

ISSN 2181-8622

Manufacturing technology problems



Scientific and Technical Journal Namangan Institute of Engineering and Technology

INDEX  COPENICUS
I N T E R N A T I O N A L

**Volume 10
Issue 2
2025**



SLIB.UZ
Scientific library of Uzbekistan

UDC: 541.49+538.113+547.447,484,574

USE OF ELECTRON SPECTRA IN DETERMINING THE COORDINATION NUMBER OF CENTRAL ATOMS OF COMPLEX COMPOUNDS BASED ON Ni(II) AND Co(II) IONS

KOCHKAROVA RANO

Docent, Tashkent State Pedagogical Institute named after Nizami, Tashkent, Uzbekistan

Phone.: (0899) 527-5009

Abstract: This article presents ideas on the identification of the central ion that forms the complex in complex compounds of nickel and cobalt with a coordination number of six.

Keywords: Coordination number, Ni(II),Co(II) complexes, electronic spectra, electronic configuration, octahedral complex, spin-orbital

Introduction. During the last decade, metal complexes have attracted much attention due to their biological activity, mainly due to the need to gain insight into the electron transport pathways in biological systems and to obtain useful information about the state of the molecule-based polarities. Metal complexes of ligands have been considered as compounds, which are considered to be responsible for their semiconducting properties. As such, vitamin B₁₂ bio-functions are analyzed as model compounds. In this work, metal complexes of multifunctional ethylenediamine- β -propionic acid have been prepared and spectrally characterized. The ligand and its metal complexes have shown significant biological activity. Metal complexes of fluorine-containing β -diketones have also been characterized.

Most complex compounds of cobalt have a coordination number of six . have a high spin electron configuration , their ground state is $4T_{1g}$ and spin-orbital interactions are significant. There are three theoretically recognized transitions in this group of complexes [1]:

${}^4T_{1g}(F) \rightarrow {}^4T_{2g}$, ${}^4T_{1g}(F) \rightarrow {}^4A_{2g}$ and ${}^4T_{1g}(F) \rightarrow {}^4T_{1g}(R)$. The ${}^4T_{1g}(F) \rightarrow {}^4A_{2g}$ transition is two-electron and is not observed. The line at $\sim 20,000\text{ cm}^{-1}$ of the octahedral complex is said to be related to ${}^4T_{1g}(F) \rightarrow {}^4T_{1g}(R)$. The formation of the shoulder is caused by the spin-orbital interaction losing identity in the excited state of ${}^4T_{1g}(R)$. Another line at 8350 cm^{-1} corresponds to the ${}^4T_{1g}(F) \rightarrow {}^4T_{2g}$ transition. The DQES of $\text{Co(EDA-}\beta\text{-Pk) GATFAT}\cdot\text{H}_2\text{O}$ has peaks and bends at 25283, 17747, 13642, 12789 and 10801 cm^{-1} [2] . The electronic spectrum of $\text{Co(EDA-}\beta\text{-Pk) GATFAT}\cdot 2\text{H}_2\text{O}$ has bends and peaks at 26543, 24655, 21031, 17678, 14838, 12742, 11308 and 10766 cm^{-1} .

Research method and preliminary analyses . The coordination compound $\text{Co(EDA-}\beta\text{-Pk) GATFAT}\cdot 3\text{H}_2\text{O}$ has maxima and bends at 26729, 24633, 19877, 17476, 13693 and 10697 cm^{-1} .

