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A Study on the Chemical Reactions Involved in the Process of the Formation of Dye with the Help of Chrysodine and 8-Hydroxy Quinoline Ligands

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Abstract – 8-Hydroxyquinoline (8-quinolinol, oxine) might be thought to function as a phenol, but of the 7 isomeric Hydroxyquinolines only oxine exhibits significant antimicrobial activity, and is the only one to have the capacity to chelate metals. If the hydroxyl group is blocked so that the compound is unable to chelate, as in the methyl ether, the antimicrobial activity is destroyed. The relationship between chelation and activity of oxine has been investigated. Oxine itself is inactive, and exerts activity by virtue of the metal chelates produced in its reaction with metal ions in the medium. Used by itself or as the sulphate (Chinosol) or benzoate in antiseptics, the effect is bacteriostatic and fungistatic rather than microbiocidal. Inhibitory action is more pronounced upon gram-positive than gram-negative bacteria; the growth-preventing concentrations for staphylococci being 10 ppm; for streptococci 20 ppm; for Salmonella typhosa and for E. coli 100 ppm.

Keywords: Reactions, Dye, Chrysodine

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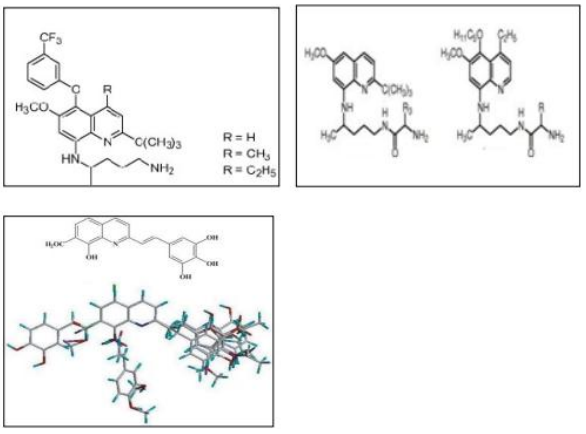
INTRODUCTION

Certain halogen derivatives of 8-hydroxyquinoline have a record of therapeutic efficacy in the treatment of cutaneous fungus infections and also of amebic dysentery. Among these are 5-chloro-7- iodo-8-quinolinol (iodochlorhydroxyquin, Vioform), 5,7-diiodo-8-hydroxyquinoline (diiodohydroxyuin), and sodium 7-iodo-8-hydroxyquinoline-5-sulfonate (chiniofon).

Copper oxinate the copper compound of 8-hydroxyquinoline, is employed as an industrial preservative for a variety of purposes, including the protection of wood and textiles against fungus-caused rotting, and interior paints for food plants.

The antibacterial activity of 8-hydroxyquinoline and its derivatives is long-known. The drugs from this group are used as chemotherapeutics in medicine for more than 120 years and in analytical chemistry as chelators.

Some newly synthesized derivatives of 8-Quinolinol were shown to exhibit a higher microbiological activity. 8-Hydroxyquinoline (8-HQ) moiety has received continuous attention as a platform for the construction of a number of selective and efficient ionophores. The most interesting feature of 8-HQ is its very low quantum yield in aqueous or organic solutions but the fluorescence enhancement occurred from cation binding and many metal chelates of 8-HQ exhibit intense fluorescences.



Although the selectivity of 8-HQ and its simple derivative is rather poor, it can be improved by appropriate substitution on the phenolic oxygen atom or aromatic rings.

Coordination polymers are defined as high molecular weight molecules formed by the repetition of monomeric units linked with covalent bonds. In comparison, coordination polymers are infinite systems build up with metal ions and organic ligands

as main elementary units linked via coordination bonds and other weak chemical bonds. These compounds are also named metal-organic coordination networks or metal-organic frameworks (MOF).

The research on synthesis and applications of coordination polymers have become a popular field since the past 20 years because of the excellent properties, such as molecular recognition, ion exchange, catalysis, microelectronics, nonlinear optics, porous materials etc. Therefore, it is important to get an object with the expected structure and function through a reasonable choice and control of metal ions, organic ligands and other synthesis conditions. Transition metal ions are easy to coordinate with nitrogen and oxygen atoms, and the coordination numbers are mainly focus on 4 or 6, so it is relatively simple for their coordination geometries.

