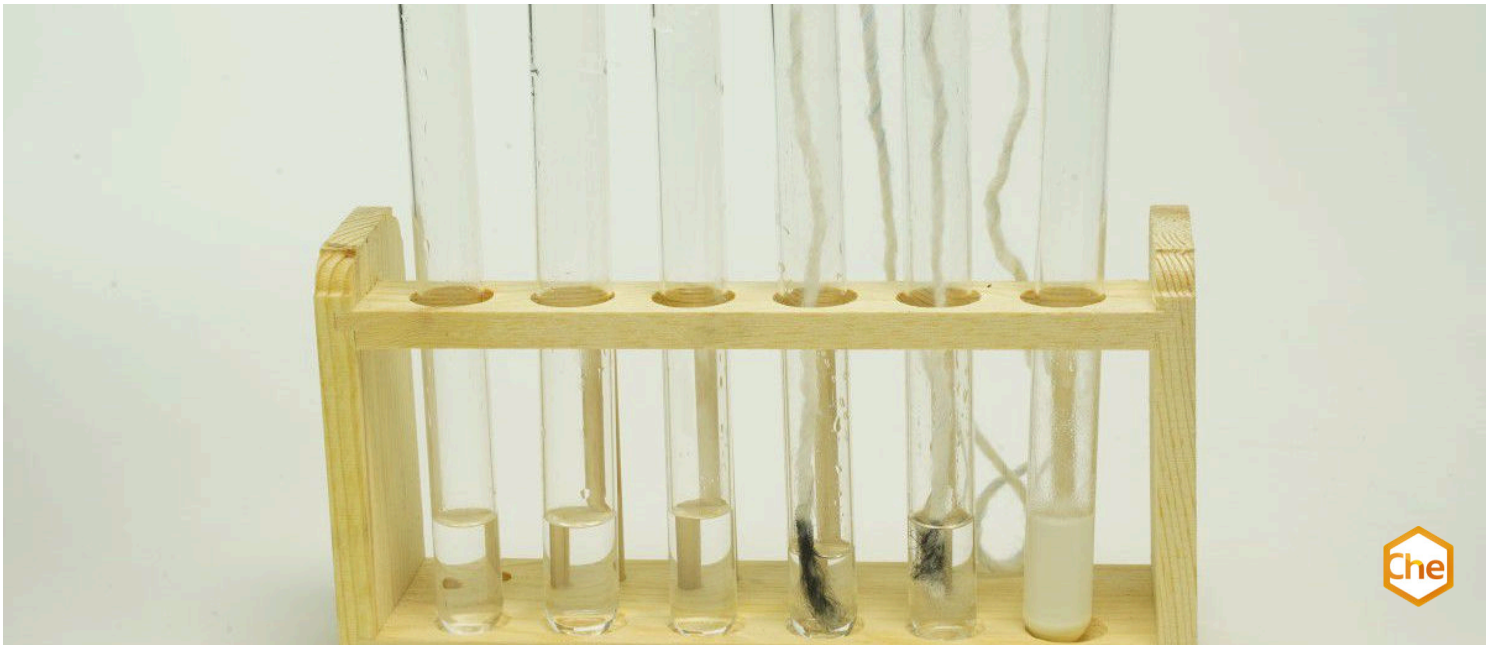
The properties of soap



Chemistry > Organic chemistry > Dyestuffs / Household chemistry

Difficulty level	Group size	Preparation time	Execution time
easy	2	10 minutes	10 minutes

This content can also be found online at:

http://localhost:1337/c/637e69781d87da0003cb3def

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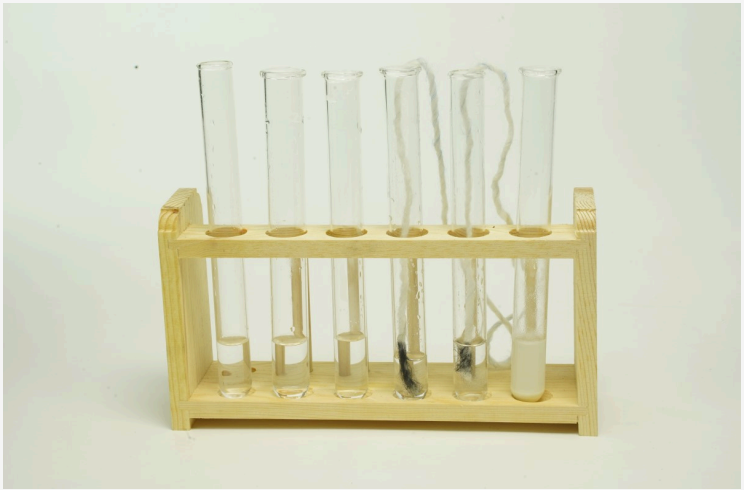
Teacher information

