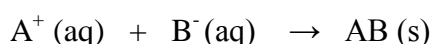


LABORATORY WORK NO. 14 PRECIPITATION REACTIONS

- **PRINCIPLE:** Precipitation reaction is a reaction in which at least one of the products is excluded from the reaction mixture in the form of a solid phase (precipitate).



(reaction between cations A^+ and anions B^- in the solution during which a slightly soluble agent AB arises).

Precipitation reactions are important for determining the presence of substances in a solution, therefore for analysis of substances. They are also used for preparation of solutions and isolation of substances from mixtures.

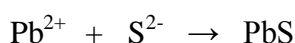
TASK NO.1 PRECIPITATION OF SELECTED CATIONS FROM THE SOLUTION BY SUITABLE PRECIPITATING AGENTS

- **CHEMICALS:** solutions of cations Pb^{2+} , Ag^+ , Fe^{3+} , Cu^{2+} , Ni^{2+} , Na_2S ($c=0,5mol/l$), $NaOH$ ($c=0,5mol/l$), 5% solution of K_2CrO_4 , KI ($c=1mol/l$)
- **AIDS:** test tubes, pipette
- **PROCEDURE:** Pour 1 ml of the solution containing the appropriate ion into the test tube, add a few drops of the appropriate precipitating agent and shake the mixture.

Write down the color of the newly arised precipitate in the table below:

Cation	Na_2S	$NaOH$	K_2CrO_4	KI
Pb^{2+}	PbS	$Pb(OH)_2$	$PbCrO_4$	PbI_2
Ag^+	Ag_2S	Ag_2O	Ag_2CrO_4	AgI
Cu^{2+}	CuS	$Cu(OH)_2$	$CuCrO_4$	$CuI+I_2$
Bi^{3+}	Bi_2S_3	$Bi(OH)_3$	$Bi_2(CrO_4)_3$	BiI_3

- **CONCLUSION:** According to the example write down the ionic equations of the precipitation:



- **SECURITY:** Lead and its compounds are hazardous when inhaled or swallowed. The greatest danger is caused by its cumulative effects in the body.

Potassium chromate causes severe irritation of eyes and respiratory tract, it may cause cancer and genetic damage by inhalation. Use all available protective equipment and follow strictly the instructions of the teacher.

TASK NO. 2 PRECIPITATION OF SELECTED ANIONS FROM THE SOLUTION BY SUITABLE PRECIPITATING AGENTS

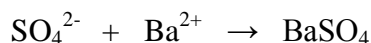
■ **CHEMICALS:** Solutions of anions SO_4^{2-} , CrO_4^{2-} , PO_4^{3-} , CO_3^{2-} , Cl^- , I^- , BaCl_2 ($c=0,25\text{mol/l}$), AgNO_3 ($c= 0,1\text{mol/l}$)

■ **AIDS:** Test tubes, pipette, dropper

■ **PROCEDURE** Pour 1 ml of solution containing the appropriate ion into the test tube, add a few drops of the appropriate precipitating agent and shake the mixture. Write down the color of the newly arised precipitate in the table below:

Anion	BaCl_2	AgNO_3
SO_4^{2-}	BaSO_4	-
CrO_4^{2-}	BaCrO_4	Ag_2CrO_4
PO_4^{3-}	$\text{Ba}_3(\text{PO}_4)_2$	Ag_3PO_4
CO_3^{2-}	BaCO_3	Ag_2CO_3
Cl^-	-	AgCl
I^-	-	AgI

■ **CONCLUSION:** According to the example write down the ionic equations of the precipitation:



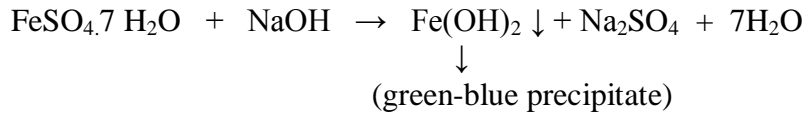
■ **SECURITY:** Barium chloride is toxic if swallowed and harmful if inhaled. When you work with it, ventilate or use a fume hood. Work safety with potassium chromate is described in task No.1.

TASK NO. 3: PREPARATION OF FERROUS HYDROXIDE

■ **CHEMICALS:** 10% solution of $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$, NaOH ($c= 1\text{mol/l}$), distilled water

■ **AIDS:** beakers, filter apparatus, pipette, rod, oven, scales, filter paper

- **PROCEDURE:** Ferrous hydroxide is prepared by precipitation of ferrous sulfate with sodium hydroxide according to the equation:



We prepare the 10% solution from 1g of ferrous sulfate sample. We add dropwise 4 ml of precipitating agent (NaOH, $c = 1 \text{ mol / l}$) to this solution under constant stirring. Let the solution stand still for 10 minutes after the precipitation. Then carry out decantation followed by filtration through the pre-weighed filter paper. Wash the filtered precipitate with distilled water. The obtained precipitate is dried in an oven at 110°C for 20-30 minutes. We weigh the dried ferrous hydroxide after cooling (SV) and calculate the relative yield (RY).

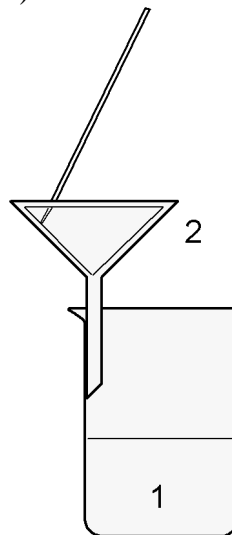


Fig. 1. Filtration apparatus (1- filtrate, 2-filter funnel with filter paper).

- **CALCULATIONS:**
 - a) Preparation of 10% solution of $\text{FeSO}_4 \cdot 7\text{H}_2\text{O}$
 - b) Calculation of the relative yield

$$RV = \frac{SV}{TV} \cdot 100$$

RV = relative yield,

SV = real yield,

TV = theoretical yield, which can be calculated from the equation

- **CONCLUSION:** Write down the real and relative yield of Fe(OH)_2 .



STUDENT'S SHEET No. 14
PRECIPITATION REACTIONS

1) Vocabulary: Translate the terms and learn the vocabulary:

- 1) precipitation reactions-
- 2) damage-
- 3) relative yield -
- 4) fume hood -
- 5) real yield –
- 6) agent-
- 7) contain -
- 8) equation-
- 9) inhalation -

2) Translate the following sentences:

a) Olovo a jeho sloučeniny jsou nebezpečné při vdechování nebo při polknutí.

.....
.....

b) Srážecí reakce je reakce, ve které alespoň jeden z produktů vzniká z reakční směsi ve formě sraženiny.

.....
.....

c) Používejte dostupné ochranné pomůcky a důsledně dbejte pokynů učitele.

.....
.....

d) Při vdechování může způsobit genetické poškození a rakovinu.

.....
.....



e) Může způsobit vážné podráždění očí a dýchacích cest.

.....
.....

3) Word search

Hint: The misspelled words you are searching for are english translations of these terms:

poškodit; rozpustný; ochranné vybavení; sušárna; nálevka ; olovo; sloučenina

1. DELA
2. DMOPCUNO
3. NVOE
4. EGMADA
5. ROPECTIVTE PITMENTEUQ
6. NEUFNL
7. EOSBLUL

4) Easy crossword – Fill in the missing verbs:

1. Následovat

--	--	--	--	--	--	--

2. Vdechnout

--	--	--	--	--	--	--	--

3. Polknout

--	--	--	--	--	--	--	--	--

4. Vznikat

--	--	--	--	--	--

5. Způsobit

--	--	--	--	--	--

6. Obsahovat

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