QO‘QON DAVLAT PEDAGOGIKA INSTITUTI ILMIY XABARLARI
(2026-yil 2-son)

TABIIY FANLAR

NATURAL SCIENCES

UDK: 546,05

Zn(II) NING 6-AMINOPIRIDIN-2-KARBON KISLOTASI BILAN KOMPLEKS BIRIKMASI SINTEZI VA TADQIQI

https://doi.org/10.70728/a.series.v08.i02.045

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Annotatsiya.6-aminopiridin-2-karbon kislotaning metall ionlari bilan ta’sirlashishi va uning metallokompleks birikmalarining xossalarini tadqiq qilish maqsadida, Zn(II)xlorid kristallogidrati bilan M:L 1:2 nisbatdagi koordinatsion soni oltiga teng bo‘lgan, yangi kompleks birikmasi olinib, uning monokristali o‘stirildi. Uning tarkibi va tuzilishi RTT yordamida aniqlandi. Kompleks birikmada ligandi bidentant holatda koordinatsiyalangan. Hirshfeld sirtini Crystal Explorer17.5 dasturi yordamida tahlil qilindi. Kompleks birikma kristalining IQ-spektri tahlil o‘tkazilib, tegishli bog‘larning tebranish chastotasi kuzatildi.

Kalit so‘zlar. 6-aminopiridin-2-karbon kislota (APY), sirka kislota rux(II)xlorid, monokristall.

Аннотация.Для изучения взаимодействия 6-аминопиридин-2-карбоновой кислоты с ионами металлов и свойств ее металлокомплексных соединений был получен новый комплексный продукт с кристаллическим гидратом хлорида Zn(II) и координационным числом шесть в соотношении M:L 1:2, и выращен его монокристалл. Его состав и структура были определены с помощью RTT. Лиганд в комплексном соединении координирован в бидентатном состоянии. Поверхность Хиршфельда была проанализирована с помощью программы Crystal Explorer 17.5. Был проанализирован ИК-спектр кристалла комплексного соединения и измерены колебательные частоты соответствующих связей.

Ключевые слова: 6-аминопиридин-2-карбоновая кислота (APY), уксусная кислота, хлорид цинка(II), монокристалл

Abstract. To study the interaction of 6-aminopyridine-2-carboxylic acid with metal ions and the properties of its metal complexes, a new complex product with crystalline

Zn(II) chloride hydrate and a coordination number of six was prepared in an M:L ratio of 1:2, and its single crystal was grown. Its composition and structure were determined using RTT. The ligand in the complex is coordinated in the bidentate state. The Hirshfeld surface was analyzed using Crystal Explorer 17.5. The IR spectrum of the complex crystal was analyzed, and the vibrational frequencies of the corresponding bonds were measured.

Key words: 6-aminopyridine-2-carboxylic acid (APY), acetic acid, zinc(II) chloride, single crystal

KIRISH. Jahonda 2,6-almashingan piridin hosilalari hamda ularning d-metall tuzlari bilan hosil qilgan aralash ligandli kompleks birikmalarining tadqiqoti, ularning tarkibi, tuzilishi, xossalari bo‘yicha ko‘plab izlanishlar olib borilmoqda. Bu borada, yuqori konformasion harakatchan karbon kislotalar asosidagi ligandlarning oraliq metallar bilan yangi tuzilish va funksiyalarni o‘zida namoyon etuvchi kompleks birikmalari sintezi, hosil bo‘lgan kompleks birikmalar tuzilishining turli omillarga, jumladan, metall tabiatiga, ligand o‘rinbosarining mavjudligiga bog‘liq ligini, shuningdek, markaziy ionga ligandning koordinasiyalanishi, bog‘ tabiati hamda fizik-kimyoviy va biologik xossalarini aniqlash katta ahamiyat kasb etadi

ADABIYOTLAR TAHLILI VA METODOLOGIYA.

