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COORDINATION COMPOUNDS OF ZN (II), NI (II), CO (II) AND CU (II) WITH ETHYLENEDIAMINE-B-PROPIONIC ACIDS

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Abstract: The article presents the biological significance of microelements nickel, copper, cobalt and zinc found in the human body. An analysis of X-ray and IR spectra of synthesized complexes of these microelements is also conducted.

Key words: Coordination compounds, essential microelement **,** antidiuretic effect, B_{12}, lipid metabolism, DNA, RNA.

Introduction

Among the various macro- and microelements contained in biological objects, cobalt, nickel, zinc and copper play an important role. The biological role of microelements has not yet been sufficiently studied [1], but the available data allow us to state that they are necessary for the enzymatic systems of living organisms.

Experimental studies on living organisms have shown that nickel deficiency leads to a sharp delay in growth and development, as well as to anemia due to a decrease in the level of hemoglobin in the blood. Nickel enhances the antidiuretic effect of the pituitary gland and actively promotes vitamin metabolism. Under its influence, ascorbic acid and vitamin B_{12} are absorbed [8]. This element regulates the absorption of calcium by the body, participates in oxidation-reduction reactions and promotes the active supply of oxygen to cells. Without nickel, tissue respiration and lipid metabolism processes in cells are impossible [2,6].

Copper is an important microelement involved in the regulation of oxidation-reduction processes. It is a catalyst for a number of cellular reactions, in particular carbohydrate metabolism, enhances water, gas and mineral metabolism, is part of copper-containing enzymes, participates in hematopoiesis (erythropoiesis, heme synthesis), stimulates the endocrine glands, has an insulin-like effect, affects neurophysiological processes and increases vascular sensitivity. In addition, copper plays a role in the functioning of mitochondrial membranes and regulates the processes of growth and development of the body [3,9].

Zinc is the second most common element in the body after iron and is associated with approximately 10% of proteins. It is involved in all types of metabolism, is part of 7,200 enzymes, plays an important role in the synthesis of proteins and nucleic acids, and is necessary to stabilize the structure of DNA, RNA, and ribosomes. Zinc is also involved in the processes of cellular transformation, growth, and division, affects the stability and permeability of cell membranes, the processes of apoptosis, osteogenesis, hematopoiesis, cellular respiration, as well as the formation of the brain and its neurotransmitter functions. In

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addition, zinc is a neuromodulator and neurotransmitter, and is involved in the processes of reproduction and fetal development [4,5,7].

Based on the above, we carried out a targeted synthesis of coordination compounds of Zn(II), Ni(II), Co(II) and Cu(II) with ethylenediamine-β-propionic acids, which have low toxicity and high biological activity.

Experimental part

Complex compounds $Co(Eda\text{-}\beta\text{-}PK)_2 \cdot 2H_2O$, $Ni(Eda\text{-}\beta\text{-}PK)_2 \cdot 3{,}5H_2O$, $Zn(Eda\text{-}\beta\text{-}PK)_2 \cdot 3H_2O$ and $Cu(Eda\text{-}\beta\text{-}PK)_2 \cdot 3H_2O$ were synthesized as follows:

0.3 mol of ethylenediamine-β-propionic acid was dissolved in 75 ml of water, adding 0.6 mol of caustic soda. A solution of 0.3 mol of nitrates of the corresponding metals in 25 ml of water was gradually added to the resulting transparent solution with stirring. The resulting precipitate was washed with water, then with alcohol and ether [10].

Results and discussion

The purity and individuality of the obtained complexes were confirmed by X-ray diffraction data. The X-ray diffraction pattern of the initial ligand sharply contrasts with the X-ray diffraction pattern of the synthesized complex compounds, which confirms their purity and individuality.

