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Der Pharma Chemica, 2013, 5(5):280-284
(http://derpharmachemica.com/archive.html)

ISSN 0975-413X
CODEN (USA): PCHHAX

Zinc dimethylglyoxime complexes

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ABSTRACT

Metal-ligand complexes of the general formula [M(A)$_2$(B) (C)] where A=dimethylglyoxime B= N_3,NCS,NCO and M= Zn(II) were prepared. Each complex was characterized by elemental analysis and infrared spectra. The IR spectra, which have indicate that the dimethylglyoxime was coordinated with the metal ions through the N and O atoms of the oxime group, pseudohalides and acetate were coordinated with metal ions through the N atom and terminal carboxyl oxygen atom. The proposed structure of the complexes were drawn using program, CS chem office 3D(2000) .

The general formula have been given for the prepared complexes :

[M(A)$_2$(B) (C)];
M(II): Zn(II).
A = DMG(dimethyl glyoxime) = $C_4H_8N_2O_2$
B = N_3,NCS and NCO.
C = Acetate ion(CH_3COO^-)

Key words: DMG, Pseudohalides, Zn(II),spectra, Dimethylglyoxime complexes.

INTRODUCTION

The oxime group (>C=N–OH), which may be considered to be derived from oxy-imine, is amphoteric with slightly basic nitrogen and mildly acidic hydroxyl groups [1]. Vic-dioxime ligands react with many transition metals in the Periodic Table and form highly stable complexes [2]. Formation and structural analysis of such complexes have been reviewed by Chakravorty [3] and Schrauzer [4]. The dimethylglyoxime derivatives have received considerable attention from both of the chemical and biological scientists. It is stimulated the reactions of vitamin B12 and vitamin- B12 Preparation and Spectral Properties of Mixed-Ligand Complexes S581 model chemistry[5-7]. Moreover, the dioximes are capable of coordinating through N, N or N, O sites of the oxime groups. Thus, some of the dioximes derivatives exhibited significant anti carcinogenic activity and antitumor agents[5]. In order to add other kinds of anion on complex, we synthesized short bridging ligand complexes, proposed structures and spectroscopic properties of the afore mentioned complexes were discussed. Synthesis and characterization of the pseudo halide metal complexes with Fe, Cd and Pb were published by Dr. B. Kishore Babu et al [8].

MATERIALS AND METHODS

A: Reagents and instruments : DMG and Pseudohalide ligands were purchased from SRL .

Metal salts were purchased from merck and Elemental analysis was obtained using a FLASH EA 1112 SERIES CHNS analyzer. Melting point were recorded by using stuart melting point apparatus . IR spectra were obtained with a Shimadzu FT-IR 8000 spectrometer. The proposed molecular structure of the complexes were determinated by using chem office 2000, 3DX prog .
B: General synthesis :

Synthesis of $Zn(dmg)_2(N_3)(oac)$
An methanolic (5 ml) solution of dimethylglyoxime (0.116g, 1.0 mmol) was added to an aqueous solution(5 ml) of Zinc acetate dihydrate (0.219g, 1.0 mmol), white precipitate was formed and then aqueous solution(5 ml) of NaN_3 (0.065 g, 1.0 mmol) was added which remained same. After constant stirring at 60^0c temperature for 30 minutes,The product was filtered off and washed with methanol. Yield 46%

Synthesis of $[Zn(dmg)_2(NCS)(oac)]$
An methanolic (5 ml) solution of dimethylglyoxime (0.116g, 1.0 mmol) was added to an aqueous solution(5 ml) of Zinc acetate dihydrate (0.219g, 1.0 mmol), white precipitate was formed and then aqueous solution(5 ml) of KNCS (0.097 g, 1.0 mmol) was added which turned pale. After constant stirring at 60^0c temperature for 30 minutes,The product was filtered off and washed with methanol. Yield 45%

Synthesis of $[Zn(dmg)_2(NCO)(oac)]$
An methanolic (5 ml) solution of dimethylglyoxime (0.116g, 1.0 mmol) was added to an aqueous solution(5 ml) of Zinc acetate dihydrate (0.219g, 1.0 mmol), white precipitate was formed and then aqueous solution (5 ml) of NaOCN (0.081 g, 1.0 mmol) was added which remained same. After constant stirring at 60^0c temperature for 30 minutes, The product was filtered off and washed with methanol. Yield 45%

RESULTS AND DISCUSSION

Physical properties and elemental analysis are presented in Table (1). Formula $M(A)_2$ (B) (C) giving good agreement between the observed and the calculated values by elemental analysis .

Fourier-transform infrared spectra :
The assignment of some of the most characteristic FT-IR band of the complexes are shown in Table (2) together with that of dmg recorded for comparative purposes and facilitate the spectral analysis. Absorption bands in the 2050-2295 cm^{-1} region are considered to be due to metal-nitrogen(of pseudohalide) vibrations [9,10] whilst those occurring around 1143 cm-1 are thought to arise from nitrogen-oxygen vibration in coordinated dmg [11,12].