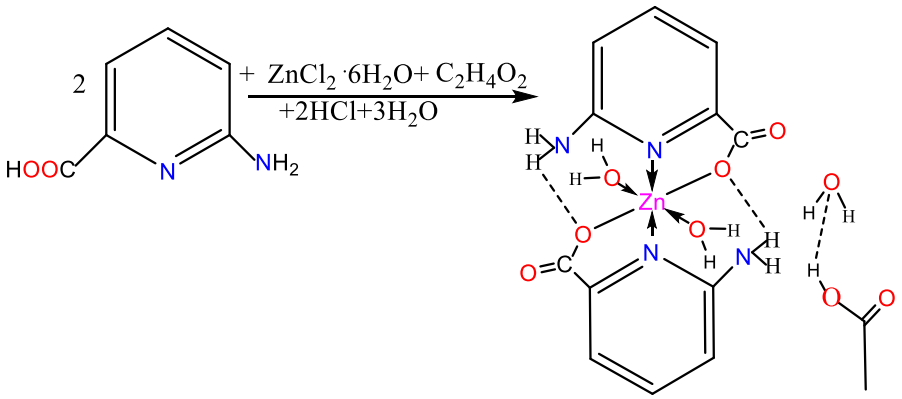
6-aminopiridin-2-karbon kislotaning kompleks hosl qiluvchi xususiyatidan foydalanib, uning turli xil tarkibli kompleks birikmalari olingan. Tarkibida Cu(II) markazi buzilgan kvadrat tekislikda joylashgan geometriya ikkita karboksilat kislorod atomi va ikkitasi bilan yakunlangan L-anionlardan piridil azot atomlarining masofalari Cu—O bog‘lari 1.9268(18) Å va Cu—N bog‘lanish masofasi mos ravishda 2.011(2) Å ga teng. Cu(II) ga nisbatan bog‘lanish burchaklari markazlari 83.06(8)° dan 180° gacha [1]. Bundan farqli o‘laroq ko‘p tishli ligandning kutilishi, L- ligandlar koordinatasi diskret $Cu(L)_2$ strukturasini hosil qilish uchun N,O xelatsiya rejimi bilan. $Cu(L)_2$ molekulasi umuman tekislikka yaqin. Bundan tashqari, aniq yuzma-yuz $\pi-\pi$ stacking shovqinlari mavjud hosil bo‘lishiga hissa qo‘shadigan L-anionlar o‘rtasida uch o‘lchovli arxitektura.

Piridin hosilalarining luminesans, biologik faollik, kataliz va magnit hususiyatlari komplekslari o‘rganilgan [2-4]. Shu sababli, almashtiril gan piridin asosidagi metall komplekslarini o‘rganishga ko‘proq e’tibor berilmoqda. Bu sohada tadqiqotlar olib borilgan [5,7]. Mn(II) titul kompleksi bitta Mn(II) ionini o‘z ichiga oladi, ikita 2-amino -6-piridinkarboksilat ligandlari va ikkita koordinatali etanol molekulalari. Mn(II)ioni koordinatsiyalangan to‘rtta O atomi (O2, O2A, O3 va O3A) va ikitasi bilan N atomlari(N2 va N2A) ikki xil 2-amino-6-piridinkarboksilat ligandlari va ikki xil koordinatali etanol molekulalari, buzilgan oktaedrik koordinatsiyani tashkil etgan.

Hozirgi vaqtda kimyogarlar metall ionlariga biriktirilgan donor atomlarining soniga qarab di, tri, tetra yoki ko‘p ligandli komplekslar bo‘lishi mumkin bo'lgan qiziqarli fizik-

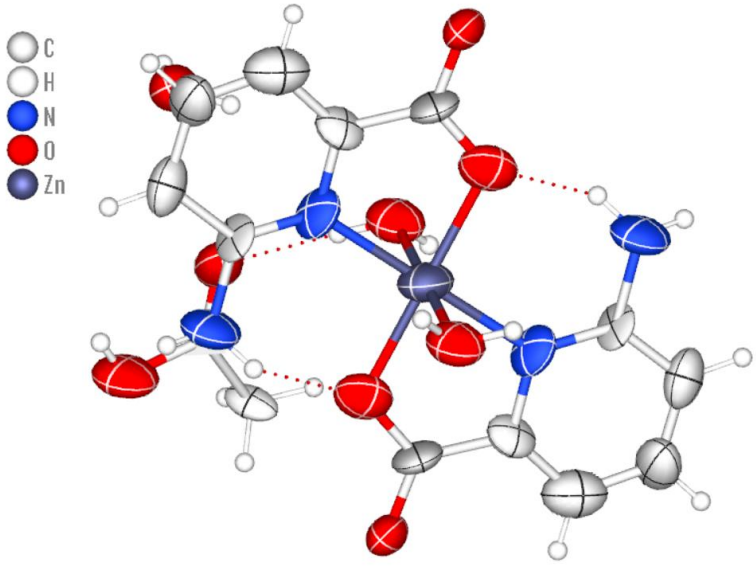
kimyoviy xossalari tufayli aralash ligand komplekslari bo‘yicha keng qamrovli tadqiqotlar olib bormoqda[8-11].

