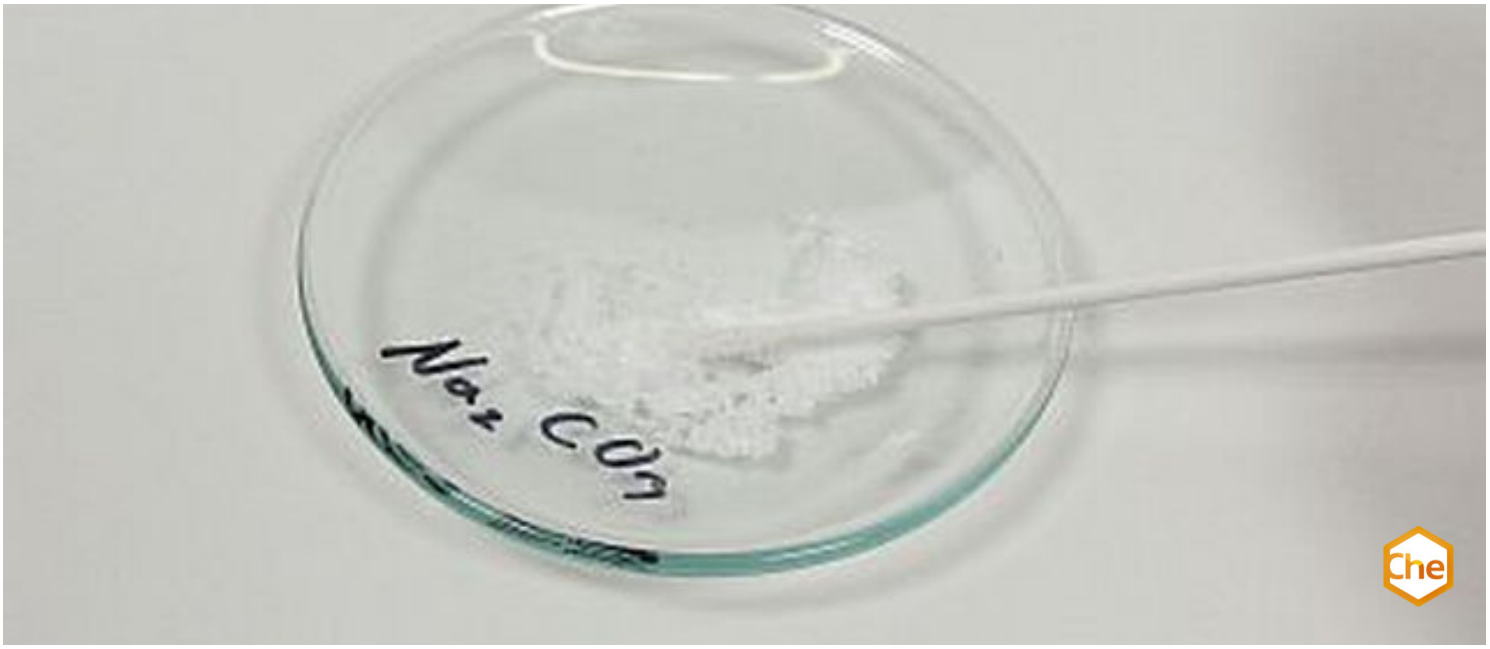
Soda lime glass beads



Chemistry > Inorganic chemistry > Chemistry of metals

Difficulty level	Group size	Preparation time	Execution time
easy	2	10 minutes	20 minutes

This content can also be found online at:

http://localhost:1337/c/61f2a31438d14300030c8649

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Teacher information

Application

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Soda lime glass

Glass is an important material today, not only in the home but also in technology. Depending on the application, there are a variety of glass types, including soda-lime glass. As the name "soda-lime glass" already suggests, the main components are mainly soda and lime, in addition to silicon dioxide.

Soda-lime glass is the basic material for the vast majority of all industrially produced glass and windows. Soda-lime glass is also known as "simple glass" because it is very easy to manufacture. In this experiment, therefore, the production of soda-lime glass is investigated as a model.