Nomenclature of prepared complexes :

Complexes	Nomenclature
$Zn(dmg)_2(N_3)_2$	Didimethylglyoximatodiazido N-Zinc(II)
$Zn(dmg)_2(NCS)_2$	Didimethylglyoximatodithiocyanato N-zinc(II)
$Zn(dmg)_2(NCO)_2$	Didimethylglyoximatodiisocyanato N- Zinc(II)

Proposed molecular structure :
Studying complexes on bases of the above analysis , the existence of tetra coordinated
$[M(A)_2(B)(C)]$,
M(II) = Zn(II)

A proposed models of the species were built with chem 3D [13] shows in Fig (1)(2)(3) .

$Zn(dmg)_2(N_3)_2$

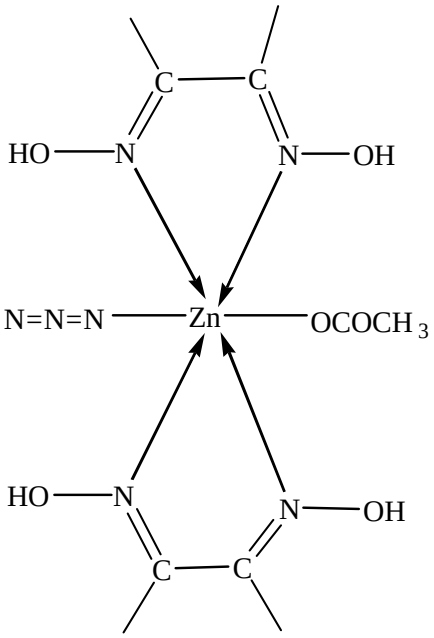

Fig (1) : The proposed structure of the complex 1

$Zn(dmg)_2(NCS)_2$

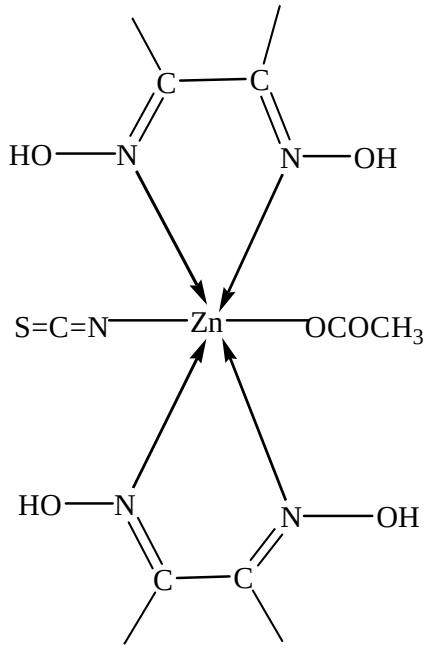

Fig (2) : The proposed structure of the complex 2

$Zn(dmg)_2(NCO)_2$

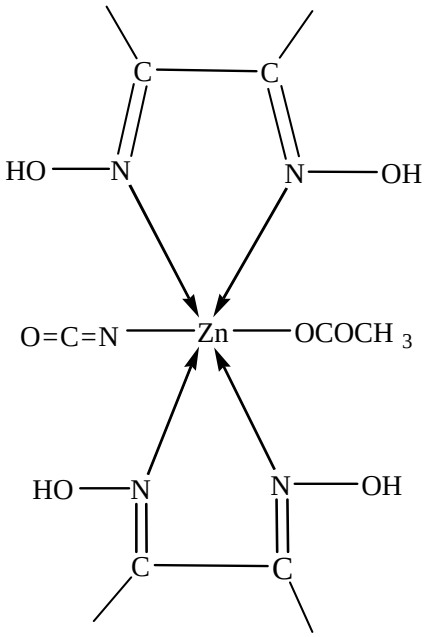

Fig (3) : The proposed structure of the complex 3

Table 1: The physical properties of the complexes

Elemental Analysis

Compound	Colour	M.P.^{0}c	%C		%H		%N	
			Calc	Found	Calc	Found	Calc	Found
DMG	White	240-241	-	-	-	-	-	-
$Zn(dmg)_2(N_3)_2$	White	Above 300	37.25	37.12	6.56	5.98	14.43	14.21
$Zn(dmg)_2(NCS)_2$	White	Above 300	37.27	37.18	6.52	6.12	14.49	14.36
$Zn(dmg)_2(NCO)_2$	White	Above 300	35.54	35.22	5.97	5.78	15.07	14.98

M.P = Melting point

Table 2 : FT-IR Spectrl Data of the Ligands and its Complexes

complex	v(OH)	v(C=C)	v(N-O)	v(C=N-O)	$v(M-N)_x$	V(COO)
dmg	3205	1490	1143	760	-	-
1	3210	1446	1139	745	2190	1364
2	3205	1435	1139	745	2194	1364
3	3210	1441	1139	750	2295	1364

X= Pseudohalide (N_3, NCS, NCO)
Complex 1 = $Zn(dmg)_2(N_3)_2$
Complex 2 = $Zn(dmg)_2(NCS)_2$
Complex 3 = $Zn(dmg)_2(NCO)_2$

CONCLUSION

Metal complexes were synthesized by self-assembly method. The obtained results were characterized by using spectroscopy and physical methods.

Acknowledgments
KP, CHP and BKB is grateful to UGC (INDIA) for providing the fellowship grants. We are grateful for the technical assistance provided by the Department of Engineering Chemistry at the Andhra University, Visakhapatnam (INDIA) and the University of Hyderabad for providing the spectral data.

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