NATIJALAR. Zn (II)xlorid kristallogidratidan $ZnCl_2 \cdot 6H_2O$ 0.122 gr (0.5 mmol), 0.138 gr (1 mmol) APY ni tegishlicha suv va sirka kislotada eritib, 1;2 mol nisbatdagi eritmalari tayyorlandi. Eritmalar aralashtirildi. So‘ngra magnitli aralashtirgich yordamida 60 ^{0}C da 30 minut davomida intensiv aralashtirildi. Eritma xona haroratida qoldirildi. Natijada 10 kundan so‘ng idish tubida och yashil rangli kompleks birikma kristali o‘sganligi kuzatildi. RTT analizi uchun yaroqli kristallar ajratilib, tekshirilganda $[Zn(APY)_2(H_2O)_2](AcOH)(H_2O)$ tarkibli ekanligi aniqlandi. Unumi 86 % $[Zn(APY)_2(H_2O)_2](AcOH)(H_2O)$ (Mr=453.16 g/ mol) $ZnC_{14}H_{20}O_9N_4$ tahlili nazariy jihatdan: C 37.07, H 4.44, N 12.35, O 31.77 % ni ko‘rsatdi: ma’lum bo‘ldiki C 36.92, H 4.27, N 12. 13.O 31.02 %. Reaksiya tenglamasi quyidagicha(1-sxema.).



1-sxema. $[Zn(APY)_2(H_2O)_2](AcOH)(H_2O)$ kompleksining olinishi

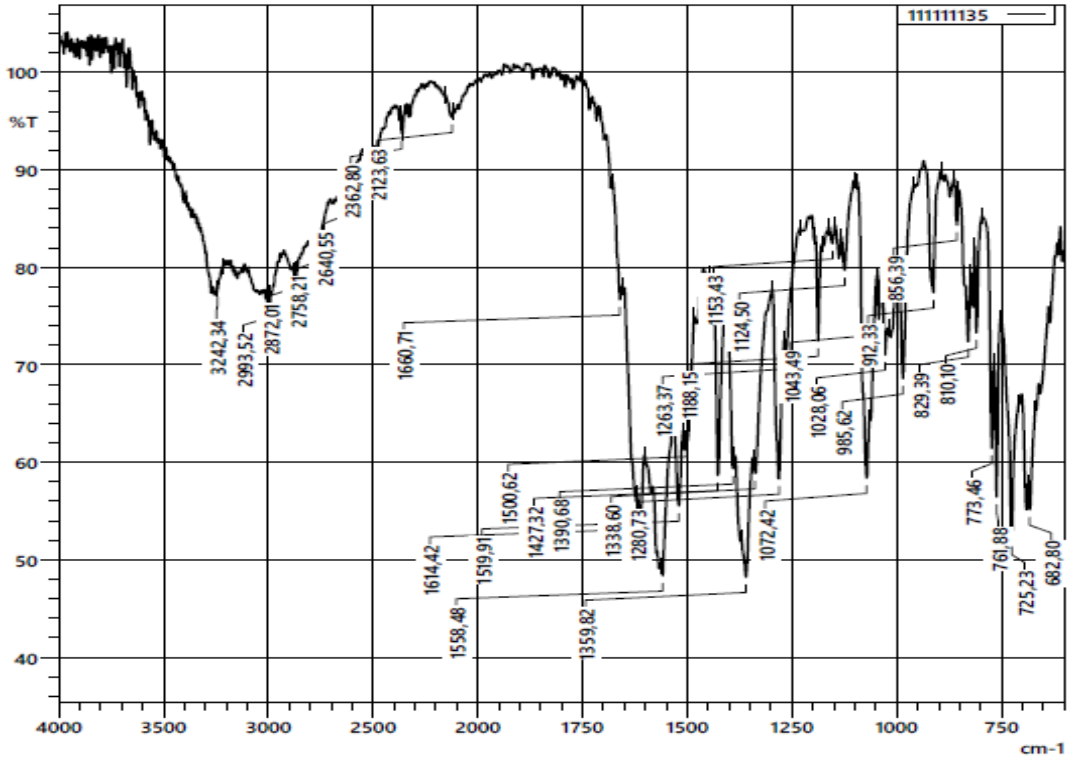
MUHOKAMA. Markaziy atom Zn(II) ning koordinatsion soni 6, sp^3d^2 holatda gibridlanishga ega. Ushbu kompleks birikmada ikkala APY anioni Ni(II) ioniga karboksil ionidagi kislorod atomi va piridin halqasidagi azot atomi orqali bidentant holatda koordinatsiyalangan(1-rasm).



