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A review on areas of homo and hetero-dinuclear complexes with oxygen

Deepak Kumar[1], Mamta Gour[1*], Om Prakash Gupta[2]
[1] Department of Chemistry, Mansarovar Global University, Bhopal, Madhya Pradesh, India
[2] Head, Department of Chemistry, MJK College, Bettiah, Bihar, India

Abstract

In the present study we have discussed new binuclear complexes of alkali and Alkaline earth metal salts with interaction of stable metal chelates of imino derivative of isonitrosopropiophenone having general formula $[Ma(IINPP)_2.MbL$ or $MbX]$ for alkali metal adducts and $[Ma(IINPP)_2..MbL_2]$ for alkaline earth metal adducts where Ma=Ni(II) and $Mb=Na^+, K^+$, and Mg^{++},L=deprotonated 1-nitroso -2-napthol and 8-hydroxyquinoline, or $X=ClO^-_4$ or SCN^-.

Keywords: Oxygen-bridgedpolynuclear, isonitrosopropiophenone, 1-nitroso-2-napthol, 8-hydroxyquinoline, chelate

Introduction

Much interest has been evinced in the last few years in the areas of homo and hetero-dinuclear complexes, stimulated by interest in areas such as metalloenzymes, homogenous catalysts, electrical conductance, and magnetic exchange process and has been comprehensivelyreviewed various types of binuclear complexes involving both similar and dissimilar metals have been reported [1].

Quadridentate Schiff base metal complexes [M (SB)] with N_2O_2 donor atom of a molecule set, are very well known to coordinate with inorganic and organic cations, to give rise to chelate adducts. Starting here a view, they act like numerous complexing behavior agents, both natural (such as cyclic or linearpolyethers), but with the advantage of greater chemical accessibility. Hence these types of complexes have been studied extensively for transition metals [2, 3, 4, 5].

An analogous complex has been reported for sodium perchlorate with two molecular of [Cu(II)(Salen)] [6], Potassium tetra –phenyl borate with two molecular of [Ni(II)(salen)] [7] where salen=NN–ethylene bis-salicylideneminate. Thecrystal structure of the complex, sodiumperchlorae with [Cu(II)(salen)] has been reported by Truter *et al* [8]. Shown in figure1.

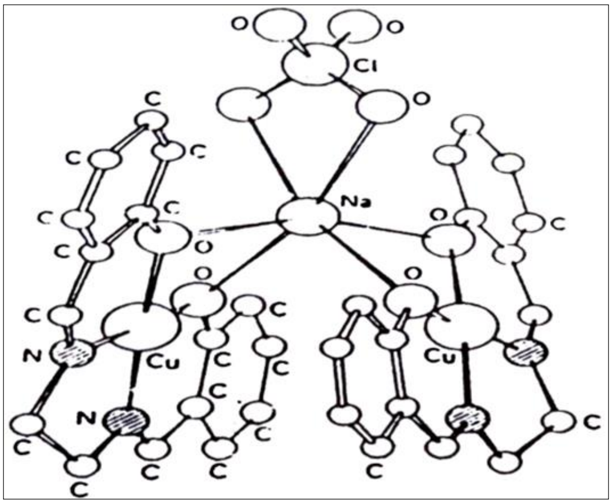

Fig 1

According to the crystal structure, each sodium ion is surrounded octahedrally by two oxygen atomsfrom the perchlorate ion and four from the two chelating [Cu (II)(salen)] ligands. The observed Na-O distances are in the normal range. [Cu(II)(salen)] and [Ni(II)(salen)] also form similar oxygen-bridged complexes with alkali metal salts of organic acids,as well as alkali metal salts (KSCN, LiCl, NaBr, and NaI) [9]. Further Lindoy *et al* [10]. Reportedthat $[Ni(II)(acen).NaClO_4]$closely resembles the $[Cu^{11}(II)(salen).NaClO_4]$, where the oxygen atoms from the [Ni(II)(acen)] units approach the Na^+ ion more closely than the perchlorate oxygen atoms and complete the coordination sphere of six.Floriani [11] observed that the Na^+ ions are surroundedby six oxygen atoms provided by [Co(salen)] and THF molecules in the polymeric structure of $[Co(salen)Na_2(THF)_2]$. The Li^+ ion is also coordinated by four oxygens provided by a [Co (salen)] group and two THF molecules in $[Co\ (salen)_2.\ Li\ (THF)\ _2]$.