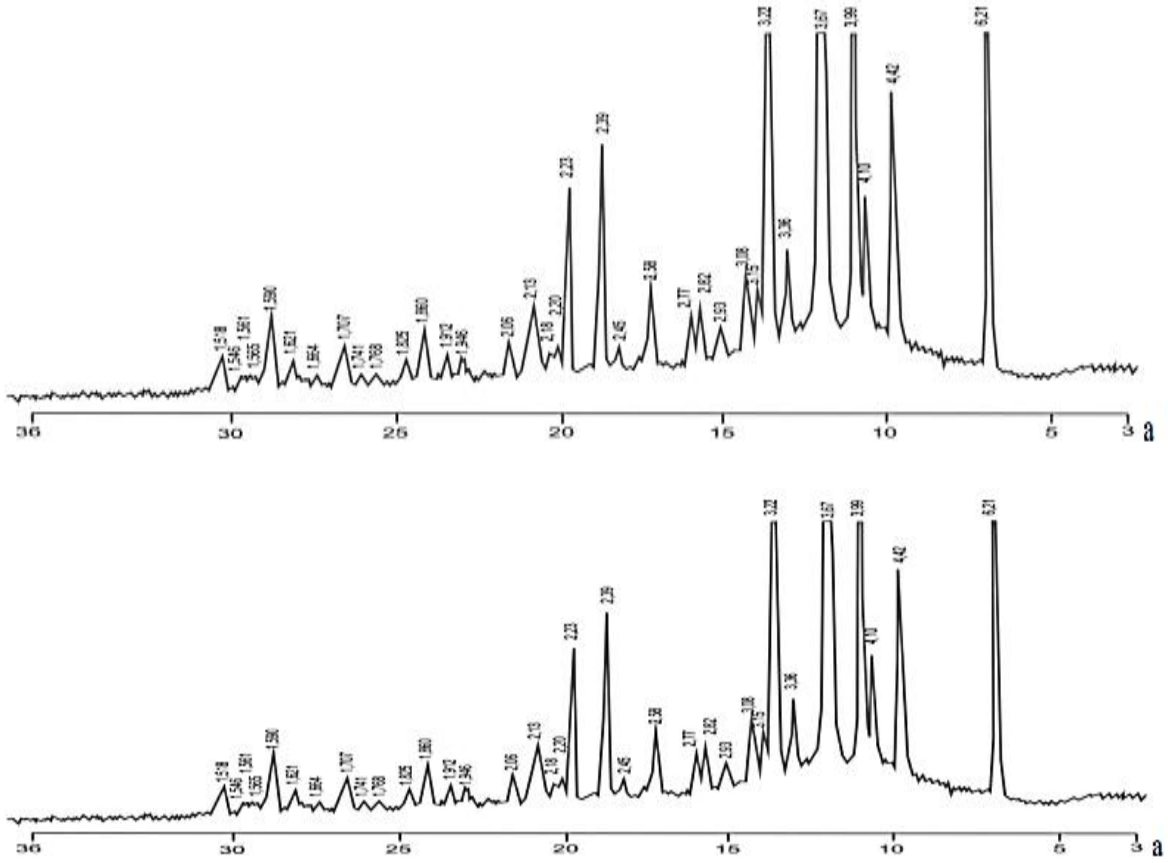

Figure 1 : X-ray image of a-(Eda - β-PK) $_2$,

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The elemental composition of the isolated compounds and some of their physicochemical properties were also studied. The main vibration frequencies in the IR absorption spectra of the complexes are shown in Figure 2 **.**