1-rasm. $[Zn(APY)_2(H_2O)_2](AcOH)(H_2O)$ kompleksining molekulyar tuzilishi

Ikki suv molekulasi ham markaziy atomga donor-akseptor bog‘lanish orqali bog‘langan, natijada oktaedrik shakl yuzaga kelgan.Tashqi sferada bir molekula sirka kislotasi va suv molekulasi o‘zaro vodorod bog‘lanish orqali bog‘langan. Kompleksning ichki sferada N2--H2B..O1 vodorod bog‘lanishi mavjud.

$[Zn(APY)_2(H_2O)_2](AsOH)(H_2O)$ kompleks birikmasining IQ-spektri tahlili

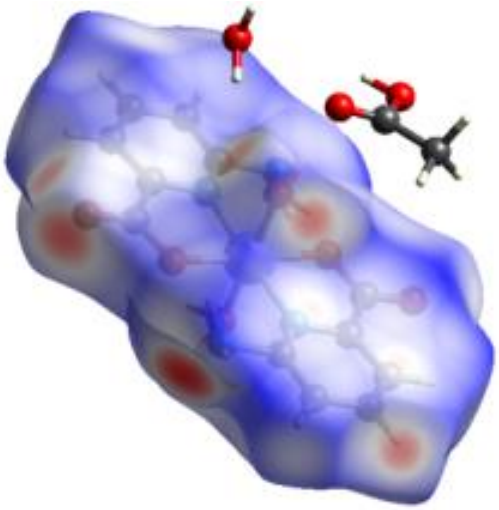


2-rasm. $[Zn(APY)_2(H_2O)_2](AsOH)(H_2O)$ kompleksining IQ-spektri

IQ-spektri tahlil natijasiga ko‘ra, 3242 sm^{-1} sohasida OH- guruhiga xos (H-bog‘lanish hosil qilgan) intensivligi juda yuqori bo‘lgan valent tebranish, 2872 sm^{-1} sohasida NH_2 guruhiga xos valent, 1558 sm^{-1} sohasida piridin halqasining halqa tebranishi, valent tebranish, 1338 sm^{-1} sohasida -C-N bog‘ining valent tebranish chastotalari kuzatildi, 1072 sm^{-1} sohasida C-O guruhiga tegishli valent tebranishlar, 682.80 sm^{-1} sohasida sohasida Me-O bog‘iga xos, 632 sm^{-1} sohasida Me-N bog‘iga xos valent tebranish chastotalari kuzatildi (2-rasm).

Hirshfeld sirtini Crystal Explorer 17.5 dasturi yordamida tahlil qilindi. Qizil va ko‘k dog‘larning d_{norm} bo‘yicha standart o‘lchamlari mos ravishda -0,604 va 1,17 ga teng.

Hirshfeld yuzasini tahlil qilish natijasida quyidagi o‘zaro ta'sirlar aniqlandi: O... H/H... O (22,4%), H... H (46,5%), H... C/C... H (11,3%) Chuqur qizil dog‘lar qo'shni turlar bilan kuchli yaqin o‘zaro ta’sirni ko‘rsatadi. Kompleks birikmaning molekulasi uchun uchastkaning o‘rtasida qisqa va tor tikanlar bo‘lgan keng hudud umumiy Hirshfeld sirtlarining O-H/H-O o‘zaro ta’siri sifatida aks ettiriladi va bu kompleks uchun hisoblangan eng yuqori foizdir va bu dipik lagandning metall kompleksi bilan solishtirish mumkin.



3-rasm. [Ni(APY)$_2$(H$_2$O)$_2$](AsOH)(H$_2$O) kompleksining uch o‘lchamli Hirshfeld sirtining dnorm bo‘yicha ko‘rinishi.

Ni(II) kompleksining dnormasi uchun Hirshfeld yuzasi xaritasi (3-rasm) ko‘rinib turibdiki, o‘tkir qizil rang sirka kislota va suv molekulasining liganddagi karboksilik guruhining kislorodi orqali molekulalararo vodorod bog‘lanish kuzatilganligini ko‘rsatadi.

Xulosa: Tadqiqotlar natijasida 2,6-piridindikarbon kislotasining nikel(II) atsetat va xlorid kislotaning M:L 1:2 nisbatdagi kompleks birikmasi sintez qilindi. Sintez qilingan kompleksning tarkibi va tuzilishi RTT yordamida aniqlandi. Hirshfeld sirti tahliliga ko‘ra molekula tarkibidagi atomlarning asosiy o‘zaro ta’sirlashuvlarni O... H/H... O (50,8%), H... H (18,9%), H... C/C... H (10,8%). Kompleksda OH-guruhiga xos keng intensiv valent tebranish 3063-3331 sm^{-1} soha oralig‘ida kuzatilgan .

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complexes Journal of Molecular Structure xxx (xxxx) 145469 https://doi.org/10.1016/j.molstruc.2026.145469