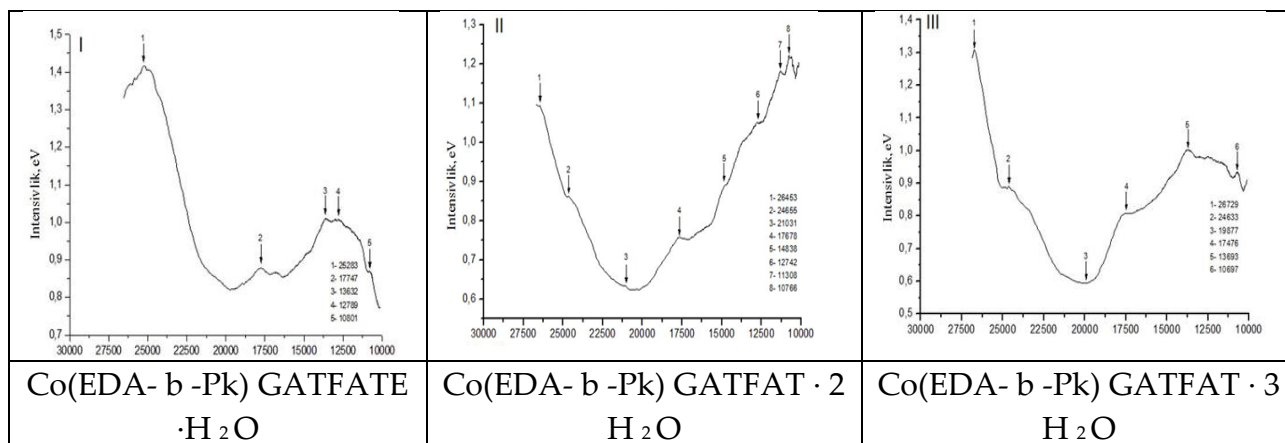


Fig 1. Electronic spectra of coordination compounds of cobalt (II) formate

Preparation of metal complexes of ethylenediamine- β -propionic acid Much research has been conducted on.

a-normal method: metal complexes were prepared by the elemental method. Monohydrate of Ni(II), Co(II), Cu(II), Zn(II) acetates was added with stirring to 25 ml of an equimolar solution of ethylenediamine- β -propionic acid solution (25 ml). The metal was added to a heated solution of acetate and ethylenediamine- β -propionic acid. The resulting mixture was stirred for 2 h and the resulting complexes were filtered, washed three times with warm solution of C and dried under vacuum in the presence of P_2O_5 . The analytical data, spectral data of Tables 1 and 2 are consistent with the proposed structures.

b-template method: 20 ml of methanol solution of Ni(II) acetate tetrahydrate, Co(II) acetate tetrahydrate, Zn acetate tetrahydrate, and Cu(II) acetate monohydrate were mixed with 15 ml of ethanol solution to prepare a 35 ml mixture and mixed with 25 ml of ethylenediamine- β -propionic acid solution of equimolar concentration. The resulting mixture was boiled for 2 hours.

The resulting complexes were filtered, washed three times with warm ethanol solution and dried. The elemental analyses of complexes 1-2, their electronic and vibrational spectra were compared with complexes 3-4 prepared by a simple method. The conclusions drawn from the comparison are presented in Table 1 below.

Table 1. Results from the comparison of complexes 1-2-3-4

№	Rangi	M. Wt	Topildi				
			C	H	N	O	M
1-kom	Qizil	353.0	30.5	6.61	14.25	16.3	15.01

2-kom	Apelsin	371.3	30.15	6.53	14.07	16.08	16.08
3-kom	Jigarrang	350.0	30.07	6.5	14.03	16.04	16.3
4-kom	Sariq	357.4	30.5	6.61	14.25	16.3	15.01

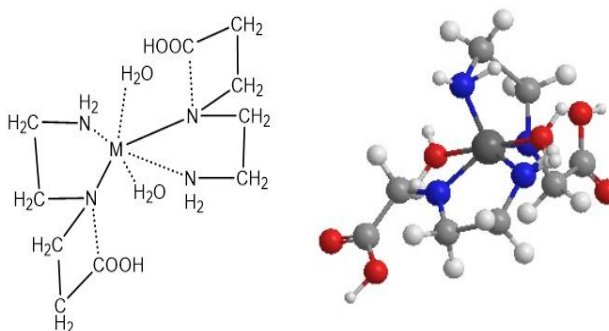


Figure 2. Structure and molecular model of metal complexes of ethylenediamine- β -propionic acid

This image will allow for accurate and scientifically based research and conclusions about the structure and molecular model of metal complexes of ethylenediamine- β -propionic acid.

II. Results: Based on the observed spectra, it can be said that the coordination number of divalent cobalt in coordination compounds with various ligands is 6, and the node geometry corresponds to an octahedron [4,8].

The octahedral complexes of nickel(II) have three absorption bands in the ranges 8000–13000, 15000–19000, and 25000–29000 cm^{-1} . The exact location of the lines in this band depends on the parameters D and β .

The electronic spectra of various coordination compounds of nickel(II) formate have been recorded [3] :

$[\text{Ni}(\text{EDA}-b-\text{Pk})\text{GATFAT}] \cdot 2\text{H}_2\text{O}$, $[\text{Ni}(\text{EDA}-b-\text{Pk})\text{GATFAT}] \cdot 4\text{H}_2\text{O}$, $[\text{Ni}(\text{EDA}-b-\text{Pk})\text{GATFAT}] \cdot 3\text{H}_2\text{O}$.