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Other teacher information (1/3)

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Prior knowledge

This experiment is designed as an introductory experiment to the topic "Glass and glass production".

Since the aim here is rather to convey a basic understanding of fabrics, no prior knowledge is necessary.

Scientific Principle

Glass is an amorphous, non-crystalline solid. Glass is produced by melting solids. The glass is built up by so-called network formers, these network formers are usually silicon dioxide or boron oxide.

In the flame of a gas burner, these substances melt to form glass. In soda-lime glass, sodium carbonate (baking soda), calcium carbonate (lime) and silicon dioxide (quartz flour / sand) are mixed together to produce a melt.

Other teacher information (2/3)

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Learning objective

- Glass is a solidified melt of metal oxides and silicon dioxide.
- Glass is made in a simple way by melting a mixture of calcium carbonate, sodium carbonate and silica sand.

Tasks

- In this experiment, glass is produced in a simple way by melting a mixture of calcium carbonate, sodium carbonate and silica sand.
- Calcium carbonate and sodium carbonate are melted in a burner flame and then mixed with quartz powder.

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Other teacher information (3/3)

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Notes

- The glass produced here in miniature is soda-lime glass, which is one of the simplest glasses in terms of its composition.
- The glass making method presented here serves as a simple introduction to glass making.
- If carrying out these experiments is too time-consuming or not appropriate for the group of students, the production of the types of glass described there can be carried out with minor modifications as in this experiment. A magnesia flute can also be used instead of the magnesia rod.

Safety instructions

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- The general instructions for safe experimentation in science education apply to this experiment.
- Do not allow quartz dust to get into the eyes! Do not inhale dust! Wear protective goggles!

Notes on the student experiments

- The burner must be set to the hottest flame.
- Make sure that the magnesia rod is held in the hot burner zone above the cone. After formation of an almost transparent bead, the test should be terminated.

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Student Information

Motivation

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Typical soda lime glass

Glass is an important raw material for the manufacture of many products such as windows or drinking glasses. Almost all glass consists mainly of silicon dioxide. Depending on the addition of other components, a distinction is made between different types of glass, such as soda-lime glass and borosilicate glass. As the name suggests, this glass is made of silicon dioxide, soda and lime.

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Equipment

Position	Material	Art.-Nr.	Menge
1	Becherglas, Boro, hohe Form, 600 ml	46029-00	1
2	Dreibein, Ring-d = 140 mm, h = 240 mm	33302-00	1
3	Pinzette, l = 130 mm, gerade, stumpf	64610-00	1
4	Drahtnetz mit Keramik, 160 x 160 mm	33287-01	1
5	Universal-Wärmeschrank, 32 l	49559-93	1
6	Sicherheits-Gasschlauch, DVGW , lfd. Meter	39281-10	1
7	Bunsenbrenner mit Hahn, für Erdgas, Standard	32167-05	1
8	Petrischale, Glas, d = 100 mm	64705-00	10
9	Kompaktwaage, OHAUS TA 302, 300 g : 10 mg	49241-93	1
10	Messzylinder, Boro, hohe Form, 100 ml	36629-00	1
11	Objektträger, 76 mm x 26 mm, 50 Stück	64691-00	1
12	Messpipette, 10 ml, Teilung 0,1 ml	36600-00	1
13	Reagenzglasgestell, 12 Bohrungen, d = 22 mm, Holz, 6 Abtropfstäbe	37686-10	1
14	Erlenmeyerkolben, Duran®, Enghals, 500 ml	36121-00	2
15	Reagenzglas, d = 16 mm, l = 160 mm, 100 Stück	37656-10	1
16	Liebigs Fleischextrakt, 10 g	31521-03	1
17	Pepton aus Fleisch 50 g	31708-05	1
18	Doppelspatel, Stahl, l = 150 mm	33460-00	1
19	Glasrührstab, Boro, l = 300 mm, d = 7 mm	40485-05	1
20	Steristopfen für di = 15 mm, 250 Stück	39266-00	1
21	Steristopfen für di = 29 mm, 100 Stück	39267-00	1
22	Pipettierball, Flip-Modell, Pipetten bis 100 ml	36592-00	1
23	Tisch-Autoklav mit Einsatz	04431-93	1
24	Heizplatte, d= 185 mm,, 230 V für Versuche in der Wärmelehre	04025-93	1
25	pH Teststäbchen, pH 6,5-10, 100 Stück	30301-04	1
26	Natriumhydroxid, Perlen, 500 g	30157-50	1
27	Wasser, destilliert, 5 l	31246-81	1
28	Agar-Agar, gepulvert, 100 g	31083-10	1
29	Ethanol, absolut, 500 ml	30008-50	1

