Removal of paraffins by extraction (Item No.: P7171400)

Curricular Relevance

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

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, extraction

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 can be removed from lubricating oil by extraction with a solvent which dissolves oils and subsequent precipitation from the solvent.

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 (wax), but lubricating oil containing paraffin can also be obtained from them.

Remarks on the students experiment:
Should sufficient paraffin precipitate out after the first cooling, then the second filtration is not necessary. Generally, however, a large part of the paraffin re-dissolves because of re-warming during the filtration, so that repeated cooling and filtering is necessary.


Hazard and precautionary statements

Acetone:	
H225:	Causes serious eye irritation.
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.

Hazards

- Acetone is highly inflammable. Extinguish all open flames!
- Acetone attacks the skin! Wash splashes of immediately!
- Wear protective glasses!

Notes

Chlorinated hydrocarbons dissolve oil better than acetone. The procedure described here is nowadays rarely used, because of the danger associated with chlorinated hydrocarbons and by reason of costs. Paraffins can be removed more cheaply and more specifically with urea. This procedure is described in the next experiment (P7171500).

Remarks on the method

This and the following experiment can be carried out separately in groups with sharing of the results. Re-thinking is required here, as not the solid, but the liquid which dissolves the solid, is extracted.

Waste disposal

- Put lubricating oil into the correspondingly labelled container.
- Put the contents of the test tubes into the container for combustible organic waste.
- For easier disposal of paraffin, re-warm it in a water bath if necessary.

Robert-Bosch-Breite 10
D - 37079 Göttingen
Tel: +49 551 604 - 0
Fax: +49 551 604 - 107
info@phywe.de
www.phywe.com

Removal of paraffins by extraction (Item No.: P7171400)

Task and equipment

Task

How can higher boiling alkanes be removed from lubricating oil? (1)

Remove paraffins from lubricating oil by extraction.

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	Glass beaker DURAN®, short, 150 ml	36012-00	1
4	Glass beaker DURAN®, short, 250 ml	36013-00	1
5	Funnel, plastic, dia.50mm	36890-00	1
6	Test tube rack for 12 tubes, holes d= 22 mm, wood	37686-10	1
7	Universal clamp	37715-00	1
8	Boss head	02043-00	1
9	Dish, plastic, 150x150x65 mm	33928-00	1
10	Graduated cylinder, 50 ml, plastic	36628-01	1
11	Erlenmeyer flask 100 ml, narrow neck, PN 19	36418-00	1
12	Spoon, special steel	33398-00	1
13	Rubber stopper, d=22/17 mm, without hole	39255-00	1
14	Protecting glasses, clear glass	39316-00	1
15	Test tube, 180x18 mm,100pcs	37658-10	(1)
16	Glass rod, boro 3.3, l=200mm, d=6mm	40485-04	1
17	Lab thermometer,-10..+150C	38058-00	1
18	Test tube brush w. wool tip,d25mm	38762-00	1
	Acetone, gr 1 l	30004-70	1
	Sodium chloride 1000 g	30155-70	1
	Circular filter,d 90 mm,100 pcs	32977-03	(1)
Additional material			
	Ice		
	Hot water		
	Lubricating oil		

Set-up and procedure

Set-up

Hazards

- Acetone is highly inflammable. Extinguish all open flames!
- Acetone attacks the skin! Wash splashes off immediately!
- Wear protective glasses!

Setup

Set up the stand as shown in Fig. 1 to 4.

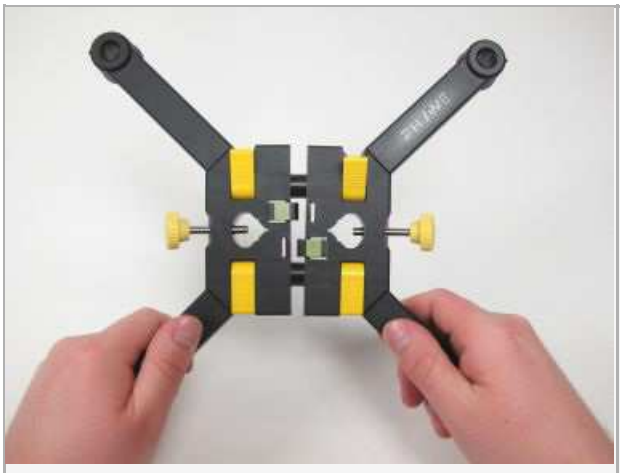

Fig. 1

Fig. 2

Fig. 3

Fig. 4

Fix the funnel in the universal clamp (Fig. 5). Put a folded filter paper in the funnel and wet it with acetone (Fig. 6).


Fig. 5


Fig. 6

Fill the dish with pieces of ice (about half full) and under stirring add salt until the temperature drops below -10 °C (Fig. 7+8).


Fig. 7


Fig. 8

Procedure

Pour 20 ml of lubricating oil and 25 ml of acetone, into the Erlenmeyer flask (Fig. 9). Close the Erlenmeyer flask with the rubber stopper and shake the mixture vigorously (Fig. 10).


Fig. 9


Fig. 10

Remove the stopper and put the Erlenmeyer flask in the cooling bath for about 5 minutes (Fig. 11), then filter the cold contents into the beaker (Fig. 12). Put the beaker with the filtrate back in the cooling bath and when it has cooled, filter it again through the same filter.

Fig. 11

Fig. 12

Fill the second beaker two thirds full with hot water. Scrape the residue from the filter (Fig. 13), put it in the test tube and place this in the hot water (Fig. 14+15). After about 3 minutes, put the test tube in the test tube rack and allow it to cool.

Fig. 13

Fig. 14

Fig. 15

Waste disposal

- Put lubricating oil into the correspondingly labelled container.
- Put the contents of the test tubes into the container for combustible organic waste.
- For easier disposal of paraffin, re-warm it in a water bath if necessary.

Robert-Bosch-Breite 10
D - 37079 Göttingen
Tel: +49 551 604 - 0
Fax: +49 551 604 - 107
info@phywe.de
www.phywe.com

Report: Removal of paraffins by extraction

Result - Observations

Note the observations you make.

.....

.....

.....

.....

Evaluation - Question 1

Draw conclusions from your observations.

.....

.....

.....

.....

Evaluation - Question 2

On which physical processes is this procedure based on?

.....

.....

.....

.....

Evaluation - Question 3

Why must lubricating oil which is won by distillation be freed from paraffin in order to be effective at all times of the year?

.....

.....

.....

.....

Robert-Bosch-Breite 10
D - 37079 Göttingen

Tel: +49 551 604 - 0
Fax: +49 551 604 - 107

info@phywe.de
www.phywe.com