In other word coordination polymers are metallo-organic entities composed of metal centers bridged by organic connectors. In marked contrast with coordinating polymers, i.e. polymers bearing sites allowing the coordination of metals, for coordination polymers, metal centers are incorporated within the structure of the polymer behaving thus as structural knots. Because metal offer a vast variety of coordination geometry as well as different oxidation states, the design and preparation of coordination polymers with controlled structures and thus, properties are currently under active investigation.

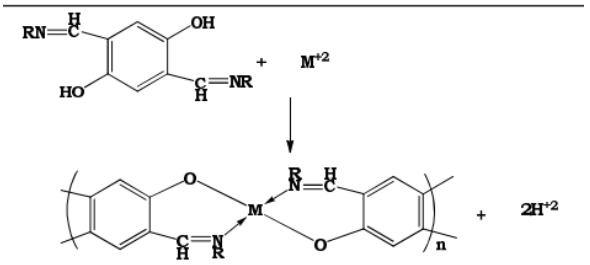
CHEMICAL REACTIONS INVOLVED IN THE PROCESS OF THE FORMATION OF DYE WITH THE HELP OF CHRYSODINE AND 8-HYDROXY QUINOLINE LIGANDS

The strategy for the formation of coordination polymers may be based on iterative assembling processes between metals and organic ligands. In this context, the design of the organic part has special importance. In order to allow the interconnection between metallic centers and ligands in which the coordination sites are oriented outwardly (exoligands) are needed.

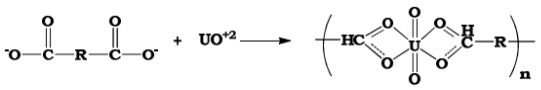
Coordination polymers have served humankind since before recorded history. The tanning of leather and generation of select colored pigments depend on the coordination of metal ions. A number of biological agents, including humans, owe their existence to coordination polymers have unknown and/or irregular structures.

Coordination polymers are possessing high thermal stability. Polymeric metal complexes have a variety of geometries that are not observed in organic polymers, some combine the properties of anisotropy with photo responsive behavior that give rise to applications in areas such as optical storage, optical switching, diffractive optical elements, non-linear optical devices, liquid crystal displays (LCD's) etc. Metal containing polymers have important applications in medical sciences; they play an important role in controlled drug delivery systems, artificial organs and protein synthesis.

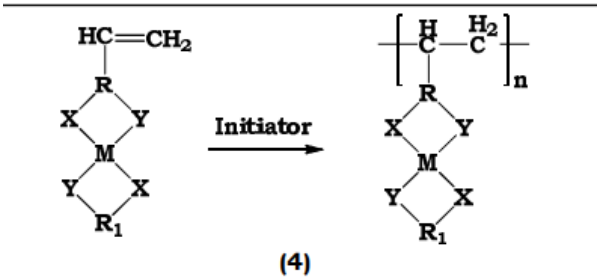
Metal chelating ligands. The monomers produced by dupont consist of copolymers of ethylene with a small portion of methacrylic acid. The polymer chains are cross linked by addition of metal ions. These polymers exhibit good thermal stability and flame retardance. Coordination polymer of metal ion containing chelating groups.

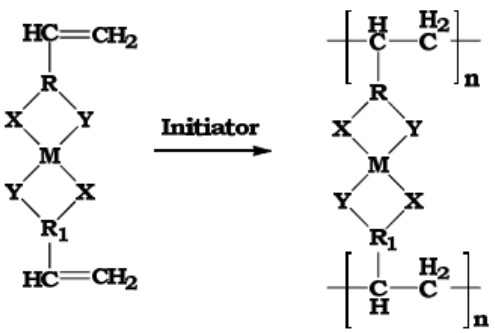


Polymer formation through reaction of metal-containing moiety with an appropriate donor atom (Lewis-base) containing reactant.



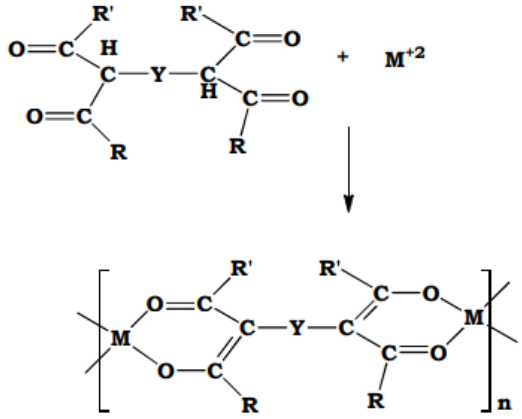
These three different reactions resulting into formation of coordination polymers are referred as the coordination reactions. Thus the syntheses of coordination polymers involve the formation of coordination complexes within the performed polymers.



