question 2

Name some of the properties of the produced alcohol which are shown by this experiment.

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