Elemental analysis of acetate complex compounds based on zinc acetamide, urea, thiocarbamide, and nicotinamide

Saule Meldebekova[1]., ZulfiyaDzhumanazarova[2].

[1]-Associate Professor of the Karakalpak Medical Institute

[2]-Doctor of Chemical Sciences, Karakalpak State University

Annotation. This thesis describes the synthesis of complex compounds of zinc (Zn^{2+}) ions with acetamide, urea, thiocarbamide, and nicotinamide ligands in the presence of an acetate medium, as well as the results of their elemental analysis. The obtained results serve to determine the composition and structure of the complexes.

Keywords: zinc acetate, complex compound, acetamide, urea, thiocarbamide, nicotinamide, elemental analysis, coordination chemistry.

Complex compounds are one of the important areas of coordination chemistry and are widely used in catalysis, medicine, agriculture, and materials science. Zinc, as a biologically active metal, forms stable complexes with organic ligands with amide and thioamide groups. The presence of the acetate ion significantly affects the crystalline structure and solubility of the complexes.

Results of elemental analysis of complex compounds of acetate zinc with acetamide, urea, thiocarbamide and nicotinamide

Compounds	M, %		S, %		N, %		C, %		H, %	
	Found.	Calc	Found.	Calc	Found.	Calc	Found.	Calc	Found.	Calc
$Zn(ac)_2 \cdot AA \cdot ANC \cdot H_2O$	16,93	17,10	–	–	11,12	10,99	37,83	37,69	4,90	5,01
$Zn(ac)_2 \cdot C \cdot ANC$	18,02	17,88	-	-	15,43	15,32	35,88	36,13	4,47	4,41

$Zn(ac)_2 \cdot AA \cdot NC \cdot 2H_2O$	17,21	17,04	-	-	14,68	14,60	21,74	21,92	4,82	9,73
$Zn(ac)_2 \cdot C \cdot NC \cdot H_2O$	17,97	17,83	-	-	18,96	19,10	19,83	19,66	4,25	4,12
$Zn(ac)_2 \cdot TC \cdot NC \cdot H_2O$	17,31	17,09	3,51	8,38	18,18	18,30	19,01	18,84	3,79	3,95
$Zn(ac)_2 \cdot NC \cdot ANC \cdot H_2O$	15,39	15,25	-	-	16,44	16,34	31,09	30,82	3,82	4,00
$Zn(ac)_2 \cdot TC \cdot ANC$	17,19	17,14	8,30	8,41	14,73	14,69	34,79	34,64	4,32	4,23

The results of elemental analysis confirmed the coordination of the zinc ion with ligands in the complex.In acetamide and urea complexes, coordination is mainly carried out through the oxygen atom.In the thiocarbamide complex, a bond is observed with the participation of a sulfur atom, which is explained by the high donor property of the C atom. In the nicotinamide complex, the coordination of the nitrogen atom predominates. The experimental results gave values close to the percentage of the theoretically calculated element, which confirms the approximate formula of the synthesized complexes.Sustainable complex compounds with acetamide, urea, thiocarbamide, and nicotinamide were synthesized based on zinc acetate. The results of elemental analysis made it possible to determine their stoichiometric composition and showed that the coordination activity of the ligands is different. The obtained complexes are promising as biologically active substances.

References

1. Cotton F.A., Wilkinson G., Murillo C.A., Bochmann M. *Advanced Inorganic Chemistry.* 6th ed., Wiley, 1999.

2. Housecroft C.E., Sharpe A.G. *Inorganic Chemistry.* 4th ed., Pearson Education, 2012.

3. Miessler G.L., Fischer P.J., Tarr D.A. *Inorganic Chemistry.* 5th ed., Pearson, 2014.

4. Greenwood N.N., Earnshaw A. *Chemistry of the Elements.* 2nd ed., Butterworth-Heinemann, 1997.

5. Kettle S.F.A. *Coordination Compounds.* Oxford University Press, 1975.

6. Nakamoto K. *Infrared and Raman Spectra of Inorganic and Coordination Compounds.* 6th ed., Wiley, 2009.

7. Vogel A.I. *Vogel's Textbook of Quantitative Chemical Analysis.* 6th ed., Prentice Hall, 2000.

8. Skoog D.A., Holler F.J., Crouch S.R. *Principles of Instrumental Analysis.* 6th ed., Cengage Learning, 2007.