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The oxidation of alkanols (Item No.: P7172300)



Task and equipment

Information for teachers

Learning objectives

- Primary and secondary alcohols can be further oxidized by oxidizing agents.
- Aldehydes are thereby formed from primary alkanols, ketones from secondary alcohols. •

Notes on setup and procedure

Preparation:

Previously used and oxidized strips of copper foils can be used. Copper wire gauze is particularly suitable because of the larger surface.

Remarks on the students experiments:

The possibility of spontaneous ignition of the alcohol exists. The flames can be suffocated by covering the beaker. Ensure that the Bunsen burner is at least 50 cm away from the beakers.



Hazard and Precautionary statements

Propyl alcohol:	
H225:	Highly flammable liquid and vapour.
H318:	Causes serious eye damage.
H336:	May cause drowsiness or dizziness.
P210:	Keep away from heat/sparks/open flames/hot surfaces No smoking.
P233:	Keep container tightly closed.
P305 + P351 + P338:	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P313:	Get medical advice/ attention.
P501:	Dispose of contents/ containers to be collected by a licensed contractor in accordance with national and local regulations.



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Teacher's/Lecturer's Sheet

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Isopropyl alcohol:

H225:	Highly flammable liquid and vapour.
H319:	Causes serious eye irritation.
H336:	May cause drowsiness or dizziness.
P210:	Keep away from heat/sparks/open flames/hot surfaces No smoking.
P233:	Keep container tightly closed.
P305 + P351 + P338:	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P501:	Dispose of contents/ containers to be collected by a licensed contractor in accordance with national and local regulations.

Hazards

- Alcohols are highly inflammable. Extinguish all open flames when handling them! Wear protective glasses!
- Remove all stock bottles before starting to heat. Position the Bunsen burner sufficiently well away from the beakers! Hold a wire gauze readily available to extinguish fires!

Notes

Primary alcohols are oxidized to aldehydes and secondary alcohols to ketones. Tertiary alcohols cannot be oxidized any further, because of the missing hydrogen on the carbon atom to be oxidized. Primary, secondary and tertiary alcohols can therefore be differentiated by their oxidation products.

Remarks on the method

The oxidation which takes place here can also be demonstrated when introducing oxidation numbers.

Waste disposal

Store the liquids in appropriately labelled containers for the next experiment.



advanced

The oxidation of alkanols (Item No.: P7172300)

Task and equipment

Task

Can alcohols be further oxidized?

Allow a primary and a secondary alcohol to react with an oxidizing agent.





Equipment



Position No.	Material	Order No.	Quantity
1	Glass beaker DURAN®, short, 150 ml	36012-00	2
2	Protecting glasses, clear glass	39316-00	1
3	Crucible tongs,200mm,stainl.steel	33600-00	1
4	Wire gauze with ceramic, 160 x 160 mm	33287-01	2
5	Scissors, I = 110 mm, straight, point blunt	64616-00	1
	Butane burner f.cartridge 270+470	47536-00	1
	Butane catridge CV 300 Plus, 240 g	47538-01	1
	Isopropyl alcohol 250 ml	30092-25	1
	Copper foil, 0.1 mm, 100 g	30117-10	1
	Propyl alcohol,normal 250 ml	31754-25	1



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Set-up and procedure

Set-up

Hazards

- Alcohols are highly inflammable. Extinguish all open flames when handling them! Wear protective glasses!
- Remove all stock bottles before starting to heat. Position the Bunsen burner sufficiently well away from the beakers! Hold a wire gauze readily available to extinguish fires!



Procedure

Pour propyl alcohol in the first beaker (Fig. 1) and isopropyl alcohol into the second one, each to a height of about 2 cm. Put them on a wire gauze (Fig. 2) and carefully carry out a smelling test on each. Place a further wire gauze ready to hand, for quick use to suffocate any flames which arise in the beaker.



Cut an approximately 1 cm wide and 10 cm long strip out from the copper foil (Fig. 3) and fold it as shown in the sketch (Fig. 4).







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Heat the strip of copper foil in the non-luminous Bunsen burner flame (place the Bunsen burner sufficiently well away from the beaker before igniting it) and then immerse the strip completely in the propyl alcohol (Fig. 5+6). Repeat this procedure another two times, ensuring that all propyl alcohol has dropped off before re-heating. Should the propyl alcohol ignite, cover the beaker immediately with the wire gauze.



Proceed in the same way with isopropyl alcohol. At the end of the experiment, carefully repeat the smelling test on each substance.

Waste disposal

Store the liquids in appropriately labelled containers for the next experiment.





Report: The oxidation of alkanols

Result - Observations

Note your observations.

a) Beaker 1 (propyl alcohol, 1-propanol).

b) Beaker 2 (isopropyl alcohol, 2-propanol).

Evaluation - Question 1

Draw conclusions from your observations.



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Student's Sheet

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Evaluation - Question 2

Formulate an equation for each of the reactions.



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