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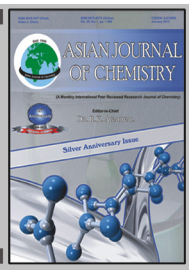

NOTE

Spectroscopic Characterization of Co(II), Ni(II) and Cu(II) Complexes with Nitrogen and Oxygen Containing Schiff Base Derived from 3-Amino-2-methylquinazoline-4(3*H*)-one

B.K. RAI[1,*], AMRITA THAKUR[2] and DIVYA[3]

[1]Department of Chemistry, L.N.T. College, Muzaffarpur-842 001, India
[2]Amrita School of Engineering, Banglore-560 035, India
[3]Delhi Institute of Pharmaceutical Sciences and Research, New Delhi-110 017, India

*Corresponding author: E-mail: binodkr_rai@yahoo.co.in

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A bidentate nitrogen/ oxygen containing Schiff base ligand, 3-amino-2-methyl quinazoline-4(3*H*)hydrazone (AMQH) and its Co(II), Ni(II) and Cu(II) complexes have been synthesized and characterized by molar mass, elemental analyses, spectral (IR and electronic) molar conductivity measurements at the room temperature. On the basis of above spectral and physicochemical studies it is proposed that ligand 3-amino-2-methyl quinazoline-4(3*H*)hydrazone acts in a bidentate manner and coordination proposes through amino group of quinazoline and azomethine N atom. The remaining coordination of metal ions are satisfied by negative ions such as Cl^-, Br^-, I^- and NO_3^-. The electronic spectral data proposes an octahedral geometry for Ni(II) and Co(II) while the geometry of Cu(II) complexes are proposed to be distorted octahedral in nature.

Key Words: Schiff base, 3-Amino-2-methyl quinazoline-4(3*H*)hydrazone, Co(II), Ni(II), Cu(II), Complexes.

Metal complexes of biologically important ligand are sometimes more effective than the free ligands. Schiff bases have a central role as chelating ligand in main group and transition metal coordination chemistry[1]. They deserve proper attention because of their role in biological applications and excellent chelating ability[2,3].

Our continuous work is focused on the Co(II), Ni(II) and Cu(II) complexes with nitrogen and oxygen containing Schiff bases[4-7]. In this paper, we report the synthesis and characterization of Co(II), Ni(II) and Cu(II) complexes with Schiff base, 3-amino-2-methyl quinozoline-4(3*H*)-hydrazone [AMQH].

All the reagents used were of analytical grade. Melting points of the complxes were determined on open capillary tubes and are uncorrected. IR spectra were recorded on in KBR pellets using Perkin-Elmer 577 spectrophotometer. The electronic spectra were recorded on magnetic susceptibility measured by Guoy saline using $Hg[Co(NCS)_4]$ as a calibrant. The molar conductane were measured on Systronics conductivity meter module 303 using DMF as a solvent.

Preparation of the ligand AMQH: A suspension of 3-amino-2-methyl quinazoline-4(3*H*)-one (0.01 m) in hot dioxane (20 mL) was treated with hydrazine hydrate [0.01 m] dissolved in 10 % ethanolic solution. The mixture was heated on water bath for 3 h, after cooling and slow evaporation the compound AMQH, was formed. The compound was recrystallized with methyl alcohol. m.p. 227 ± 1 ºC. Yield 65 %.

Preparation of the complexes: All the complexes of Co(II), Ni(II) and Cu(II) were synthesized by reacting an ethanolic solution of respective metal halide/nitrate (0.001 m) with the ethanolic solution of ligand AMQH (0.002 m). The mixture was heated on water bath for 2-3 h. The solid coloured complexes which separated on cooling were filtered, washed with aqueous ethanol, dried and crystallized with tetrahydrofuran to furnish colourless crystalline solids. Yields 65-70 %.

The IR spectra of the ligand exhibit strong and broad band[8] at 3200 cm^{-1} assigned to ν(N-H) vibrations. This band shifts to lower wave number in all the complexes by about 20-35 cm^{-1}, that indicates linkage of metal ion with amino group of quinazolone side chain. The IR spectrum of the ligand show strong band at 1490 cm^{-1} assigned ν(C=N). This band also shifts to lower wave number by 20-35 cm^{-1} suggesting participation of azomethine linkage with metal ion. Metal ligand vibration are generally observed in the far IR region and usually give valuable information regarding the bonding of ligand to metal ions. The medium band 475-440 cm^{-1} observed in the complexes assigned[8,9] to ν(M-N) stretching vibrations. In present study we assigned a medium intensity band in the region 325-625 cm^{-1} assigned[8,9] to ν(M-X) (X = Cl^-, I^-, Br^-)

TABLE-1
ANALYTICAL AND PHYSICAL MEASUREMENTS OF LIGAND 3-AMINO-2-METHYL QUINAZOLINE-4(3*H*)-HYDRAZONE (AMQH) AND ITS METAL COMPLEXES

