Removal of paraffins by urea (Item No.: P7171500)

Curricular Relevance

Area of Expertise: Chemie
Education Level: Klasse 7-10
Topic: Organische Chemie
Subtopic: Kohlenwasserstoffe und Petrochemie
Experiment: Entparaffinierung durch Harnstoff

Difficulty	Preparation Time	Execution Time	Recommended Group Size
Easy	10 Minutes	10 Minutes	2 Students

Additional Requirements:

Experiment Variations:

Keywords:

petrochemistry, oil, removal of paraffins

Task and equipment

Information for teachers

Learning objectives

- Unpurified lubricating oil contains long-chain paraffins which greatly reduce the lubricating effect in the cold.
- These paraffins can be removed by solid extraction.

Notes on setup and procedure

Preparation:
The lubricating oil fraction must be prepared from petroleum by vacuum distillation. The lubricating oil offered by mineral oil companies is already freed from paraffin (dewaxed), but lubricating oil containing paraffin can also be obtained from them.

Remarks on the students experiments:
The mixture of lubricating oil/urea solution must be allowed to stand for at least one day. Label the test tubes and if the place where they stand is used by other groups, label them with the according hazard pictograms.

Hazard and precautionary statements

Methanol:	
H225:	Highly flammable liquid and vapour.
H331:	Toxic if swallowed.
H311:	Toxic in contact with skin.
H301:	Toxic if inhaled.
H370:	Causes damage to organs.
P210:	Keep away from heat/sparks/open flames/hot surfaces – No smoking.
P233:	Keep container tightly closed.
P280:	Wear protective gloves/protective clothing/eye protection/face protection.
P302 + P352:	IF ON SKIN: Wash with soap and water.
P309 + P310:	IF exposed or you feel unwell: Immediately call a POISON CENTER or doctor/physician.

Hazards

- Methanol is poisonous. Do not inhale it or swallow it! Wash splashes on the skin off with plenty of water!
- Wear protective glasses!
- Methanol is highly inflammable! Extinguish all open flames!

Notes

Urea forms addition compounds with (unbranched) paraffins in which the urea molecules are arranged spirally. Paraffin chains are held in the hollow spaces. In this way, short-chain, unbranched alkanes can be removed from fractions obtained by vacuum distillation or branched alkanes be separated from unbranched ones.

Remarks on the method

It is recommended that this experiment is carried out together with the previous one (P7171400) in group work-sharing. The experiment can be prepared by one group and be evaluated in the next lesson by all the groups.

Waste disposal

- Put lubricating oil into the correspondingly labelled container and re-use it for similar experiments.
- Put the contents of test tube into the container for combustible organic waste.

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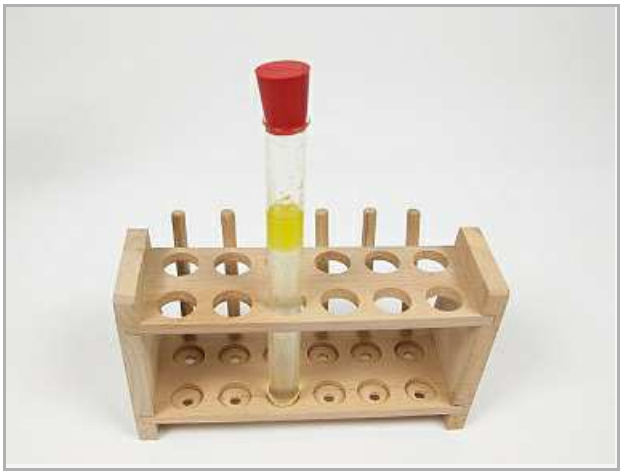
Task and equipment

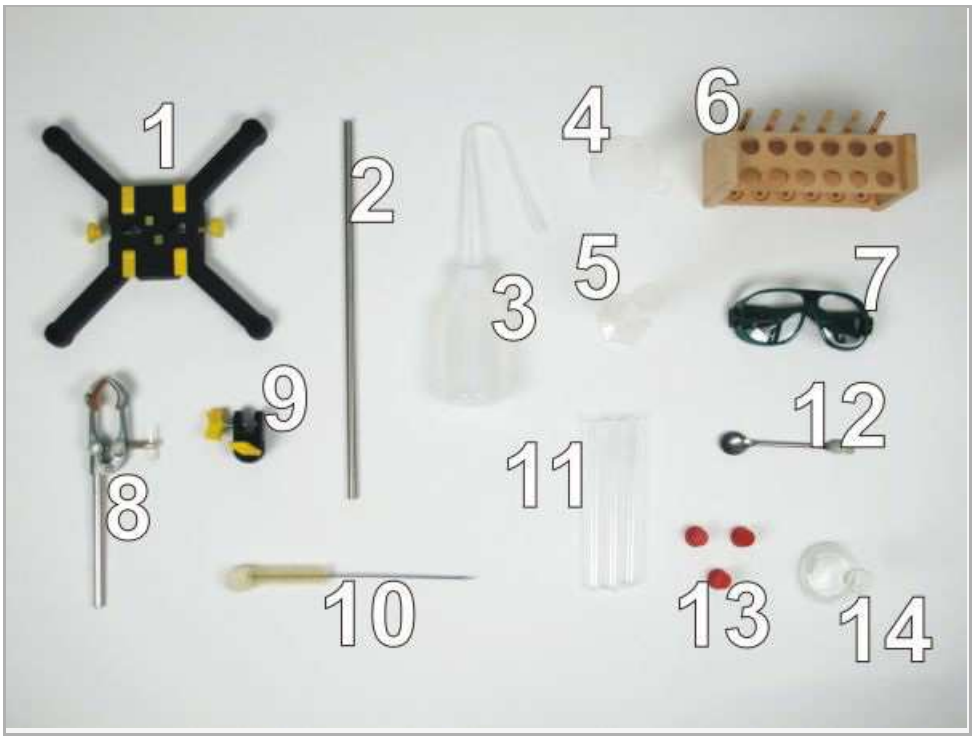
Task

How can higher boiling alkanes be removed from lubricating oil? (2)

Remove paraffins from lubricating oil with the help of urea.



