

**Department of Chemistry  
Indian Institute of Technology Madras, Chennai-36**

Research Proposal Seminar

**An Approach Towards Stereoelectronically Modified Transition Metal-*N*-  
Heterocyclic Carbene Complexes for Catalysis**

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Date: <sup>08</sup>06-11-2019

Venue: CB-310


Time: <sup>4</sup>3.00 PM

Abstract:

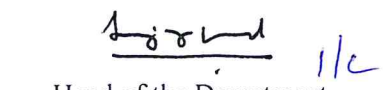
The isolation of first stable *N*-heterocyclic carbene (NHC) by Arduengo was a new beginning in the field of homogeneous catalysis. The versatile structural and electronic properties<sup>1</sup> made NHCs a privileged group of ligands, capable of replacing classical ligands like phosphines and cyclopentadienes. Later, imidazole based abnormal carbenes (aNHCs) and triazolylidene based NHCs (mesoionic carbenes, MICs) have emerged as potent subclasses of classical Arduengo type ImNHCs and they are found to be better  $\sigma$  donors than their normal ImNHC analogues.<sup>2a</sup> Diversity in their bonding characteristics fascinated researchers to incorporate NHC moieties into various multi-dentate ligand systems and this has led to new developments in the area of organometallic catalysis.<sup>2b</sup> Unsymmetrical heteroditopic chelating ligands incorporating different NHC donors such as imidazol-2-ylidene and 1,2,3-triazol-5-ylidene are recently gaining attention not only due to the presence of two distinct carbene centers having varying  $\sigma$ -donor/ $\pi$ -acceptor properties but also due to numerous possibilities for stereoelectronic modifications. Such modulations in the ligand environment have impact on the stereoelectronic profiles of the metal center which in turn reflect in the catalytic behavior of the corresponding complexes.<sup>3</sup> In addition to that, proper selection of the linker in heteroditopic ligand systems can provide the platform for development of heterobimetallic complexes which find applications in one-pot tandem catalysis.<sup>4</sup> Therefore, with the objective of devising NHC based new ligand systems for the synthesis of effective organometallic catalysts, the presentation will be focused on the approaches for fine-tuning the steric and electronic properties of ligands to tweak the catalytic activity of their metal complexes. Research proposal and some preliminary results will also be discussed along with the future plans.

References:

1. Nelson, D. J.; Nolan, S. P. *Chem. Soc. Rev.* **2013**, *42*, 6723.
2. a) Schuster, O.; Yang, L.; Raubenheimer, H. G.; Albrecht, M. *Chem. Rev.* **2009**, *109*, 3445.  
b) Herrmann, W. A. *Angew. Chem. Int. Ed.* **2002**, *41*, 1290.
3. Bauri, S.; Donthireddy, S. N. R.; Illam, P. M.; Rit, A. *Inorg. Chem.* **2018**, *57*, 14582.
4. Mata, J. A.; Hahn, F. E.; Peris, E. *Chem. Sci.* **2014**, *5*, 1723.

  
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