
LABORATORY WORK NO.18

TRANSITION METALS I

■ **PRINCIPLE:** The ability to hand over valence electrons (and to form cations in a solution) is the dissolving tension which a metal shows in contact with water or with solutions of own or strange metals. According to dissolving tension, metals and hydrogen are ranged into a series which starts with potassium and finishes with gold.

Beketov's metal electrochemical series – incomplete:

K.....Zn,Cr, Fe, Cd, In, Co, Ni, Sn, Pb, **H**, Mo, Re, Cu, Os, Ru, Ag, Hg....Au

Each metal discharges every other following metal located on the right side of the metal electrochemical series more easily if their mutual distance is longer (i.e. if the difference of their dissolving tensions is bigger).

TASK 1. SELECTED REACTIONS OF TRANSITION METALS

■ **CHEMICALS:** NaCl, CuSO₄·5H₂O, Pb(NO₃)₂, AgNO₃, Cd(NO₃)₂, ZnSO₄, CrCl₃ (all c=0,1mol/l), NaOH (c=2mol/l), concentrated H₂SO₄, H₂SO₄ (c=1mol/l), H₂O₂ (30%), zinc granules

■ **AIDS:** test tubes, pipette, test tube stand

■ **PROCEDURE:**

A) Zinc in the metal tension series

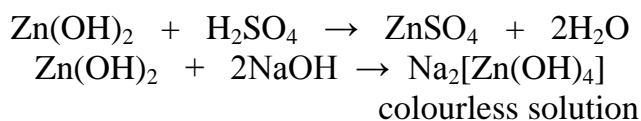
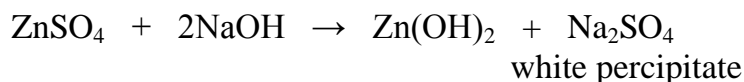
Pour 3ml of NaCl, CuSO₄·5H₂O, Pb(NO₃)₂, AgNO₃, Cd(NO₃)₂, ZnSO₄ solutions (with concentration c=0.1 mol/l) into five different test tubes. Drop a granule of Zn into each test tube and observe the changes.

■ **CONCLUSION:** Write down the equations of the chemical reactions you observed.

B) Preparation of zinc hydroxide and its characteristics

■ PROCEDURE:

Put 3 ml of ZnSO₄ solution (c= 0.1 mol/l) in the test tube and add 4 drops of NaOH solution (c=2 mol/l) until a precipitate arises. Divide the obtained precipitate into two parts into two different tubes. Drop carefully 5 drops of the concentrated sulfuric acid into the first tube. Add an excess of NaOH solution into the second tube.

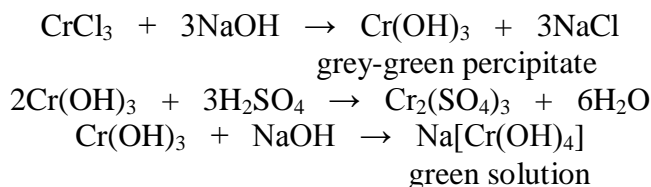


■ CONCLUSION:

Observe reactions and draw a conclusion about the character of the zinc hydroxide.

C) Preparation of the chromium hydroxide and its characteristics

Add dropwise a solution of NaOH (c=2 mol/l) to the solution of 3 ml CrCl₃ (c=0,1mol/l) until a precipitate arises. Divide the obtained precipitates into two parts into two test tubes. Pour the diluted H₂SO₄ (c = 1 mol/l) into the first tube and an excess of NaOH into the second tube.



■ **CONCLUSION:** Observe the reactions and draw a conclusion about the character of Cr(OH)₃.

