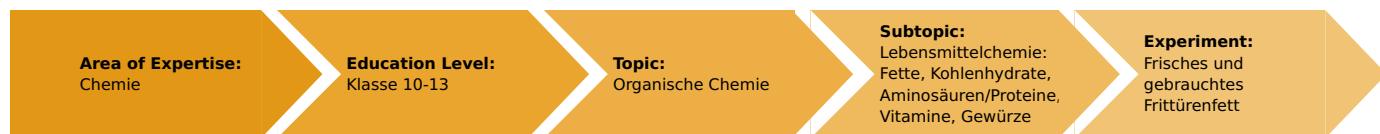


Fresh and spent deep-fry fat (Item No.: P7186100)

Curricular Relevance



Difficulty



Intermediate

Preparation Time



10 Minutes

Execution Time



20 Minutes

Recommended Group Size



2 Students

Additional Requirements:

Experiment Variations:

Keywords:

fats, fry fat

Task and equipment

Information for teachers

Additional Information

Food from a snack-bar is nowadays a matter of course. Large amounts of deep-fry fat are required. As a rule, the fat is kept at the necessary temperature the whole day long. The usability of it must be continually checked.

Notes on content and learning objectives

- The reaction with Schiff's reagent can be used to judge deep-fry fat.
- Deep-fry fat which is unfit for use can be recognized by its colour, taste and reduced smoke point.

Notes on the method

The dangers present when deep-frying foods, such as burns from overheating or frying frozen food containing water, should be pointed out.

The possible chemical changes in fats caused by heat and oxygen, and their effect on health, should be worked out.

The formation and toxic effect of acrolein should also be pointed out.

Fundamentals and remarks

Usually vegetable fats and oils are used for deep-frying. Animal fats, such as beef suet and leaf fat are less suitable. Alongside fat, they contain protein, which separates as a brown turbidity on heating and negatively influences the usability of the fat. When fats and oils are heated with foods, the fats are considerably changed by auto-oxidation, isomerisation, polymerisation and hydrolysis.

By using pure vegetable fats with a low content of unsaturated fatty acids, the effect of heat and atmospheric oxygen can be reduced.

Suitable deep-fry fats can be prepared by the catalytic hydrogenation of vegetable oils with a high content of unsaturated fatty acids. As the products which result are solid or spreadable, the procedure is known as the hardening of fats.

Hints on going deeper

- The health aspects of deep-frying should be discussed.
- The use of pure vegetable fat is favourable.

Notes on set-up and procedure

Preparation:

Should no spent deep-fry fat be available, it can be prepared by intensive, repeated heating of an appropriate fat with frozen food.

Notes on the students experiment:

To judge the various deep-fry fats, solutions of them having the same concentration can be added stepwise (e.g. 2, 4, 6, 8 and 19 drops) to the same amount of Schiff's reagent. The less drops required to give a positive reaction, the more often the deep-fry fat was used.



Hazard and Precautionary statements

Petroleum ether:

H225:	Highly flammable liquid and vapour.
H304:	May be fatal if swallowed and enters airways.
H315:	Causes skin irritation.
H361f:	Suspected of damaging fertility or the unborn child.
H336:	May cause drowsiness or dizziness.
H373:	May cause damage to organs through prolonged or repeated exposure.
H411:	Toxic to aquatic life with long lasting effects.
P210:	Keep away from heat/sparks/open flames/hot surfaces – No smoking.
P233:	Keep container tightly closed.
P240:	Ground/bond container and receiving equipment.
P273:	Avoid release to the environment.
P281:	Use personal protective equipment as required.
P301 + P310:	IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
P302 + P352:	IF ON SKIN: Wash with soap and water.
P304 + P340:	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P308 + P313:	IF exposed or concerned: Get medical advice/attention.
P331:	Do NOT induce vomiting.
P403 + P235:	Store in a well ventilated place. Keep cool.

Schiff's reagent:

H314:	Causes severe skin burns and eye damage.
H350:	May cause cancer.
P201:	Obtain special instructions before use.
P280:	Wear protective gloves/protective clothing/eye protection/face protection.
P305 + P351 + P338:	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do – continue rinsing.
P308 + P313:	IF exposed or concerned: Get medical advice/attention.

Hazards

- Petroleum ether is highly inflammable. Extinguish all open flames before handling.
- Wear protective glasses!
- Carry out the experiment in a fume cupboard, whenever possible!

Waste disposal

Pour the solution in the test tubes into the container for combustible organic solvents.

Fresh and spent deep-fry fat (Item No.: P7186100)

