

SYNTHESIS AND CHARACTERIZATION OF CO(II) AND NI(II) COMPLEXES WITH SCHIFF BASE 2,2-DIMETHYLPROPIOPHENONETHIOSEMICARBAZONE

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ABSTRACT

Complexes of Co(II) and Ni(II) with Schiff base 2,2 dimethyl propiophenonethiosemicarbazone (DMPPTSC₂H) was synthesized and characterized by elemental analysis, magnetic properties, color and IR spectra.

Keywords: DMPPTSC₂H, magnetic properties, IR spectra, Schiff base.

INTRODUCTION

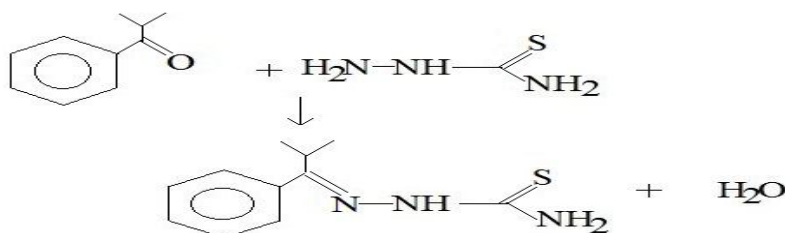
Schiff base is type of chemical compounds containing carbon – nitrogen double bond as functional group where the nitrogen atom joined to aryl group but not to hydrogen. Schiff bases are able to stabilized many different metals in different oxidation states. In recent past, various Schiff base complexes of transition metals including Fe(II), Ni(II), Co(II), Cr(II), etc. have been used as catalyst. In the present study, synthesis and characterization of Co(II) and Ni(II) complexes with (DMPPTSC₂H) has been done.

MATERIALS AND METHODS

All chemicals used in the synthesis were of laboratory grade.

1.1: Synthesis of 2,2-dimethylpropiophenone thiosemicarbazone

About 14.8 gm of 2,2-dimethylpropiophenone was dissolved in about 50 ml of C₂H₅OH. Again approximately 9.5 gm of thiosemicarbazide was dissolved in about 40 ml of C₂H₅OH. These two solutions were mixed together. A few drops of CH₃COOH were added to the resulting mixture. The mixture was then refluxed over water bath for about 3 hours. On cooling, a pale yellow mass separated out. The precipitated solid was filtered of, recrystallized in C₂H₅OH and dried in open. The yield was found 15 gm. The melting point of the perfectly dried sample was found to be 205^oC.



1.2: Synthesis of $\text{Co}(\text{DMPPTSC}_2\text{H})_2\text{Cl}_2$ and $\text{Ni}(\text{DMPPTSC}_2\text{H})_2\text{Cl}_2$

These two complexes were prepared in the following manner.

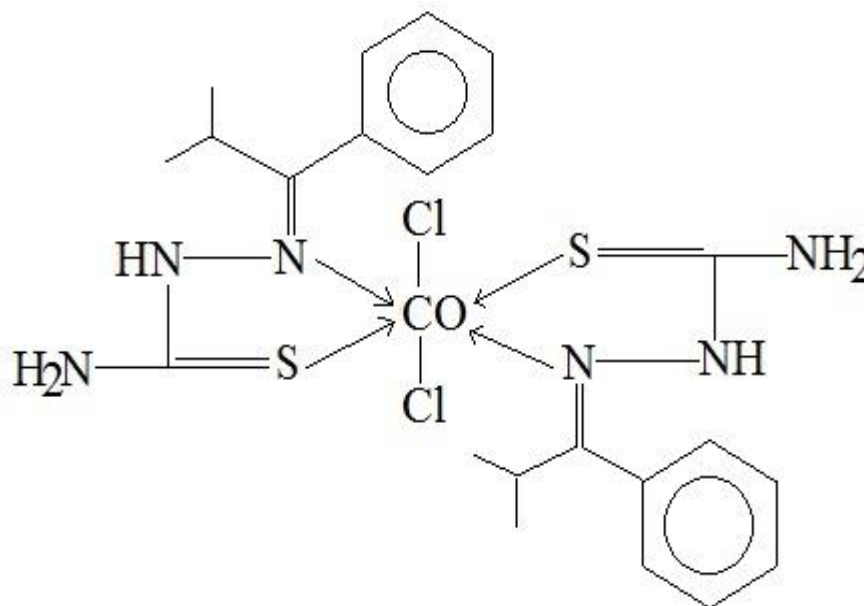
Ethanol solution of the Schiff base (10 millimoles) was added gradually to the ethanolic solution of the hydrated metal (II) chloride (5 millimoles) over a period of about half an hour with constant stirring of the solution. During addition of the Schiff base solution, change in color of the metal ion solution was noticeable. The resulting mixture was refluxed over water bath for about 20 to 50 minutes when colored and crystalline solid products were filtered off, washed repeatedly with $\text{C}_2\text{H}_5\text{OH}$ and dried over P_4O_{10} in vacuo.