Compounds (Colour)	Molar mass	Yield (%)	Elemental analysis (%): Found (calcd.) M	C	H	N	λ_{max} electronic (cm^{-1})	μ_{eff} (BM)	Ω_m (ohm^{-1} cm^2 mol^{-1})	DT (ºC)
AMQH	176	60	–	61.22 (61.36)	6.73 (6.81)	31.70 (31.81)	9600, 16300	4.89	4.1	216
$[Co(AMQH)_2Cl_2]$ (Yellowish red)	481.93	64	12.10 (12.22)	44.70 (44.81)	4.89 (4.97)	23.11 (23.23)	9500, 16700	4.86	4.3	201
$[Co(AMQH)_2Br_2]$ (Yellowish red)	570.74	65	10.24 (10.32)	37.72 (37.84)	4.13 (4.20)	19.50 (19.62)	9300, 16300	4.91	4.8	213
$[Co(AMQH)_2I_2]$ (Yellowish red)	664.73	63	8.78 (8.86)	32.38 (32.49)	3.52 (3.61)	16.78 (16.84)	9700. 16100	4.95	4.7	212
$[Co(AMQH)_2(NO_3)_2]$ (Yellowish red)	534.93	62	10.89 (11.02)	40.22 (40.37)	4.30 (4.48)	20.82 (20.93)	17300, 17600 22100	3.16	3.1	189
$[Ni(AMQH)_2Cl_2]$ (Brown)	481.71	65	12.11 (12.18)	44.88 (44.64)	4.60 (4.98)	23.13 (23.25)	11100, 17800 22400	3.11	3.8	193
$[Ni(AMQH)_2Br_2]$ (Brown)	570.52	65	10.22 (10.29)	37.78 (37.86)	4.12 (4.20)	19.55 (19.63)	10700, 17900 22300	3.12	3.6	197
$[Ni(AMQH)_2I_2]$ (Brown)	664.51	65	8.74 (8.83)	32.37 (32.50)	3.54 (3.61)	16.77 (16.85)	17500, 17300 22000	3.12	3.1	196
$[Ni(AMQH)_2(NO_3)_2]$ (Brown)	534.71	64	10.89 (10.97)	40.24 (40.30)	4.39 (4.48)	20.80 (20.94)	12800, 27200	1.89	26	222
$[Cu(AMQH)_2Cl_2]$ (Blue)	486.54	63	12.93 (13.05)	44.23 (44.39)	4.87 (4.13)	22.87 (23.01)	12600, 26800	1.91	2.8	219
$[Cu(AMQH)_2Br_2]$ (Blue)	575.35	62	10.98 (11.04)	37.41 (37.54)	4.09 (4.17)	19.34 (19.46)	12500, 26900	1.94	2.3	204
$[Cu(AMQH)_2(NO_3)_2]$ (Blue)	539.54	61	11.68 (11.77)	39.90 (40.03)	4.39 (4.44)	20.63 (20.75)				

DT = Decomposition temperature.

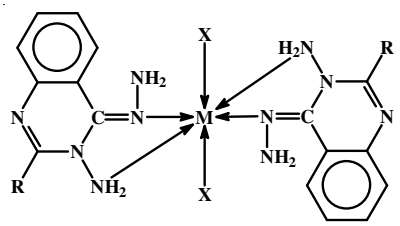
which indicate the metal-halogen linkage, which is further supported by the low value of molar conductance in the range 4.3-6.3 ohm^{-1} cm^2 mol^{-1}. The molar conductance value of the complexes indicates their non-electrolytic nature. The presence of two spectral bands at 1580 and 1460 cm^{-1} with a separation of 120 cm^{-1} suggest mono-coordinated nature of nitrate group.

TABLE-2
IR SPECTRAL BANDS OF LIGAND 3-AMINO-2-METHYL QUINAZOLINE-4(3*H*)-HYDRAZONE (AMQH) AND ITS METAL COMPLEXES OF Co(II), Ni(II) AND Cu(II)

Compounds	ν(N–H)	ν(C=N)	ν(M–N)	ν(M–X)
AMQH	3200 s,b	1490s,b		
$[Co(AMQH)_2Cl_2]$	3280m,b	1465m,b	450m	300m
$[Co(AMQH)_2Br_2]$	3280m,b	1460m,b	450m	320m
$[Co(AMQH)_2I_2]$	3275m,b	1470m,b	455m	310m
$[Co(AMQH)_2(NO_3)_2]$	3280m,b	1465m,b	460m	310m
$[Ni(AMQH)_2Cl_2]$	3275m,b	1460mb	475m	280m
$[Ni(AMQH)_2Br_2]$	3275m,b	1470mb	470m	280m
$[Ni(AMQH)_2I_2]$	3270m;b	1470m,b	465m	275m
$[Ni(AMQH)_2(NO_3)_2]$	3275m,b	1470m,b	460m	275m
$[Cu(AMQH)_2Cl_2]$	3270m,b	1470mb	455m	280m
$[Cu(AMQH)_2Br_2]$	3275m,b	1465mb	460m	290m
$[Cu(AMQH)_2(NO_3)_2]$	3270m,b	1460mb	470m	305m

The electronic spectral[10] and magnetic susceptibility[11] data (Table-1) suggest octahedral geometry of the complexes. Low conductivity values show non electrolytic nature of the complexes.

Thus on the basis of the above studies, the complexes of Co(II) and Ni(II) are proposed to be octahedral geometry whereas the geometry of Cu(II) complexes is distorted octahedral as shown in Fig. 1.



M = Co(II) and Ni(II); X = Cl^-, Br^-, I^- and NO_3^-;
M = Cu(II), X = Cl^-, Br^- and NO_3^-

Fig. 1. $[M(AMQH)_2X_2]$

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