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A Study of Synthesis, Characterization and Biological Activity of Schiff Bases

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ABSTRACT

Three new series of biologically active amino substituted Schiff bases with general formula R1N=CHR2. Here R1 = 2-amino-benzthiazole, 4-amino-salicylic acid and 4-aminophenol. R2 =4-chloro-benzaldehyde, 2-chloro-benzaldehyde, salicylaldehyde, vanillin and benzaldehyde were synthesized by the reaction of three different amino substituted compounds and substituted aldehydes in ethanol. Such compounds were characterized by different physico-chemical techniques like, melting point, elemental analysis, multinuclear NMR (1H, 13C). The free ligands and their metal complexes have been screened for their in vitro biological activities against bacteria, fungi and yeast. The metal complexes show more potent activities compared with Schiff base ligands.
Keywords: schiff bases; benzthiozol; aminophenol; antibacterial; antifungal.

Introduction:

Schiff bases are condensation products of primary amines with carbonyl compounds and they were first reported by Schiff in 1864. The common structural feature of these compounds is the azomethine group with a general formula RHC=N-R1, where R and R1 are alkyl, aryl, cyclo alkyl or heterocyclic groups which may be variously substituted. These compounds are also knows as anils, imines or azomethines. Several studies showed that the presence of a lone pair of electrons in an sp2 hybridized orbital of nitrogen atom of the azomethine group is of considerable chemical and biological importance. Because of the relative easiness of preparation, synthetic flexibility, and the special property of C=N group, Schiff bases are generally excellent chelating agents, especially when a functional group like –OH or –SH is present close to the azomethine group so as to form a five or six membered ring with the metal ion. Versatility of Schiff base ligands and biological, analytical and industrial applications of their complexes make further investigations in this area highly desirable.

Schiff bases have been known since 1864 when Hugo Schiff reported the condensation of primary amines with carbonyl compounds (1). Nowadays, the research field dealing with Schiff base coordination chemistry has expanded enormously. The importance of Schiff base complexes for bioinorganic chemistry,
biomedical applications, supramolecular chemistry, catalysis and material science, separation and encapsulation processes, and formation of compounds with unusual properties and structures has been well-recognized and reviewed.

A large number of different Schiff base ligands have been used as cation carriers in potentiometric sensors as they have shown excellent selectivity, sensitivity, and stability for specific metal ions such as Ag(II), Al(III),

Co(II), Cu(II), Gd(III), Hg(II), Ni(II), Pb(II), Y(III), and Zn(II). Schiff bases have been studied for their important properties in catalysis. They show catalytic activity in hydrogenation of olefins . They find applications in biomimetic catalytic reactions.

An interesting application of Schiff bases is their use as an effective corrosion inhibitor, which is based on their ability to spontaneously form a monolayer on the surface to be protected. Many commercial inhibitors include aldehydes or amines, but presumably due to the C=N bond the Schiff bases function more efficiently in many cases. The principal interaction between the inhibitor and the metal surface is chemisorption. The inhibitor molecule should have centers capable of forming bonds with the metal surface by electron transfer. In such cases the metal acts as an electrophile and the inhibitor acts as a Lewis base. Nucleophilic centers, such as oxygen and nitrogen atoms, of the protective compound have free electron pairs which are readily available for sharing. Together with the atoms of the benzene rings they create multiple absorption sites for the inhibitor thus enabling stable monolayer formation.

Results & Discussion:

The azo Schiff base ligand was prepared by reacting equimolar amounts of 5-((4-chlorophenyl)diazenyl)-2-hydroxybenzaldehyde with 2-hydroxybenzohydrazide in ethanol medium. The structures of the ligand and the complexes were established from their IR, ^{1}H-NMR spectra, elemental analyses, and magnetic susceptibility measurements. The complexes are intensely coloured stable solids, and the low molar conductance values of the complexes reveal their none lectrolytic nature. The results of the elemental analysis (Table 1) of the Schiff base are in good agreement with those calculated for the suggested formula and agree with a 1 : 1 metal to ligand stoichiometry for all the complexes.

Conclusions:

Conclusion

Schiff bases of 2-amino-Benzthiazole, 4-amino-Salicylic acid and 4-aminophenol were synthesized and characterized by analytical and spectral techniques. These compounds exhibited significant activity against all the tested microorganisms.

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