It is evident that each spectrum contains several curves. The largest maxima were selected for line analysis. The studied complexes have three maxima in the proposed order: 25576, 16142, 10228; 26738, 16314, 10766; 26694, 16021, 10714 cm^{-1} , which are associated with the spin-allowed $^3\text{A}_{2g}(\text{F})$ to $^3\text{T}_{2g}(\text{F})$, $^3\text{T}_{1g}(\text{F})$ and $^3\text{T}_{1g}(\text{R})$ [5] .

The values of Δ , β and p were calculated according to generally accepted methods. The following equation was used to calculate p:

$$[6Dq - 16(Dq)^2] + (-6Dq - p)E + E^2 = 0$$

the Ni^{2+} ion, $p = 15V$, where V is the Rak parameter, and for the nickel complex Ni(II) $p = 15B'$. The difference between the energies for the ^3R and ^3F states in the complex

changes as for the gaseous ion under covalent influence, i.e. 3R serves as a measure of covalency [11].

nickel (II) formate are shown in Figure 3 below.

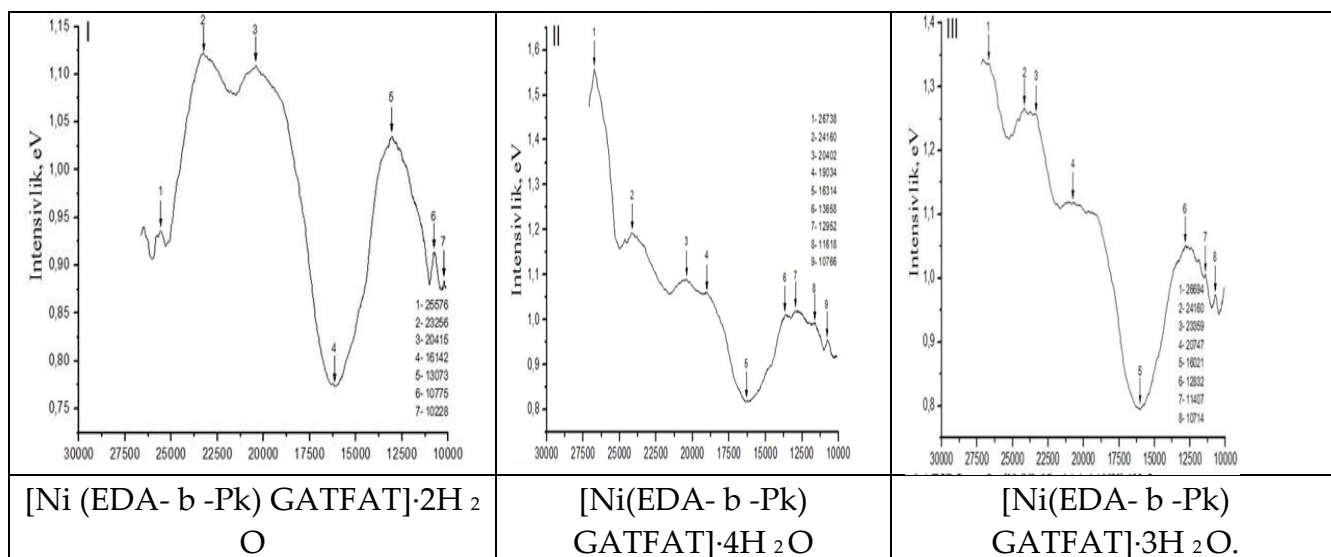


Figure 3. Nickel (II) formate

This image helps to accurately analyze the spectra of coordination compounds of nickel (II) formate and draw scientifically based conclusions.

III. Conclusion . It is seen that there is a difference between the calculated and found values of the ${}^3A_{2g} \rightarrow {}^3T_{1g}(F)$ energies, which indicates that the bond between the central ion and the ligand exhibits a small amount of covalence. This leads to a shift in the octahedral geometry of the coordination node [10].