Recently much interest has been developed in the use of these bifunctional centers for activating small molecules. Reactions of [Co (I) (salen) Na] with CO_2 clearlyshowed that the carbon atom of CO_2 is coordinated to cobalt and one of the oxygens is coordinated to sodium. Carbon monoxide being coordinated both by a transition metal and an alkali metal has also been reported by Floriani [12].The crystal structure of $[(THF)\ Co\ (salophen)\text{-}S_2\text{-}Co\ (Salophen)\ Na\ (THF)\ _2]^+$has been elucidated and it confirms the nature of the Complex and shows that the alkali metal serves to hold the two complexes and shows that the alkali metal serves to hold the two Schiff bases in close proximity [13, 14] which is shown in fig.2.

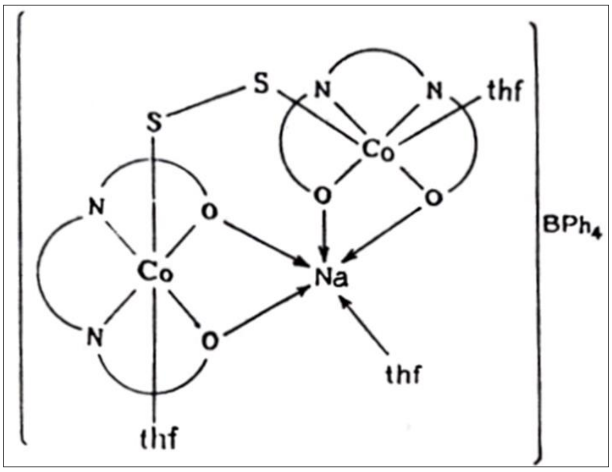

Fig 2

The development of bimetallic buildings determined utilizing progress metal Schiff base edifices as ligands for metal β-diketonates [15, 16, 17] prompted the acknowledgment that the combination of a β-β-diketone with oxygen contributors and a Schiff base, with oxygen and nitrogen benefactor molecules, could on a fundamental level give a solitary ligand equipped for bimetallic complexation.

It has also been observed by Banerjee *et al* [18, 19]. that even after the ligands combine with cations forming stable metal compounds, the coordinating ability of the ligands is not fully saturated, and in turn, the metal complexesso formed still have donor properties (rather, enhanced donor properties),acting as Lewis Base. A glance into the trimeric structure of $[Ni (acac)_2]_3$ reveals that out of twelve ligating oxygen atoms, six are terminal ones (with a covalence of two /three) and the other six are bridged ones (with covalence three/four) attached to two nickel ions. Under suitable conditions, when a trimer breaks into amonomer, the bond between the bridged oxygen atoms and the second nickel ion is snapped these oxygen atoms in the monomer now have the third/fourth covalence free. These in situ behave as a double-faced bidentate oxygen donor Lewis Base. The partially covalent bonded alkali metal salts, which are coordinatively unsaturated Lewis Acids and float around, are now grabbed by the monomer $[Ni (acac)_2]$ and form oxygen-bridgedpolynuclear complexes. A break in the polymerized system leads the six –six-coordinated octahedral central metal ions to coordination number four, and a tetrahedral structure [20]. Which can show in Fig. 3.

