

NOTE

Synthesis, Analytical and Antimicrobial Studies of Co(II) Complexes of Macrocyclic Ligands

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In present work, the authors describe the synthesis of two macrocyclic complexes of Co(II) with the composition $[\text{Co}(\text{L})](\text{BF}_4)_2$ [L = (DPIDAH) = 2,6-diacetyl pyridine N,N'-iminodiacetic acid dihydrazone or (PCCIDAH) = pyridine-2,6-dicarbonyl dichloride N,N'-iminodiacetic acid dihydrazone]. The complexes were characterized by elemental analyses, molar conductance, infrared and electronic spectra. The biocidal properties of the compounds were also reported.

Key Words: Co(II), Macrocyclic Complexes, Biocidal activities.

Transition metal complexes of macrocyclic ligands are significant because of their resemblance with many natural systems such as porphyrins¹ and cobalamines². Recently, we have reported^{3,4} some octahedral and biopotential macrocyclic complexes of Ni(II) and Cu(II). In the present communication, the synthesis, characterization and their biocidal properties of two macrocyclic complexes of Co(II) derived from 2,6-diacetyl pyridine N,N'-iminodiacetic acid dihydrazone (DPIDAH) and pyridine 2,6-dicarbonyl dichloride N,N'-iminodiacetic acid dihydrazone (PCCIDAH) have been reported.

The complexes were synthesized by following general method; equimolar quantities of imino diacetic acid dihydrazide, cobalt(II) acetate and 2,6-diacetyl pyridine/or 2,6-pyridine dicarbonyl dichloride was mixed in 15 mL ethanol with continuous stirring. The reaction mixture was refluxed over a water bath for *ca.* 8 h and reduce the volume by evaporation. After that the stoichiometric amount of ethanolic solution of sodium tetrafluoroborate was added in the reaction mixture and left the solution for overnight. Fine crystals of the desired complex was filtered, washed with ethanol and finally dried in vacuum over anhydrous CaCl_2 .

Analytical data confirm the molecular formula of these complexes as follows; $[\text{Co}(\text{DPIDAH})](\text{BF}_4)_2$ as $[\text{Co}(\text{C}_{11}\text{H}_{14}\text{N}_9\text{O}_7)](\text{BF}_4)_2$ and $[\text{Co}(\text{PCCIDAH})](\text{BF}_4)_2$

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as $[\text{Co}(\text{C}_7\text{H}_{10}\text{Cl}_2\text{N}_9\text{O}_2)](\text{BF}_4)_2$. Both the coloured solid complexes are stable at room temperature and soluble in DMSO, DMF and propylene glycol, but insoluble in common organic solvents. The conductance measurements suggest the 1:2 electrolytic nature of these complexes. Thus, anionic ligand tetrafluoroborate is not participating in coordination in present complexes.

Infrared spectrum of the ligands fragments revealed the sharp and distinct bands at $3350 \nu_{\text{sym}}(\text{NH})$, $1715 \nu(\text{C}=\text{O})$ and 1430 cm^{-1} for $\nu_{\text{asym}}(\text{NH})$. A sharp band was also observed at $2930 \text{ cm}^{-1} \nu(\text{CH}_2)$ in the spectrum of imino diacetic acid dihydrazide. The phenyl ring deformation bands observed at 960 cm^{-1} . The peak due to $\nu_{\text{sym}}(\text{NH})$ (3350 cm^{-1}) did not undergo any shift after complexation, while there is significant lower shift in all the coordinating sites. The new bands observed in cobalt(II) complexes at 550 and 430 cm^{-1} were also observed in the spectra of the complexes due to $\nu(\text{Co}-\text{O})$ and $\nu(\text{Co}-\text{N})$ (metal-ligand) vibrations respectively.

Electronic spectra of present Co(II) complexes exhibiting broad bands at $12,240$ and $23,800 \text{ cm}^{-1}$. First electronic band may be assigned to ${}^2\text{E}_g \rightarrow {}^2\text{T}_{2g}$ transitions suggesting an octahedral geometry of these complexes. Second band may be attributed to L \rightarrow M (charge-transfer) band. These compounds were assayed for their antimicrobial activities against four test organisms, *viz.*, *S. aureus*, *E. coli*, *A. niger* and *C. albicans*. All show potential activities for these organisms.

REFERENCES

1. E. Kimura, M. Shinoya, A. Hoshino and Y. Yamada, *J. Am. Chem. Soc.*, **104**, 114 (1992).
2. J.G. Muller, X. Chen, A.C. Dadiz, S.E. Rokita and C.S. Burrows, *Pure Appl. Chem.*, **65**, 545 (1993).
3. J. Ambwani, N.L. Bansal and K. Kaushik, *Asian J. Chem.*, **13**, 859, 1059 (2001).
4. J. Ambwani, N.L. Bansal and M.R. Sharma, *Asian J. Chem.*, **13**, 863, 1063 (2001).

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