Application



The experimental setup

Soaps Mixtures of various alkali salts of long-chain fatty acids and belong to the group of surfactants. A soap molecule consists of a hydrophobic hydrocarbon chain and a hydrophilic carboxylate group. $(R-COO^-)$ and belongs to the amphiphilic molecules. Soaps are thus able to dissolve non-polar substances. Soaps form alkalis in aqueous solution and react with other salt solutions (except alkali salts) to form insoluble compounds (lime soaps).

In this experiment, the students investigate the effect of soaps.

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Application

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Other teacher information (1/4)

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Prior knowledge

The students should already have a basic knowledge of alkanes, acids and bases, as well as carboxylic acids and their salts. A basic understanding of simple reaction equations and the safe handling of chemicals should also already be present or can be acquired with the help of this experiment.

Principle

Due to their hydrophilic and hydrophobic components, soaps are able to dissolve non-polar substances and thus detach them from materials. Soaps form alkalis in aqueous solution and react with other salt solutions (except alkali salts) to form insoluble compounds (lime soaps).

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Other teacher information (2/4)

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Learning objective

The students learn that soaps form alkalis in aqueous solution. They also react with other salt solutions (except alkali salts) to form insoluble compounds called lime soaps.

Tasks

Determine the behaviour of soaps in relation to some other substances.

Other teacher information (3/4)

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Notes on set-up and procedure

Preparations

This experiment requires curd soap, toilet soaps are not very suitable. The soap solution can also be made from the curd soap used. Any other vegetable oil can be used instead of olive oil.

Notes on the student experiments

Make sure that the ends of the wool threads hang out of the test tube so that they can be removed from it again for checking. The addition of water to the soap solution stained with indicator must not be done with alkaline (tap) water.

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Other teacher information (4/4)

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Methodological remarks

A diluted potassium chloride solution can be added to the soap solution in a parallel experiment to show that alkali salts do not form lime soaps. The experiments are suitable for working in groups and then exchanging the experimental results.

Disposal

- Pour the contents of test tubes 1 to 4 and the beaker into the spout.
- Put the contents of test tubes 5 to 7 into the collection container for acids and alkalis.

Safety instructions

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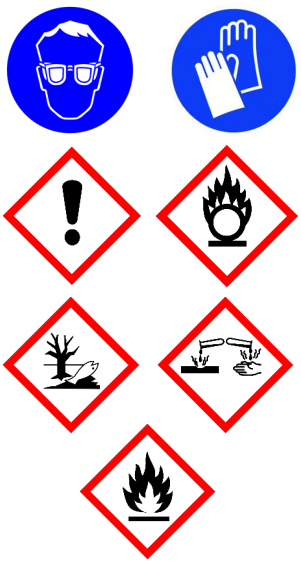

The general instructions for safe experimentation in science lessons apply to this experiment.

For H- and P-phrases please consult the safety data sheet of the respective chemical.

Dangers

- Lime water is corrosive. Put on protective goggles!
- Silver nitrate solution has a decomposing effect on skin contact. Wash off splashes on the skin immediately with plenty of water.

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Student information

Motivation

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Soap bars

Soaps were already made about 4500 years ago and used for cleaning. But there are also soaps (lithium soap) that are used as thickeners, for example in greases. Soaps therefore have several properties. Another property is the formation of so-called lime soap. These form when soaps are used in hard water (water with a high lime content) and consist of calcium or magnesium salts of fatty acids that are difficult to dissolve in water.

In this experiment, different properties of soap are examined in more detail.

