Approaches to Transition Metal Catalysis – Multimetallic and Hybrid Systems

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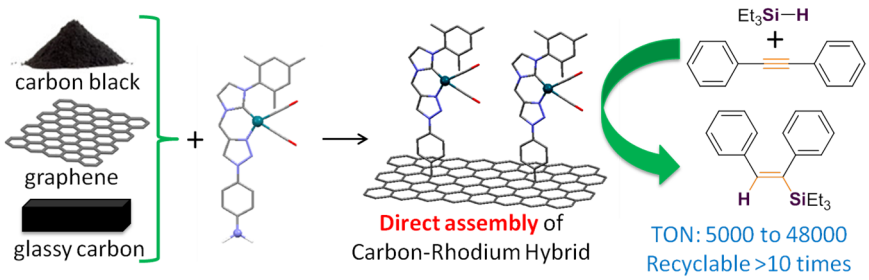
Abstract:

Restricting two catalytically active metal ions within a single ligand framework can dramatically enhance catalyst performance relative to that of the analogous catalyst with a single metal ion. We have previously shown that bimetallic complexes of Ir(I) and/or Rh(I) with *N',N* donor ligands are significantly more efficient catalysts than their monometallic counterparts. We have also demonstrated the dependence of bimetallic enhancement on intermetallic distance. Heterobimetallic complexes, which contain two different metal centres, are of particular interest due to their ability to promote two or more sequential transformations in the same reaction vessel

We are exploring the development of effective hybrid catalysts by anchoring our homogeneous catalysts onto a range of robust carbon supports. Well defined carbon-based catalyst scaffolds have the potential to provide economical and practical routes to a range of high value compounds due to their well defined nanostructure, relatively defect free surfaces, large surface areas and resistance to oxidation. We have recently developed a convenient method of covalently attaching homogeneous iridium and rhodium catalysts onto a range of carbon surfaces. Tethering pairs of different metal complexes to carbon surfaces has the potential to lead to highly effective catalysts for multistep reactions, and we have shown that we have good control over such an attachment. The tethered complexes (both mononuclear and with pairs of different complexes) are effective and recyclable catalysts for reactions including the hydrosilation and hydroamination of alkynes, and C-N bond forming via hydrogen borrowing.



Biographical Statement of speaker:

Ph.D. University of Sydney 1987. Postdoctoral Fellow ETH Zürich, Switzerland 1987-1989, Gritton Research Fellow, University of Sydney 1990-1991; ARC Queen Elizabeth II Fellow 1992-1997, and ARC Senior Research Fellow 1997-2002, at the University of Sydney and UNSW. At UNSW from 1999: Senior Lecturer, Associate Professor, then Professor 2008-, and Head of School, Chemistry 2007-2014. Currently, Executive Dean, Science and Engineering, and Professor of Chemistry, Macquarie University.
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