IV. List of used literature

1. Kuchkorova R.R. Kompleksnye soedineniya nickelya,medi i zinca s p roizvodnymi fluorirovannyx b- diketonov: Dis. ... a candidate. chem. nauk.- Tashkent : IU AN RUz , 2007. – 144 p .
2. Complex Nickel (II) Compounds Based on Acylhydrazones of royltrifluoroacetyl -methanes_KR Rasulovna European Journal of innovation in non-formal education 3 (10), 3-5.
3. Complex compounds of fluorinated β -diketone derivatives with transition metals . KR Rasulovna, UB Bafoevich, KS Ziyodulloevna International Journal of Early Childhood Special Education 14 (5)
4. Reaction of 1, 1, 1-trifluoromethyl -4-phenylbutadione -2, 4 with benzoic acid hydrazide UB Bafoevich, KR Rasulovna, KS Ziyodulloevna Information technology in industry 9 (3), 939- 944
- 5 . K o mpleksnye soedineniya proizvodnyx fluorirovannyx b-diketonov s prekhodnymi metallami RR Kuchkorova. International conferences 1 (10), 250-255

6. Rano Kuchkorova Acylgidrazony 1-(2-thenoyl)-3,3,3 - trifloracetone Education , science and Innovation (spiritual - enlightenment , scientific - methodological) journal , issue 1 , 2024 , pages 39-42 .
7. Rasulovna, KR (2023). Complex Nickel (II) Compounds Based on Acylhydrazones of Aroyltrifluoroacetylmethanes. European journal of innovation in non-formal education, 3(10), 3-5.
8. Kuchkarova, RR (2022, November). Complex compounds of derivatives of fluorinated β -diketonis with transition metals. In international conferences (Volume 1, No. 10, p. 250-255).
9. Rasulovna, KR, Bafoevich, UB, & Ziyodulloevna, KS (2022). Complex compounds of fluorinated β -diketone derivatives with transition metals. International Journal of Early Childhood Special Education, 14(5).
10. Bafoevich, UB, Rasulovna, KRN, & Ziyodulloevna, KS (2021). Reaction of -1, 1, 1-trifluoromethyl -4-pheylbutanedione -2,4 with benzoic acid hydrazide. Information technology in industry, 9(3), 939-944.
11. Kuchkorova R. R. B. Umarov Complex connection copper (II) basically acylgidrazonov 1-(2- thenoyl)-3,3,3- trifluoroacetone O ' z MU news March 15, 2024 pages 401-406
12. Kochkarova, RR, Ibodulloyeva, MI, & Ziyodulloyevna, QS (2022). APPLICATION OF EDUCATIONAL METHODS IN CHEMISTRY LESSONS. Contemporary scientific solutions to actual problems, (January).
13. Kuchkarova, R. R. Methodology of conducting a non-traditional form of teaching - dictation lessons in general secondary schools . WARSAW, P. (2019). POLISH SCIENCE JOURNAL.104-108
14. Kadirova, SZ, Saidov, SA, Mirsultonov, JO, & Kuchqorova, RR (2024). PHARMACOTHERAPEUTIC EFFECTS OF FLAX. International innovation and researches, 1(2), 56-59.
15. Rasulovna, QCRN (2023). METHODOLOGY OF TEACHING AGROCHEMISTRY ON THE BASIS OF INTER-INTEGRATION WITH BIOLOGICAL SCIENCES. Science and innovation, 2(Special Issue 7), 230-232.
16. Kuchkorova, R. (2025). VZAIMODEYSTVIE NESIMMETRICHNYX 1, 3-DIKETONOM S ETHYLENDIAMINOM. Interpretation and researches, (4-50).
17. Kochkarova, RR, Ibodulloyeva, MI, & Ziyodulloyevna, QS (2022). APPLICATION OF EDUCATIONAL METHODS IN CHEMISTRY LESSONS. Contemporary scientific solutions to actual problems, (January).

CONTENTS

TECHNICAL SCIENCES: COTTON, TEXTILE AND LIGHT INDUSTRY

Kadirov K., Xoldorov B., To'xtashev A.	3
Analysis of power quality indicators in light industry enterprises	
Monnopov J., Kayumov J., Maksudov N.	15
Evaluation of deformation properties of highly elastic knitted fabrics in sportswear design	
Nazarova M., Musayeva G., Mirzaraximova S.	22
Study of clothing quality control and analysis	
Abdullayev R.	28
Theoretical basis of technological parameters of the new pneumo-mechanical gin machine	
Bakhritdinov B.	33
Increase production volume by regeneration of cotton	
Otamirzayev A.	38
Measures to dangermine during the initial processing of cotton	
Kamolova M., Abdukarimova M., Mahsudov Sh.	42
Measures to dangermine during the initial processing of cotton	
Shogofurov Sh., Jurabayev N., Xolikov K.	55
Analysis of the technology of obtaining knitted fabrics with patterns and their physical and mechanical properties	
Jurabayev N., Shogofurov Sh., Yusupov S.	64
Study of the physical and mechanical properties of hosiery products made from bamboo yarn	