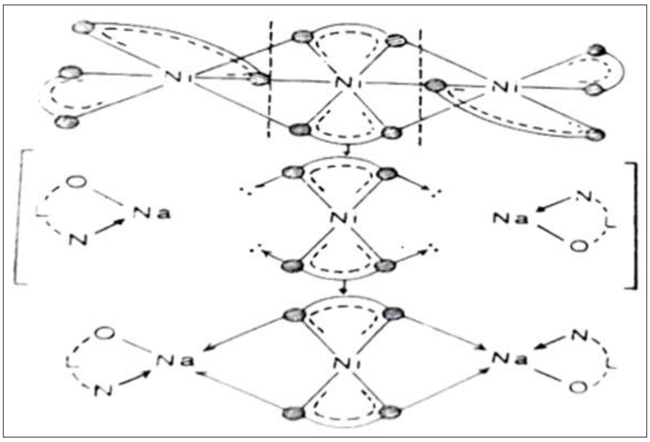

Fig 3

The information on the coordination of soluble base metals by open-chainpolyethers on the move metal edifices presented a class of mixtures wherein the open-chainpolyethers are composed of a changing metal and held in such a reasonable direction, for additional coordination of a salt metal. X-beam gem and sub-atomic design of tetrakis [1-(O-carboxymethoxyphenoxy)-2-(O-hydroxyphenoxy-ethanao (1-)] dispotassiumcobal (II), A trinuclear potassium - cobalt-potassium complex [21] affirms the above assertion. An exceptionally fascinating element of the entirely steadythe complex was the presence of two potassium particles for every atom, giving a straight K… … Co… ..K gathering. Every potassium particle is facilitated by ten oxygen molecules.The potassium particles lie sandwiched between the two layers, fascinating with five oxygen iotas from each layer. The structure of the above compound is Fig.4

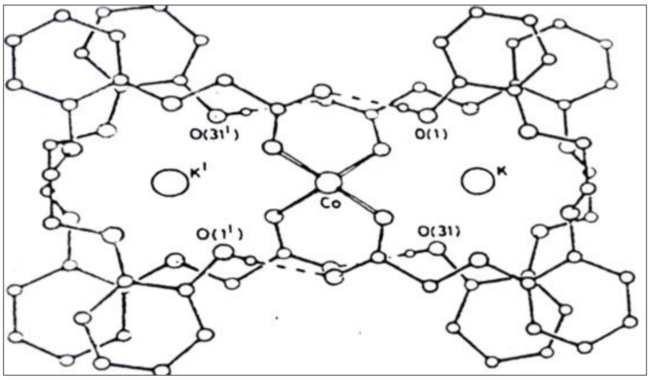

Fig 4

The complex CoL_2 was only selective to K^+ ions. This selectively was interpreted to arise due to two factors:-

Firstly, the Na^+ ion being smaller in size than the K^+ ion, would tend to pull the open chainligands inwards, causing non-bonded interaction (like crown ethers), and secondly, it is unusual,although not unknown, for Na to adopt 10-fold coordination. This type of selectively suggested possible transport and extraction applications [22].Coucounvanis [23] has reported $[K_2Ni (Dto)_2]$ complex where Dto=dithioxalate. The complexesare linked in dimers by bridging dithiooxalate ligands and the dimersare linked in infinite chains of dimers through potassium. The potassium coordination geometry is an irregular polyhedron formed by seven oxygen, five from the Dto ligand, and two from the acetone molecule. In $[(18C_6)K_2[Cu(S_2C_2O_4)_2]$ complex,the $(18C_6)K^+$ cations are bound to the -ketone portion of the coordinated Dto ligand and interact weakly with the oxygen atoms of and DMF molecule of crystallization [24].Diaquonoxalato-nickel(II) form binuclear alkali metal complexes with bridgedoxalatogroups of the general formula $(M_bL)M_aOX.2H_2O$ [25].

Similar binuclear alkali metal complexes with nickel and cobalt ethylenediamine oxalates have also been reported by Banerjee *et al* [26].

Synthesis of hetero-binuclear complexes with alkaline earth metals has also been carried out some of the hetero-binuclear complexes incorporating Mg^{+2} have been established with molecular structures and reported [27, 28, 29]. The Structure of $[Cu(salen).Mg(hfac)_2]$ (where hfac is hexafluoroascetylacetone) is depicted in Fig.5.

