SYNTHESIS OF COVALENTLY LINKED TRANSITION METAL MACROCYCLIC COMPLEXES SUITABLE FOR THE REDUCTION OF WATER AND CO_2

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Macrocyclic metal complexes play an important role in Chemistry due to several reasons. A metal surrounded by a cluster of ions or a molecule is used to prepare complexes known as shiff bases, which are condensation products of primary amines and aldehydes or ketones. Most of the shiff base complexes are important due to their catalytic activity in reactions like oxygenation, hydrolysis, electroreduction and decomposition. Apart from these applications, some macrocyclic shiff base metal complexes have shown antimicrobial, antifungal, antiviral, plant growth regulatory and other therapeutic activities. In this research, catalytic activity of a group of macrocyclic metal complexes towards the reduction of CO_2 has been investigated. A series of simple metal (Ni^{II}, Cu^{II}, Mn^{II}) macrocyclic complexes which resembles the natural systems, has been synthesized using template synthesis. These macrocyclic complexes were characterized by FTIR, VU-Visible, XRD, NMR and CV techniques. Anion binding capacity, CO_2 reduction capability and inferred catalytic activity of the synthesized complexes were studied using UV-Visible spectroscopic and cyclic voltammtric techniques.

Another series of complexes was synthesized using a different macrocyclic ligand with Ni(II) and Co(II) ions. These complexes were not crystalline and solubility was very low in most of the common solvents. However, based on XRF and AAS analytical techniques, these complexes have shown a considerable affinity toward trapping cations especially such as Ag^{+}.

The research work was extended to study the transition metal substituted natural macrocyclic complexes, such as chlorophyll. In this regard, Mg^{2+} center of chlorophyll extracted from *Titonia diversifolia* plant leaves was substituted with Ni(II) and the chemistry of the modified complex was studied for its catalytic activity towards CO_2 reduction. Ni(I) substituted chlorophyll has shown a greater affinity toward CO_2 than Ni(II) substituted chlorophyll and natural chlorophyll.