

Catalytic Behavior of Remotely Placed Manganese Centers in Mn^{III} (Corrole-Porphyrin-Corrole) Triad

Jyoti Rai, Biju Basumatary, Jeyaraman Sankar*

Department of Chemistry, IISER Bhopal

Bhauri, Bhopal Bypass Road, Bhopal – 462066, Madhya Pradesh, INDIA

(E-mail: jyotir@iiserb.ac.in)

Abstract:

Metalloenzymes are known to catalyze a variety of important biological processes in nature, involving complex chemical transformations, which exhibit astounding examples of efficient and selective catalysis.^[1] These chemical transformations are usually very challenging synthetically as they are multi-electron redox reactions.^[2] Simplified systems that consider small molecules as models, have been engaged to mimic structural and functional features of enzymes.^[3] Cytochrome P450 enzymes constitute a large family of heme proteins that can perform oxidation of various substrates at high catalytic rates using molecular oxygen through reductive activation mechanism.^[4] In all these systems, it is speculated that enzymes have one or more metals at their active site and may also include metal centers at their active peripheral sites as well.^[5]

As part of the development towards multi-metal catalyzed chemical transformations, we herein describe the structural characterization of homotrimeric manganese (corrole-porphyrin-corrole) triad where all the three metal centres have same oxidation state i.e., Mn (III) in corrole as well as porphyrin. In order to investigate the effect of multiple catalytic site in single molecule on the oxidation of alkenes, we performed the reactions with various oxidants in benzene as solvent in open atmosphere. The results obtained shows the enhanced activity of the metal towards epoxidation when present in the trimer and hence enhanced yield as compared to the monomers.

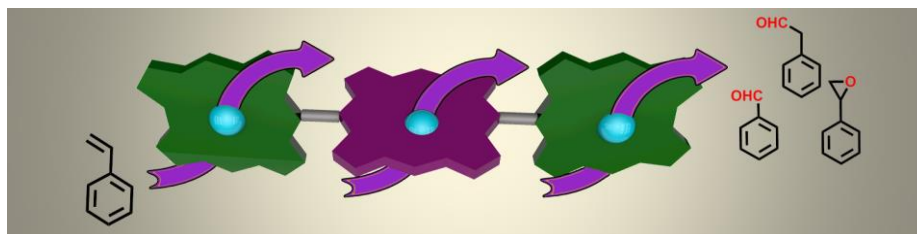


Figure: Oxidation of alkene by homometallic Mn^{III} (corrole-porphyrin-corrole) triad.

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Student Talk
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Bio-Sketch of Speaker

Ms. Jyoti Rai

Research Scholar

Department of Chemistry

IISER Bhopal

Bhauri, Indore Bypass Road

Bhopal

+917692936221

email: jyotir@iiserb.ac.in



I joined IISER Bhopal in August 2013 as a research scholar. I belong from Varanasi, city of temples and ghats, in Uttar Pradesh state where I have completed my school as well as graduation also. I am fortunate to be graduate of Banaras Hindu University in chemistry (Hons.) in year 2010. After that I went to Lucknow University to do my masters in general chemistry and completed in the year 2012. By that time I have developed a strong interest in the subject and therefore I chose to go for research as my future career. To fulfill my interest I joined IISER Bhopal as a Ph.D. student under Dr. Srinivas Katukojwala. In his lab I was working in organic synthesis of enalcarbenoids. But after sometime I realised that my interest is in some other field where I can do much better and therefore later in September 2014 I joined Dr. J. Sankar group where I carried out some very interesting research on metalated porphyrin-corrole hybrids and their utility as catalysts in selected organic transformations.

During my whole research period I got several opportunities to attend scientific conferences and present my work in the form of posters as well as talks. Recently I got chance to showcase my work in an international conference on porphyrins and phthalocyanines, held in Munich, Germany in July 2018. It was a very fruitful experience for me where I met lot of great researchers from around the globe and shared fruitful discussions with them. I wish to continue my research career in future in the direction of application of these compounds so that I can contribute to the welfare of society and human being.