Equipment



Position No.	Material	Order No.	Quantity
1	Support base, variable	02001-00	1
2	Support rod, stainless steel, l=370 mm, d=10 mm	02059-00	1
3	Wash bottle, 250 ml, plastic	33930-00	1
4	Funnel, plastic, dia.50mm	36890-00	1
5	Graduated cylinder, 50 ml, plastic	36628-01	1
6	Test tube rack for 12 tubes, holes d= 22 mm, wood	37686-10	1
7	Protecting glasses, clear glass	39316-00	1
8	Boss head	02043-00	1
9	Universal clamp	37715-00	1
10	Test tube brush w. wool tip,d25mm	38762-00	1
11	Test tube, 180x18 mm,100pcs	37658-10	(3)
12	Spoon, special steel	33398-00	1
13	Rubber stopper, d=22/17 mm, without hole	39255-00	3
14	Erlenmeyer flask 100 ml, narrow neck, PN 19	36418-00	1
	Urea, 250 g	30086-25	1
	Methanol, tech.gr. 1000 ml	30142-70	1
	Water, distilled 5 l	31246-81	1
	Circular filter,d 90 mm,100 pcs	32977-03	(1)
Additional material			
	Lubricating oil		

Set-up and procedure

Set-up

Hazards

- Methanol is poisonous. Do not inhale it or swallow it! Wash splashes on the skin off with plenty of water!
- Wear protective glasses!
- Methanol is highly inflammable! Extinguish all open flames!




Setup

Set up the stand as shown in Fig. 1. Fix the funnel in the universal clamp.

Fig. 1

Put a folded filter paper in the funnel but do not wet it.

Procedure

Pour 25 ml of methanol into the Erlenmeyer flask (Fig. 2). While swirling the flask, add urea until no more of it dissolves (Fig. 3). Close the Erlenmeyer flask with the rubber stopper during shaking.

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Fig. 2

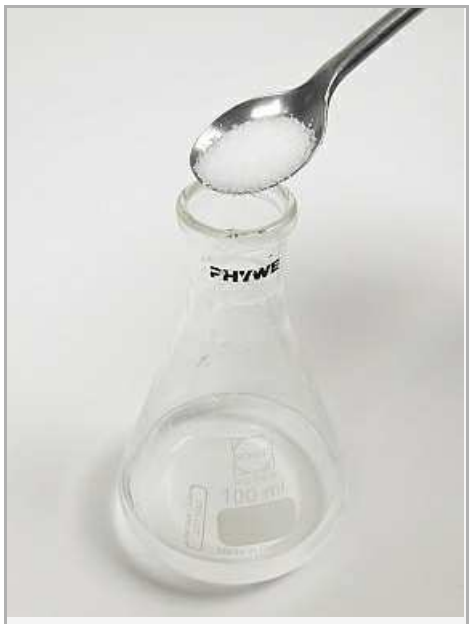

Fig. 3

Put 2 ml of lubricating oil in a test tube and add 20 ml of the urea solution to it (Fig. 4). Close the test tube with the rubber stopper and shake it vigorously. Put the test tube in the test tube rack and place it somewhere safe until the next lesson.

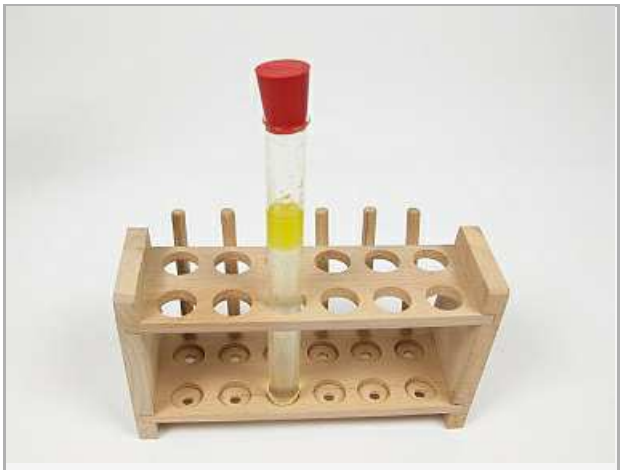

Fig. 4

After it has been allowed to stand, filter the contents of the test tube into a second test tube (Fig. 5). Remove the residue on the filter with the spatula, put it in a test tube and add the double amount of water to it.

Fig. 5

Stopper the test tube and shake it (Fig. 6). Place it in the test tube rack and wait a few minutes.

Fig. 6

Waste disposal

- Put lubricating oil into the correspondingly labelled container and re-use it for similar experiments.
- Put the contents of test tube into the container for combustible organic waste.

Report: Removal of paraffins by urea

Result - Observations

Note the observations you make.

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Evaluation - Question 1

Draw conclusions from your observations.

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Evaluation - Question 2

Which physical processes is this procedure based on?

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Evaluation - Question 3

Which advantages and which disadvantages does this procedure have compared to the removal of paraffin with a solvent?

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