Salt formation due to a precipitation reaction

(Item No.: P7159700)

Curricular Relevance

Area of Expertise: Chemie
Education Level: Klasse 7-10
Topic: Anorganische Chemie
Subtopic: Salze
Experiment: Salzbildung durch Fällungsreaktion

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

Additional Requirements:

Experiment Variations:

Keywords:

salt formation, precipitation reaction

Task and equipment

Information for teachers

Learning objectives

- Different salts can be caused to react with each other while at the same time an exchange of cations or anions takes place.
- If during this process a salt precipitates out in the form of an insoluble component, this can be taken as a test reaction.

Notes on set-up and procedure

Preparations
Prepare a 10% barium chloride solution (20 g of $BaCl_2 \cdot 2\ H_2O$ and 100 ml of water). The silver nitrate solution given in the list of materials already is a 5% solution. The concentrations given must not be kept precisely.

Remarks on the students' experiments
Draw the students' attention to the fact that the precipitates must first sediment. As far as the saline solutions of copper are concerned, the students might otherwise get the impression that the reaction leads to coloured precipitates which are thus of a different kind as those originating from the parallel experiments.

Hazard and Precautionary statements

Barium chloride:

H301:	Toxic if swallowed.
H332:	Harmful if inhaled.
P301 + P310:	IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.

Silver nitrate solution:	
H410:	Very toxic to aquatic life with long lasting effects.
P273:	Avoid release to the environment.
Copper chloride:	
H302:	Harmful if swallowed.
H315:	Causes skin irritation.
H319:	Causes serious eye irritation.
H335:	May cause respiratory irritation.
H400:	Very toxic to aquatic life.
P261:	Avoid breathing dust.
P273:	Avoid release to the environment.
P305 + P351 + P338:	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. - Continue rinsing.
Copper sulphate:	
H319:	Causes serious eye irritation.
H315:	Causes skin irritation.
H302:	Harmful if swallowed.
H410:	Very toxic to aquatic life with long lasting effects.
P273:	Avoid releasse to the environment.
P302 + P352:	IF ON SKIN: Wash with plenty of soap and water.
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

- Heavy-metal salts are hazardous to health when they are swallowed!
- Wash your hands thoroughly after the experiment!
- Silver nitrate solution causes extenisve burns!
- Put on protective glasses!

Notes

At a higher concentration level, silver ions, too, react with sulphate ions and form a white precipitate. However, silver sulphate is much more soluble in water than silver chloride so that after an increased dilution silver sulphate precipitates can be dissolved again.

Remarks on the method

This experiment can also be used for introducing further detection agents. The precipitation of bromide anions and iodide anions by means of silver ions should be demonstrated here. In this context, the faster reduction of the silver ions in the bromide or the iodide can be picked up as a central theme though this experiment will be treated independently in conjunction with the process of photography.

Waste disposal

- Filter out the barium sulphate precipitates and treat them as heavy-metal waste together with the sulphidic or basic copper ions precipitated.
- Collect the silver chloride or retransform it into silver nitrate.
- Put all other solutions into the collecting tanks for acids and alkalis.

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Task and equipment

Task

Do salts react with salts?

Prepare several salt solutions and study the processes taking place when the solutions are mixed.

Equipment

Position No.	Material	Order No.	Quantity
1	Test tube rack for 12 tubes, holes d= 22 mm, wood	37686-10	1
2	Wash bottle, 250 ml, plastic	33930-00	1
3	Labor pencil, waterproof	38711-00	1
4	Test tube, 18x188 mm, 10 pcs	37658-03	(6)
5	Spatula, powder, steel, l=150mm	47560-00	1
6	Pipette with rubber bulb	64701-00	2
7	Protecting glasses, clear glass	39316-00	1
	Barium chloride 250 g	30033-25	1
	Copper-II chloride 100 g	30121-10	1
	Copper-II sulphate,cryst. 250 g	30126-25	1
	Sodium chloride 250 g	30155-25	1
	Sodium sulphate 500 g	30166-50	1
	Silver nitrate solution 5% 100 ml	30223-10	1
	Water, distilled 5 l	31246-81	1
	Magnesium chloride 500 g	31540-50	1

Set-up and procedure

Set-up

Hazards

- Heavy-metal salts are hazardous to health when they are swallowed!
- Wash your hands thoroughly after the experiment!
- Silver nitrate solution causes extensive burns!
- Put on protective glasses!




Procedure

Number the test tubes from 1 to 6 (Fig. 1).

Fig. 1

Place the test tubes into the test tube rack (Fig. 2). Fill a spatula-tipfull of sodium chloride into test tube 1 (Fig. 3), a spatula-tipfull of copper chloride into test tube 2 and a spatula-tipfull of magnesium chloride into test tube 3. Fill the corresponding sulphates into test tubes 4 to 6.