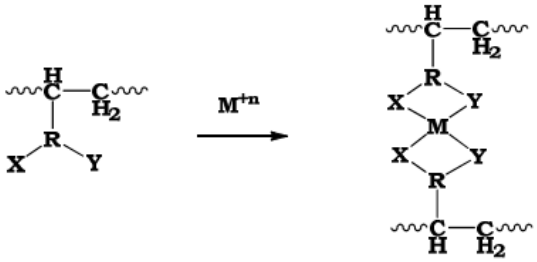


Coordination of a metal ion with multidentate ligands through chelating groups. The possibility of using reaction of this type depends primarily upon the fact that transition metals are poly-functional in character and therefore are capable of accepting more than one

pair of electrons yielding the cross linked or polymer chain containing ring polymeric structures. This is illustrated by the reaction of β-diketone.

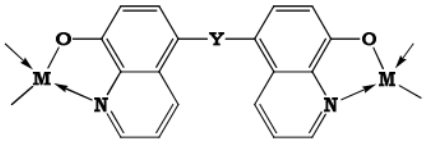


Formation of coordination polymers by reaction of metal ions with preformed polymeric ligands capable of coordinating to metal atoms. In such reactions the metal atom acts as crosslinking units between the adjacent chains as shown in following:



In addition to this, the chelating ability of ligand may be enhanced by using bis (bidentate) type ligands such as bis-β-diketone, dithiooximido, bis (8-hydroxyquinoline) etc. However, to obtain linear polymers with bis (bidentate) chelating agents the metal atom must have a coordination number at least four.

Bis (8- hydroxyquinoline) can also use as bis (bidentate) chelating agents with four or six coordinate divalent transition metal ions to give polymer of the type.



Where Y = $-CH_2-$, $-C(CH_3)_2-$, $-SO_2$ and M = Metal ions

CONCLUSION

Complex forming (Chelating) agents are becoming of increasing importance in analytical chemistry such as in gravimetric, titrimetric and colorimetric measurements. New types of complexes and complex forming agents are constantly under investigation, for possible analytical and industrial applications.

The growing importance of the use of metal chelates in analytical chemistry may be realized by the ever-increasing number of publications on this subject. Some of recently repotted Metal chelates of mixed ligand of 8-hydroxy quinoline are listed below. Hasmukh.Patel et all. synthesized novel bis-(bidentate)-ligand 5,5′-(3,3′-(phenyl methylene)bis(1H-indole-3,1-diyl)bis(methylene)diquinolin-8-ol)(PBIQ) by condensation of 5-chloromethyl-8-hydroxyquinoline hydrochloride with 3,3′-(phenyl methanediyl) bis (1H-indole) in the presence of a base catalyst. Coordination polymers of this PBIQ bisligand were prepared with Cu(II), Ni(II), Co(II), Mn(II), and Zn(II) metal ions.

REFERENCES

1. J. C. Bailar (2014). Jr., Prep. Inorg. React.1, 1.
2. C. Janiak (2013). Dalton Trans.14, 2781.
3. R. Matsuda, R. Kitaura, et. al. (2015). Nature. 436, 238.
4. S.S.Y. Chui, S.M.F. Lo, et. al. (2010). Science. 283, 1148.
5. B. Moulton, M.J. Zaworotko (2011). Chem. Rev. 101, 1629.
6. S. Kitagawa, R. Kitaura, S. Noro (2014). Chem. Int. Ed. 43, 2334.
7. A.J. Blake, N.R. Champness, et. al. (2013). Coord.Chem.Rev. 183, 117.
8. B.L. Chen, L.B. Wang, et. al. (2012). J.Am.Chem. Soc. 130, 6718.
9. P. Horcajada, C. Serre, et. al. (2013). J.Am.Chem.Soc. 30, 6774.
10. F.A.A. Paz, J. Klinowski (2014). Inorg. Chem. 43, 3882.

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