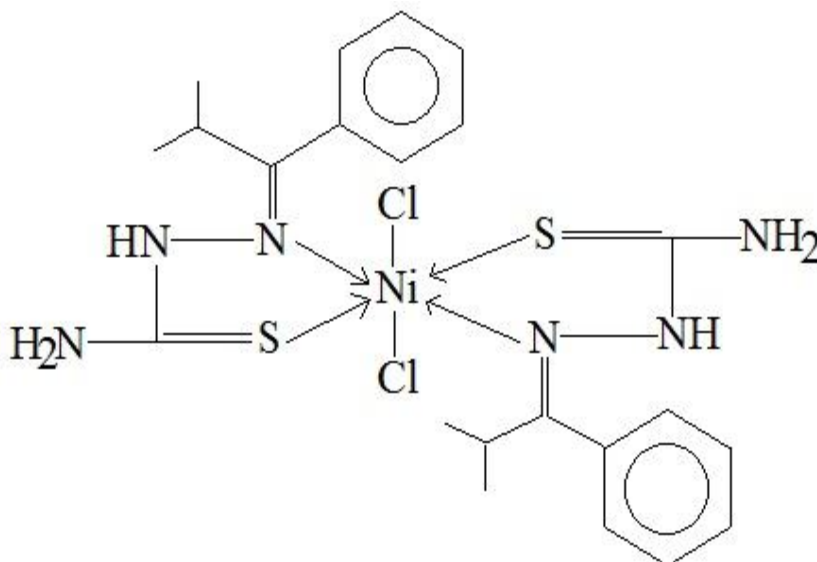
RESULTS AND DISCUSSION

Schiff base containing thiosemicarbazid residue react with Co(II) chloride and Ni(II) chloride in ethanolic solution in 2 : 1 molar proportions to yield pale red and pale blue complexes of Co(II) and Ni(II) respectively. The analytical data of these two complexes

fit into the general formula $\text{M}(\text{LH}_2)\text{Cl}_2$ where LH is Schiff base molecule. The molar conductance data of the Co(II) and Ni(II) complexes in DMF solution are very low ($3 \text{ ohm}^{-1}\text{cm}^2\text{mol}^{-1}$) and ($2 \text{ ohm}^{-1}\text{cm}^2\text{mol}^{-1}$) respectively. This indicates that complexes are non electrolytic in nature and chloride ions are coordinated to the metal. Coordination no. of central Co(II) and Ni(II) in ligands complexes are six. So the preferred geometry is octahedral. The complexes are paramagnetic as its magnetic moments are 5.21 BM and 3.23 BM respectively. This value also suggests that high spin complexes in octahedral environment corresponding to sp^3d^2 hybridization of the central metal ion. Co(II) complex is expected to give three electronic absorption bands but actually only one band around 550 nm was absorbed while Ni(II) complex shows two absorption bands in the visible region. One located in 405-435 nm region and other in 578-590 nm region. From these analyses, these two complexes have following structure.

Chelates	Color	Magnatic Moment (BM)	Elemental Analysis						$\lambda^0 \text{ max } 10^3 \text{ DMF sol}^n$	$\lambda \text{ max (nm)}$
			%C	%H	%N	%S	%Cl	%M		
$\text{Co}(\text{DMPPTSC}_2\text{H})_2\text{Cl}_2$	Pale Red	5.21	46.15	5.24	14.68	11.18	12.41	10.31	3	235 312 540
$\text{Ni}(\text{DMPPTSC}_2\text{H})_2\text{Cl}_2$	Plae Blue	3.23	46.15	5.24	14.68	11.18	12.41	10.31	2	232 315 427 585





ACKNOWLEDGEMENT

Authors are very thankful to department of chemistry M.S.College, Motihari, Bihar and VBMV College Amravati, Maharashtra.

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