IAS Distinguished Lecture

Magical Power of d-Block Transition Metals – Past, Present, and Future

Professor Ei-ichi Negishi
Herbert C. Brown Distinguished Professor of Chemistry, Purdue University
Nobel Laureate in Chemistry (2010)

Date: 1 December 2016 (Thursday)
Time: 3:30pm – 5:00pm (Light refreshments will be served from 3:00pm to 3:30pm)
Venue: Connie Fan Multi-media Conference Room, 4/F, Cheng Yick-chi Building, City University of Hong Kong

Abstract
Until recently, most of the 24 d-block transition metals had been used primarily as useful materials for (i) construction and also as tools and containers, etc., (Ti, Zr, Fe and their alloys with V, Cr, Mn, Co, Ni, etc.), (ii) precious and ornamental items (Au, Pt, Ir, Os, Ag, etc.), and (iii) electromagnetic applications (Cu, Nb, Ta, W, Re, etc.). Over the past several decades, their superb properties as chemically useful substances, especially as catalysts for chemical reactions, have been increasingly recognized. “Why are they so useful as catalysts?” In most cases, their superb catalytic properties may be attributed to one or both of the following two:
(1) ability to provide simultaneously both filled nonbonding valence-shell orbitals (one or more) and empty valence-shell orbitals (one or more) within thermally stable species and
(2) ability to undergo simultaneously both reduction and oxidation under one set of reaction conditions in one reaction vessel.
A combination of these two properties can be exploited in devising a wide variety of useful catalytic reactions for formation and cleavage of C–C, C–H, C–O and other bonds.
For critically important C–C bond formation, a) reductive elimination, b) carbometalation, c) migratory insertion, and d) olefin metathesis may be exploited. As representative examples of reductive elimination and carbometalation, the Pd-catalyzed cross-coupling proceeding via reductive elimination and Zr-catalyzed asymmetric carboalumination of alkenes (ZACA) proceeding via carbometalation will be discussed.

Many more novel catalytic one- and two-electron processes via organotransition metals will be discovered and developed.

Biography
Ei-ichi Negishi, H. C. Brown Distinguished Professor of Chemistry, Purdue University, grew up in Japan and received his Bachelor's degree from the University of Tokyo in 1958. From 1958-1966, while working as a Research Chemist at Teijin, Ltd., Japan, Negishi spent 3 years (1960-1963) as a Fulbright-Smith-Mund Scholar at the University of Pennsylvania and obtained his Ph.D. in Chemistry. In 1966, he joined Professor H. C. Brown's Laboratories at Purdue as a Postdoctoral Associate and was appointed Assistant to Professor Brown in 1968. Negishi went to Syracuse University as Assistant Professor in 1972 and began his life-long investigations of transition metal-catalyzed organometallic reactions for organic synthesis. Negishi was promoted to Associate Professor at Syracuse University in 1976 and invited back to Purdue University as Full Professor in 1979. In 1999 he was appointed the inaugural H. C. Brown Distinguished Professor of Chemistry. He has received various awards, with the most representative being 1987 J.S. Guggenheim Fellowship, 1996 Chemical Society of Japan Award, 1998 ACS Award in Organometallic Chemistry, 1998–2001 Alexander von Humboldt Senior Researcher Award, Germany, 2000 Sir Edward Frankland Prize, Royal Society of Chemistry, UK, 2007 Yamada-Koga Prize, Japan, 2010 ACS Award for Creative Work in Synthetic Organic Chemistry, 2010 Japanese Order of Culture, 2010 Nobel Prize in Chemistry, 2010 UK Royal Society of Chemistry Honorary Fellowship Award, 2011 Fellow of the American Academy of Arts and Sciences, and 2014 elected into the National Academy of Sciences as a Foreign Associate.

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Enquiries:
Tel: 3442 6611
Email: ias@cityu.edu.hk