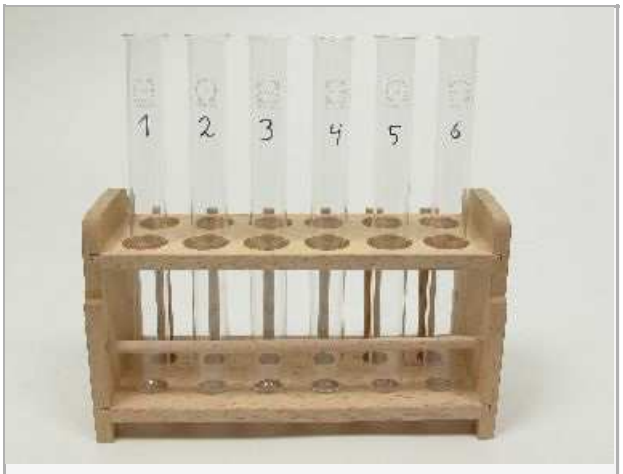

Fig. 2

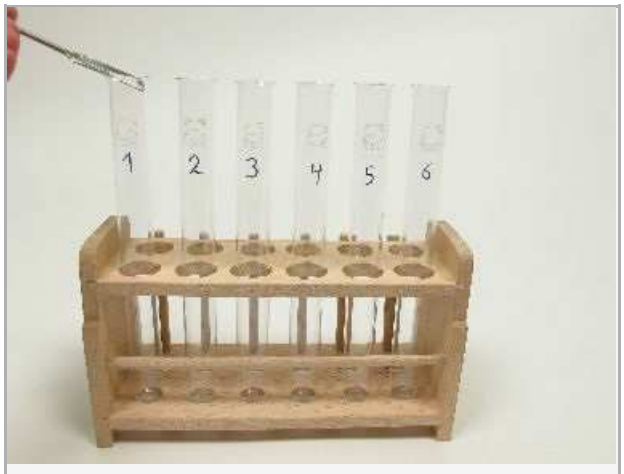

Fig. 3

Fill all test tubes one third full with distilled water (Fig. 4) and dissolve the salts by gently shaking the test tubes.

Fig. 4

Use the pipette to drop a few drops of silver nitrate into test tubes 1 to 3, then take the second pipette and drop some drops of barium chloride into test tubes 4 to 6 (Fig. 5).

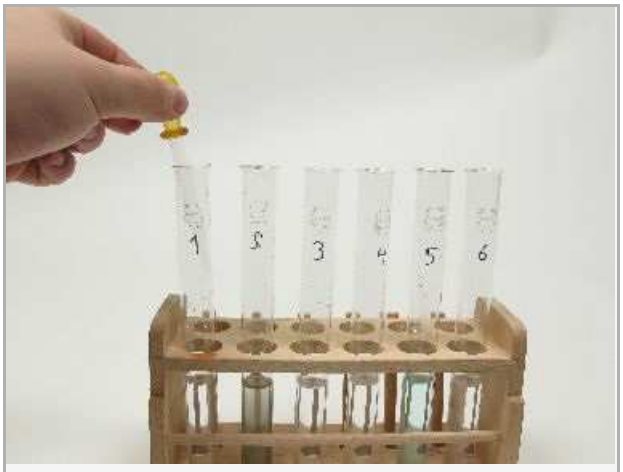

Fig. 5

Waste disposal

- Filter out the silver chloride precipitates and put them into a special reservoir marked correspondingly.
- Put the barium sulphate precipitates into the collecting tank for heavy-metal waste.
- Put the saline solutions of sodium and magnesium into the collecting tank for acids and alkalis.
- Precipitate the copper salts as sulphidic or basic precipitates and put them into the collecting tank for heavy-metal waste.

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Report: Salt formation due to a precipitation reaction

Result - Table 1

Enter the experimental results into Table 1.

Salt solution	Added salt solution	Reaction	Colour of the product
Sodium chloride	Silver nitrate 1	precipitation 1	white 1
Copper chloride	Silver nitrate 1	precipitation 1	white 1
Magnesium chloride	Silver nitrate 1	precipitation 1	white 1
Sodium sulphate	Barium chloride 1	precipitation 1	white 1
Copper sulphate	Barium chloride 1	precipitation 1	white 1
Magnesium sulphate	Barium chloride 1	precipitation 1	white 1

Evaluation - Question 1

Draw the conclusions from your observations. Describe the way of producing salts presented here in form of a catchword.

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Evaluation - Question 2

State the reaction equations for all processes that have taken place.

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Evaluation - Question 3

What purpose can barium chloride solution and silver nitrate solution be used for as far as the result of this experiment is concerned?

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