Task and equipment

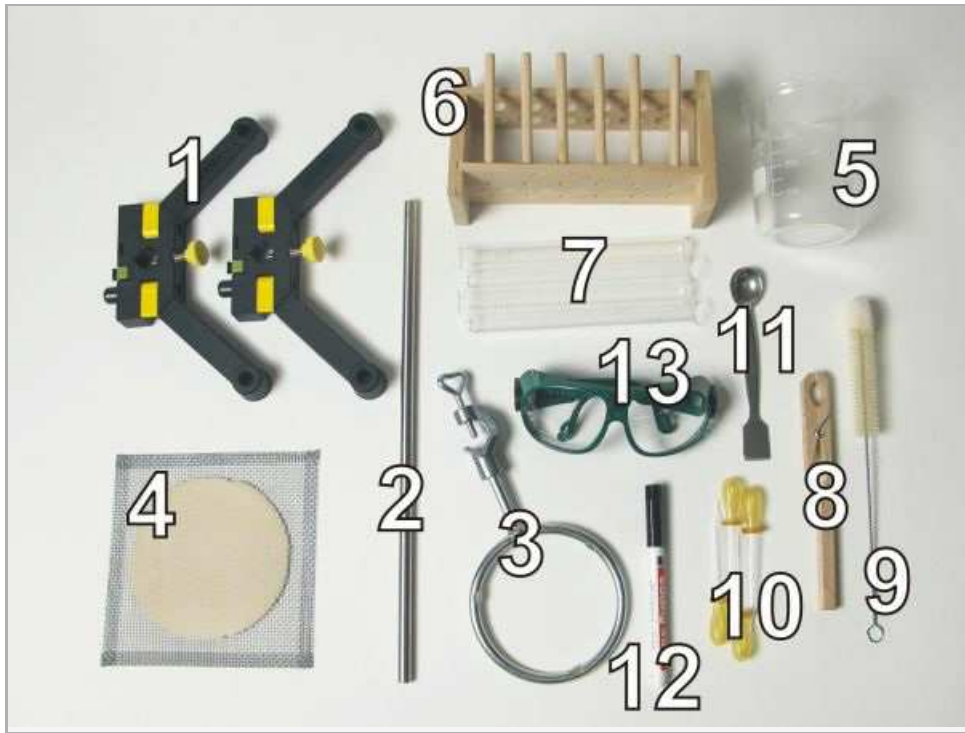
Task

How can spent deep-fry fat be recognized and which method detects fresh or spent deep-fry fat?

Distinguish fresh from spent deep-fry fat.



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	Ring with boss head, i. d. = 10 cm	37701-01	1
4	Wire gauze with ceramic, 160 x 160 mm	33287-01	1
5	Glass beaker DURAN®, short, 400 ml	36014-00	1
6	Test tube rack for 12 tubes, holes d= 22 mm, wood	37686-10	1
7	Test tube, 180x18 mm,100pcs	37658-10	(4)
8	Test tube holder, up to d 22mm	38823-00	1
9	Test tube brush w. wool tip,d25mm	38762-00	1
10	Pipette with rubber bulb	64701-00	4
11	Spoon, special steel	33398-00	1
12	Labor pencil, waterproof	38711-00	1
13	Protecting glasses, clear glass	39316-00	1
	Butane burner f.cartridge 270+470	47536-00	1
	Butane cartridge CV 300 Plus, 240 g	47538-01	1
	Petroleum ether, 40-60 gr 1000 ml	30184-70	1
	Schiff's reagent 250 ml	31827-25	1
	Boiling beads, 200 g	36937-20	1
Additional material			
	Deep-fry fat, fresh		
	Deep-fry fat, spent		

Set-up and procedure

Set-up

Hazards

- Petroleum ether is highly inflammable. Extinguish all open flames before handling them.
- Wear protective glasses!
- Carry out the experiment in a fume cupboard, whenever possible.



Setup

Number four test tubes from 1 to 4 and stand them next to each other in the test tube rack (Fig. 1).



Fig. 1

Assemble the stand as shown in figures 2 to 6. Fasten the support ring to the support rod and place the wire gauze on it. Adjust the height of the support ring so that the flame of the burner just reaches the wire gauze.



Fig. 2



Fig. 3



Fig. 4



Fig. 5



Fig. 6

Half-fill a 400 ml beaker with water and add a few boiling stones. Heat it to boiling, then put it aside. Extinguish the bunsen burner flame!



Fig. 7

Procedure

Test the taste and smell of fresh and spent deep-fry fat (Finger test).

Put a spatula tip of fresh deep-fry fat in test tube 1, and the same amount of spent deep-fry fat in test tube 2 (Fig. 8). Pipette petroleum ether into each of the test tubes to a height of 2 cm and dissolve the fats in it.



Fig. 8

Pipette Schiff's reagent in tubes 3 and 4, each to a height of 2 cm (Fig. 9).



Transfer five drops of deep-fry fat solution from test tube 1 to test tube 3, and five drops of the deep-fry fat solution from test tube 2 to test tube 4.

Put the test tubes 3 and 4 in the hot water bath for approx. 5 minutes.
Look for colour changes.

Waste disposal

Pour the solution in the test tubes into the container for combustible organic solvents.

Report: Fresh and spent deep-fry fat

Result - Observations

Note your observations.

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Evaluation - Question 1

Fresh and spent deep-fry fat can differ from each other in several properties. Assign the properties to their correct place in the table. Use your own experience.

Colour: light / dark

Taste: smoky / neutral

Smell: odourless / slightly burned

Reaction with Schiff's reagent: positive / negative

Property	fresh deep-fry fat	spent deep-fry fat
Colour	1	1
Taste	1	1
Smell	1	1
Reaction with Schiff's reagent	1	1

Evaluation - Question 2

Draw conclusions from your observations.

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Evaluation - Question 3

Complete the following statements:

1. Fresh deep-fry fat is, whereas spent fat is and coloured.
2. Fresh deep-fry fat has a taste, spent fat tastes or
3. Fresh deep-fry fat is, spent fat smells
4. Fresh deep-fry fat shows a reaction with Schiff's reagent. Spent deep-fry fat gives a Färbung.

Evaluation - Question 4

When chips are deep fried, the frothing and the smoke development differ according to the age of the fat. What is typical for fresh deep-fry fat, what is typical for spent deep-fry fat?

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