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Set-up

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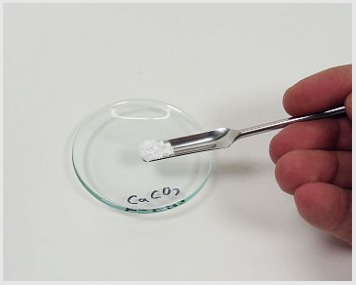
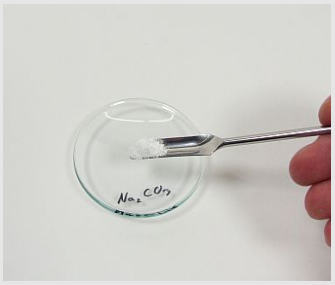
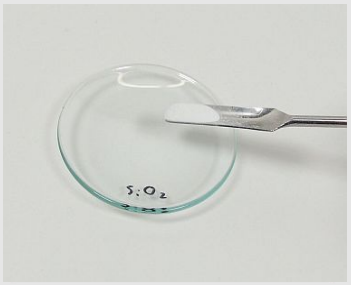
- Take a gas burner and three watch glass bowls.
- Label the watch glass dishes with $CaCO_3$, Na_2CO_3, SiO_2.
- Place the burner and the required materials on the work surface.
- Place a spatula tip of calcium carbonate, sodium carbonate and quartz flour on the correspondingly marked watch glasses.
- See the illustrations on the right.







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Procedure

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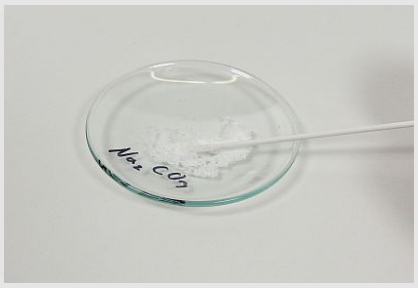
- Ignite the burner, open the air supply completely so that the flame is as hot as possible. Dip the glowing tip into the sodium carbonate so that substance adheres (see illustration above right), melt it in the flame until a bead is formed.
- Constantly rotate the rod so that no substance drips off. Dip the resulting bead into the calcium carbonate and heat again until both substances have melted into a uniform mass (see figure below right).
- Pick up quartz flour with the newly created bead and fuse it with the other two substances. Now repeat the three melting processes until a larger and clear bead is created.



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Report

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Task 1

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What do you observe when the sodium carbonate melts together with the calcium carbonate?

What do you observe when you add quartz flour (silica)?

Observation formation of the melt	Observations Addition of quartz flour

Task 2

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What other type of glass is commonly used?

- Neon glass
- Borosilicate glass
- Argon glass

Which of these "substances" are components of soda-lime glass

- [ ] Sodium carbonate
- [ ] Boric acid
- [ ] Lead carbonate
- [ ] Lime
- [ ] Silicon dioxide

Check

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Task 3

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Using the physical definition, explain why glass, unlike a crystal, shatters irregularly.

Simple glass consists of _____ but there is no uniform composition.
Glass is a _____ in the physical sense.
Because glass is a _____ melt, the ions have not yet ordered themselves into a _____ (crystal) lattice. Glass is therefore _____, i.e. it shatters irregularly.

amorphous
solidified melt
regular
silica
solidified

Check

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