TECHNICAL SCIENCES: AGRICULTURE AND FOOD TECHNOLOGIES

Nasriddinov B., Serkaev Q., Yo'ldiev A.	70
Effect of solvent compositions on oil indicators in cotton oil extraction	
Yulchiev A., Yuldashev Sh.	79
Economic efficiency in the production of cream-perfumed soap	
Ikromova Y., Ikromov F., Khamdamov A., Xudayberdiyev A.	85
Modeling of primary distillation process of vegetable oil miccella	
Ismailov M., Adashev B.	92
Prevention of external flood formation on the surface of heat exchanger pipes	

CHEMICAL SCIENCES

Tajibayeva N., Ergashev O.	99
Nanofibers based on chitosan and synthetic polymers: a review of properties and applications	

Kuchkarova D., Soliyev M., Ergashev O.	
Quantitative determination of adsorption activity of adsorbents obtained on the basis of cotton stalk and cotton boll	104
Abdullaxanova G., Ergashev O.	
Differential heat and entropy of adsorption of methanethiol in sodalite	112
Paygamova M., Khamzakhojayev A., Ochilov A., Paygamov R.	
Physicochemical properties of carbon adsorbents derived from renewable biomass	121
Kochkarova R.	
Use of electron spectra in determining the coordination number of central atoms of complex compounds based on Ni(II) and Co(II) ions	131
Yusupova M., Mamadjonova M., Egamberdiev S., Abduvohidov I.	
Study of the conditions for the aminolysis of secondary polycarbonate	136
Ikramova G., Askarova O., Siddikov D., Karimov A., Botirov E.	
Chemical components of perovskia kudrjashevii	142
Kaxarova M., Soliyev M.	
Types of plant growth regulators and their application in agriculture	147
Juraboev F.	
Investigation of the synthesis of acetylene amino alcohols and the study of their biological activity	151
Salikhanova D., Usmonova Z.	
Thermal activation of plums	155
Kadirxanov J., Urinov A.	
Development of composite materials for corrosion protection of main gas and oil pipelines with increased chemical adhesion	160
Sotiboldiev B.	
Synthesis of hybrid composites of polysaccharides based on methyltrimethoxysilane	167
Jumayeva D., Nomonova Z.	
Chemical characterization of raw materials used for adsorbent production	174
Muratova M.	
Method for producing a fire retardant agent with nitric acid solutions of various concentrations	183
Shamuratova M., Abdikamalova A., Eshmetov I.	
Physicochemical properties and results of sem analysis of soils in the regions of Karakalpakstan	192
Dadakhanova G., Soliev M., Nurmonov S.	
Composition of oil products and methods of separation of individual substances	199

Hoshimov F., Bektemirov A., Ergashev O.	206
Effectiveness of the drug "Akaragold 72%" against cotton spider mites	
Abdirashidov D., Turaev Kh., Tajiyeu P.	213
Analysis of the physicochemical properties of polyvinyl chloride and the importance of mineral fillers in increasing its fire resistance	

TECHNICAL SCIENCES: MECHANICS AND MECHANICAL ENGINEERING

Makhmudjonov M., Muminov Kh., Tilavkhanova L.	219
Classification and analysis of level measurement methods	
Mukhammadjanov M.	226
Digital modeling of the heat transfer process in oil power transformers in operation	
Mukhtorov D.	230
Investigation of drying efficiency in a solar installation with composite polyethylene film depending on the product thickness	
Tursunov A., Shodmanov J.	239
Advancing sustainable environmental strategies in the cotton industry through dust emission reduction	
Saidov O.	247
Event-driven process orchestration in e-governance: modeling asynchronous integration patterns	
Obidov A., Mamajanov Sh.	252
Organization of scientific and research processes based on information and digital technologies in higher education	
Turdaliyev V., Akbarov A., Toychieva M.	259
Theoretical study of the vibration of chain networks	
Abdusattarov B., Xamidov S.	265
Modeling the process of separating cotton particles from air in the working chamber of a cotton gin	
Toirov O., Amirov S., Khalikov S.	272
Diagnostics of the condition of elements of electric power supply substation	

ADVANCED PEDAGOGICAL TECHNOLOGIES IN EDUCATION

Mukhtorov D., Jamoldinov K.	281
Development and improvement of drying technologies in a solar dryer	
Uzokov F.	291
Graphical solution of systems of equations in two-and three-dimensional spaces using MS excel	

ECONOMICAL SCIENCES

Yuldashev K., Kodirov X.

Financing of pre-school educational institutions based on public-private partnerships and their results **299**

Boltaboev D.

Specific aspects of labor resource management in different countries **304**