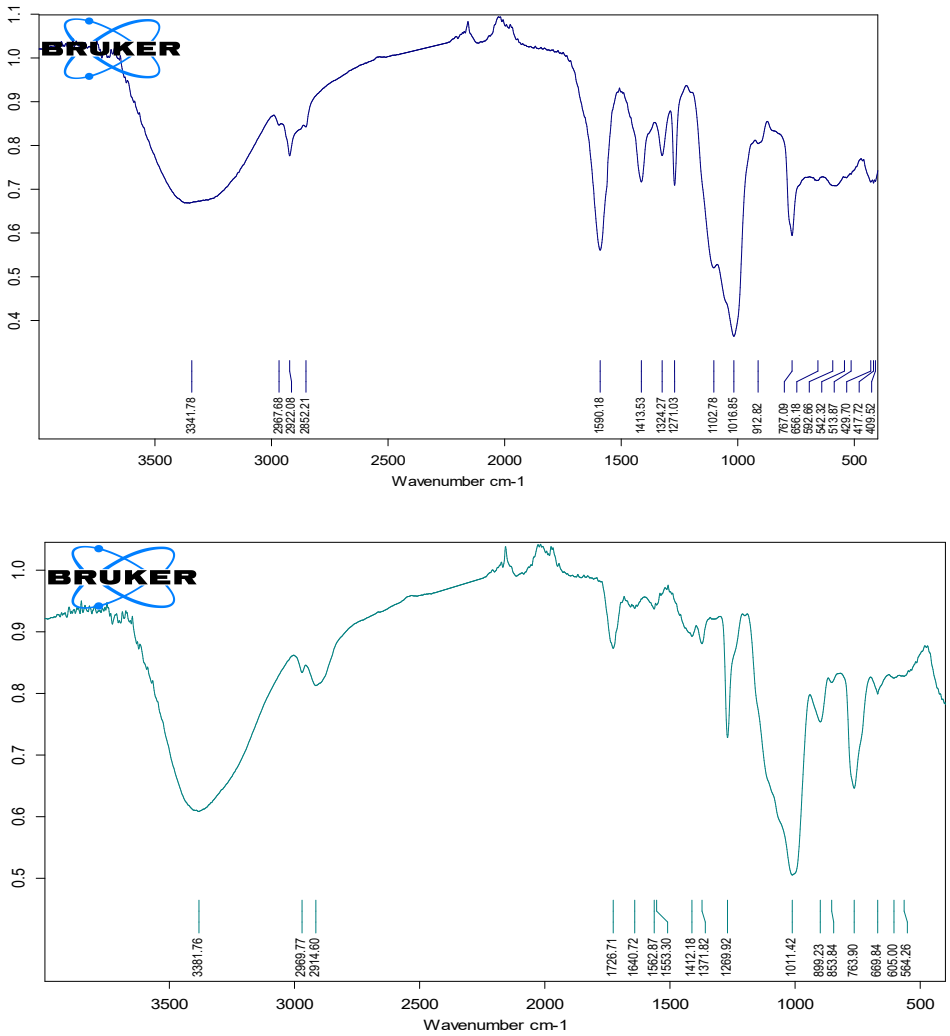

Figure 2: a- free EDA-β-PK IR spectra. work IR spectrum of b-ZN(Eda-β-PK) $_2$ * $_{3H2O}$

Comparison of the IR spectra of free EDA-β-PK and the studied complex compounds shows that the frequencies of the C–H bond stretching vibrations shift to higher frequencies, while the predominant frequency of the C=O bond stretching vibrations decreases by 5–10 cm^{-1} upon coordination. This shift ν(C=O) is associated with the formation of the M←O bond **,** which in turn leads to a strengthening of the C–O bond and, accordingly, an increase in the ν(C–O) frequency **.**

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List of references:

1. Kuchkorova, R. R. (2007). Complex compounds of nickel, copper and zinc with derivatives of fluorinated β-diketones: diss… Cand. chemistry sciences. Tashkent: NUUz.–2007.–140 p.
2. Kuchkorova, R. R. (2007). Complex compounds of nickel, copper and zinc with derivatives of fluorinated β-diketones: diss… Cand. chemistry sciences. Tashkent: NUUz.–2007.–140 p.
3. Bafoevich, U. B., Rasulovna, K. R. N., & Ziyodulloevna, K. S. (2021). REACTION OF 1, 1, 1-TRIFLUOROMETHYL-4-PHENYLBUTANEDIONE-2, 4 WITH BENZOIC ACID HYDRAZIDE. INFORMATION TECHNOLOGY IN INDUSTRY, 9(3), 939-944.
4. INTERACTION OF UNSYMMETRICAL 1,3-DIKETONE WITH ETHYLENEDIAMINE . Interpretations and researches, (4-50).
5. Qizi, K. M. T., & Qo'Chqorova, R. R. (2025). CHEMICAL PROPERTIES AND APPLICATIONS OF TUNGSTEN. Eurasian Journal of Entrepreneurship and Pedagogy, 3(1), 29-31.
6. Rasulovna, Q. C. R. N. (2023). AGROKIMYO FANINI BIOLOGIYA FANLARI BILAN O'ZARO INTEGRATSIYASI ASOSIDA O'QITISH METODIKASI. Science and innovation, 2(Special Issue 7), 230-232.
7. Kochkarova, R. R., & Turgunov, E. (2023). Improving the methodology of teaching chemistry lessons at school with the help of different games. American Journal of Applied Science and Technology, 3(10), 15-19.
8. Qodirova, S. Z., Saidov, S. A., Mirsultonov, J. O., & Qo'chqorova, R. R. (2024). ZIG'IRNING FARMAKOTERAPEVTIK TA'SIRLARI. International innovation and research, 1(2), 56-59.