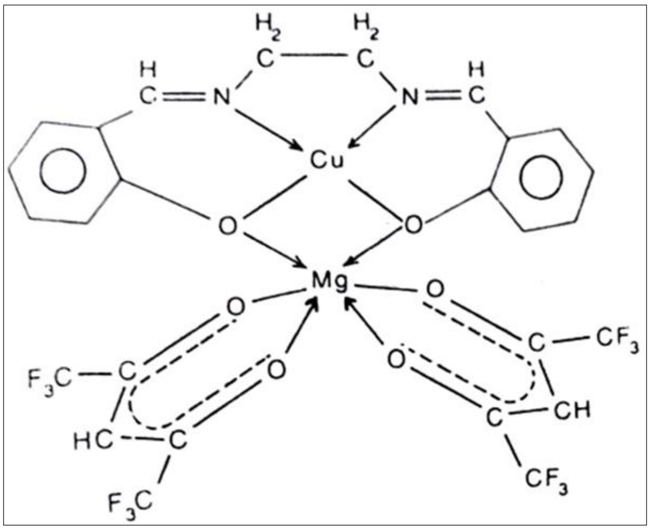

Fig 5

It has been observed that the fsaen anion, in the complex [CuMg(fsaen)] [30].$3H_2O$ acts as a binucleating chelating ligand by providing a planner N_2O_2 donor grouping for the Cu^{+2} ion,(where fsaen is Schiff bases of ethylenediamine with 3-formylsalicylic acid.)

Some trinuclear mixed metal complexes of alkali metal salts with Ni (II), Pd (II) complex of dimethylglyoxime & Ni (II) & Cu (II) Salidylaldoximoto have been reported [31]

Synthesis & Crystal structure of mixed ligand heterometallic Cluster with a mutual low coordination number of barium have been reported by Katharina *et al* [32, 33]. Synthesis and structural analysis of the poly metallated alkali calixarenes have been reported by Katharina *et al* [34]. Structure of alkali & alkaline earth metal clusters with Oxygen donor ligands have been extensively studied by K.M Fromm et.al [35]. Metal Complexes as ligand trinuclear alkali metal with Ni(II),Cu(II)&Co(II) Complexes of 2-hydroxy-1- alkali metal salts of organic acid have been reported by SheosatyaPrakashet.al [36]. Mixed Ligand mixed metal complex formation of transition metal with alkali metal salts have been reported by Dharamivirsingh [37].

The inclusion of a guest molecule in a tetranuclear adduct of sodium perchlorate and Copper (II) complex di-Shiff base ligand has been reported by SaptrashiBisswas et.al [38].Oxygen-bridged alkali metal Complex with Ni(II)&Cu(II) metal chelates of iso nitroso acetophenone have been reported by O.P. Gupta et.al [39].

Synthesis & Characterization of Oxygen bridged Complexes of metal Chelates of isonitrosopopiophenone, iso nitroso acetylacetone & isonitroso-barbituric acid have been reported by O.P Gupta et.al [40, 41, 42]. Alkali & Alkaline earth metal complexes as versatile Catalysts for the synthesis of biodegradable polyesters from various cyclic monomers have been investigated by J. et.al [43, 44, 45]. Synthesis & Structural characterization of three New Strontium (II) Coordinating polymers have been reported by N.A. Parsekar et.al [46]. Alkali & alkaline earth metals doped cubane complex have been investigated theoretically for better nonlinear optical materials by M.A. Gilani [47]. Encouraged by the facts mentioned above, we have selected Ni(II) metal chelates of the amino derivative of isonitroso-propiophenone devoted by [Ni(IINPP)$_2$] as metal Complex ligands & Synthesized several stable oxygen-bridged complexes of alkali/alkaline earth metals salts with [Ni(IINPP)$_2$].

Conclusions

In this paper, we have focused on areas of homo and hetero-dinuclearcomplexeswith Oxygen Bridge.

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