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Equipment

Position	Material	Item No.	Quantity
1	Spoon, special steel	33398-00	1
2	Wash bottle, 250 ml, plastic	33930-00	1
3	Beaker, 150ml, low-form	46060-00	1
4	Graduated cylinder, 10 ml, plastic	36636-00	1
5	Test tube, 180x18 mm,100pcs	37658-10	1
6	Test tube brush w. wool tip,d20mm	38762-00	1
7	Test tube rack for 12 tubes, holes d= 22 mm, wood	37686-10	1
8	Laboratory pen, waterproof, black	38711-00	1
9	Rubber stopper, d=22/17 mm, without hole	39255-00	2
10	Protecting glasses, clear glass	39316-00	1
11	Rubber gloves, size M (8), one pair	39323-00	1
12	Scissors, l = 110 mm, straight, point blunt	64616-00	1
13	Pipette with rubber bulb	64701-00	1
14	Ethanol extra pure ab.95% 1000 ml	30008-70	1
15	Charcoal powder 250 g	30087-25	1
16	Olive oil,pure 100 ml	30177-10	1
17	Soap solu.(Boutron-Boudet) 250 ml	30221-25	1
18	Silver nitrate solution 5% 100 ml	30223-10	1
19	Water, distilled 5 l	31246-81	1
20	Calcium hydroxide solution 1000ml	31458-70	1
21	Magnesium chloride 500 g	31540-50	1
22	Phenolphthalein, 0,5% soution in ethanol, 100 ml	31715-10	1

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11	Rubber gloves, size M (8), one pair	39323-00	1
12	Scissors, l = 110 mm, straight, point blunt	64616-00	1

Additional equipment

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Additional equipment
Curd soap
Wool thread

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Set-up

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1. Number the test tubes from 1 to 7 and place them next to each other in the test tube rack.

2. Add about 1 ml of soap solution to test tubes 1 and 2 (fig. 1), fill up with 2 ml of water and mix the liquids by shaking gently.

3. Fill the test tubes 3 and 4 to the same level with water.

4. Add approx. 5 ml of soap solution to each of the test tubes 5 to 7 (Fig. 2).

Figure 1

Figure 2

Procedure (1/6)

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Figure 3

5. Pipette 2 drops of olive oil into each of the test tubes 1 and 3 (fig. 3).

6. Close the test tubes with the stopper and shake vigorously (Fig. 4).

7. Put the test tubes back into the test tube rack and determine the time taken for the mixture to separate.

Figure 4

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Procedure (2/6)

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8. Cut two strands of wool about 25 cm long and rub them with charcoal powder at one end (fig. 5).

9. Dip one thread with this end into each of the test tubes 2 and 4, move the threads back and forth several times and then shake the contents vigorously (Fig. 6).

Figure 5

Figure 6

Procedure (3/6)

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Figure 7

10. Put half a spoonful of curd soap into the beaker (fig. 7).

11. Add 10 ml of absolute alcohol (fig. 8).

Figure 8

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Procedure (4/6)

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Figure 9

12. Add a few drops of phenolphthalein solution with the pipette (fig. 9).

13. Then dilute with distilled water until a change occurs (Fig. 10).

Figure 10

Procedure (5/6)

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14. Add some lime water to the soap solution in test tube 5 (fig. 11), close with a rubber stopper and shake vigorously (fig. 12).

15. Add a few drops of magnesium chloride solution to test tube 6 and a few drops of silver nitrate solution to test tube 7. Close the test tubes and shake vigorously.

Figure 11

Figure 12

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Procedure (6/6)

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Disposal

- Pour the contents of test tubes 1 to 4 and the beaker into the spout.
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Figure 11

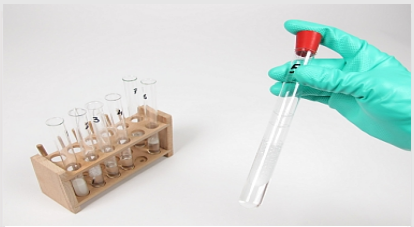

Figure 12

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Report

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Task 1 (1/2)

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Write down your observations.

a) Test tube 1

b) Test tube 2

c) Test tube 3

d) Test tube 4

Task 1 (2/2)

PHYWE

Continue to write down your observations.

e) Test tube 5

f) Test tube 6

g) Test tube 7

h) Beaker

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Task 2

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Which of these observations could be made?

- [ ] The oil-soap solution mixture took less time to demix than the oil-water mixture.
- [ ] The charcoal on the wool threads came off better with the soap solution.
- [ ] The oil-soap solution mixture took more time to demix than the oil-water mixture.
- [ ] The charcoal on the wool threads was easier to remove with the water.

Check

Task 3

PHYWE

Conclusion

What conclusion can be drawn from the observations?

Soaps are able to dissolve

substances and thus detach them from materials.

nonpolar

polar

acidic

magnetic

Check

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Task 4

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Why should water softener be added to washing powder in areas with very hard water?

Soaps form alkalis in aqueous solution. They react with other salt solutions (except alkali salts) to form _____ compounds called _____. The higher the concentration of lime soaps, the _____ the water. This reaction _____ the washing effect, as it reduces the amount of active soap for washing.

insoluble
lime soaps
reduces
harder

Check

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