TASK 2. CHARACTERISTICS OF THE TRANSITION METALS – PRINCIPLES OF PHOTOCHEMICAL REACTIONS

- **CHEMICALS:** KCl, KBr, KI (all $c=1\text{ mol/l}$), AgNO_3 ($c=0,1\text{ mol/l}$), alkaline solution of hydroquinone ($c=1\text{ mol/l}$), $\text{Na}_2\text{S}_2\text{O}_3$ ($c=1\text{ mol/l}$)
- **AIDS:** spot plate, dropper, test tubes
- **PROCEDURE:**

The preparation of silver halides and their behavior when light exposed

Put two side by side drops of solutions of KCl, KBr and KI with concentration of 1 mol/l into the spot plate. Add the solution of AgNO_3 ($c = 0,1\text{ mol/l}$) to one of the prepared sample drops (the second drop of the same sample is used for comparison). Observe the color of the arised precipitates at the beginning, after 5 minutes and after 15 minutes.

Write down your observation into the table.

	Reaction with AgNO_3 (equation)	immediately	after 5 minutes	after 15 minutes
	■ C			
KCl	O			
KBr	N			
KI	C			
	L			
	U			

- **CONCLUSION:** Write down the relevant chemical equations.



STUDENT'S SHEET No. 18

TRANSITION METALS I

1) Vocabulary Czech – English from the text

Translate:

1. Zkumavka
2. Přechodné prvky
3. Halogenidy
4. Kapkovací destička
5. Nadbytek
6. (přidávat něco) po kapkách
7. Vlastnosti
8. Valenční elektrony
9. Nadbytečné množství
10. Stojan na zkumavky

2) Translate following sentences:

- 1) Pozorujte reakce a shrňte závěr.

.....

- 2) Příprava hydroxidu zinečnatého a jeho vlastnosti.

.....

- 3) Napište rovnice chemických reakcí, které jste pozorovali.

.....

3) Matching words



Match correctly words to their translations:

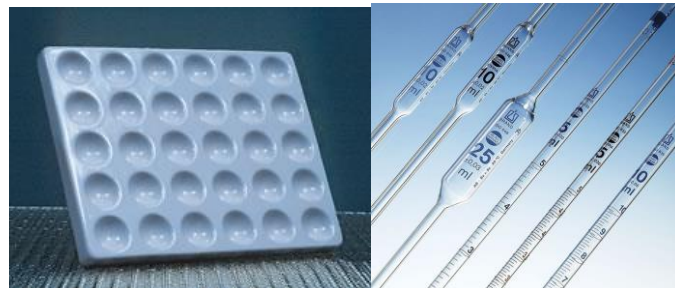
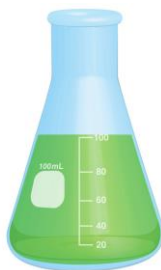
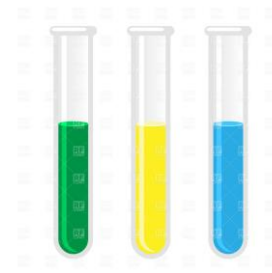
- | | |
|----------------------|-------------------|
| 1. equation | A. přechodné kovy |
| 2. dropper | B. zásaditý |
| 3. granule | C. rovnice |
| 4. precipitate | D. kapátko |
| 5. alkaline | E. zrnko |
| 6. transition metals | F. sraženina |

4) Match and learn following verbs:

- | | |
|----------------------|-----------|
| 1) přidat | A. pour |
| 2) nalít | B. divide |
| 3) rozdělit | C. occur |
| 4) vhodit | D. drop |
| 5) stát se, přihodit | E. add |

5) Match suitable names to the pictures:

pipette, Erlenmeyer flask, spot plate, test tube stand, test tube (-s), dropper (-s)





INVESTICE DO ROZVOJE VZDĚLÁVÁNÍ

- <http://thumbs.dreamstime.com/z/dropper-vector-illustration-medical-pipette-35638721.jpg>
- <https://encrypted-tbn3.gstatic.com/images?q=tbn:ANd9GcQB2N51zTeDSvq5ZjiPcVHjnkYZNKkcxNTZBiFTfZYFV88D0IWJ>
- <http://www.korematsupto.org/wp-content/uploads/2011/05/Beaker.jpg>
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- <http://3.bp.blogspot.com/-nZAaxxsqcjs/Ual3uLIJg9I/AAAAAAAAAIQ/ePvPJ0zJf3w/s1600/pipeta-graduada-458628.jpg>