

CCST Seminar

Thursday, November 19, 2009

1:30 p.m. (REVISED TIME)

366 Colburn Lab

Dr. John Regalbuto

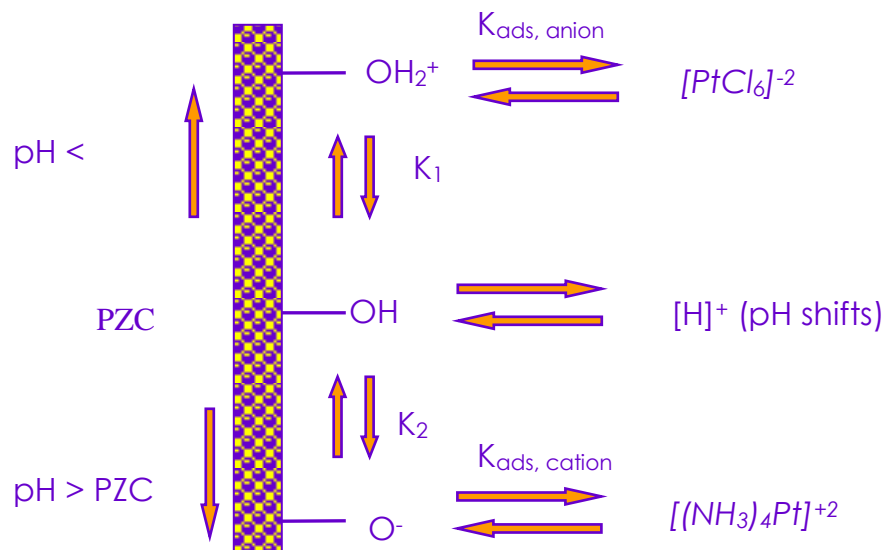
Professor, Dept. of Chemical Engineering
University of Illinois at Chicago

Dr. John Regalbuto received his bachelor's degree in chemical engineering from Texas A&M University in 1981 and later received his M.S. (1983) and his Ph.D. (1986) from the University of Notre Dame. He joined the Department of Chemical Engineering at the University of Illinois at Chicago in 1986 as assistant professor and was promoted to full professor in 2005. Dr. Regalbuto is currently the program director of NSF Catalysis and Biocatalysis.

A Rational Preparation of Supported Metal Catalysts

Our group's efforts have been directed toward "the transformation of the art of catalyst preparation into a science." To this end, we have been conducting fundamental studies of catalyst impregnation, the process whereby solutions containing atomically dispersed metal precursors are contacted with high surface area supports. The goal of the synthesis is to create a catalyst with the highest amount of stable active sites: small metal particles firmly anchored to the support.

The adsorption of noble metal coordination complexes such as chloroplatinic acid, $[PtCl_6]^{2-}$, and platinum tetraammine, $[(NH_3)_4Pt]^{2+}$, over many oxides and carbon surfaces can be explained by a relatively simple electrostatic model. Oxide and oxygenated carbon surfaces terminate in hydroxyl groups, which can become protonated and positively charged at low pH and deprotonated and so negatively charged at high pH, relative to the characteristic pH of point of zero charge (PZC) of a material.



In this talk, it will be demonstrated that "strong electrostatic adsorption" (SEA) of many noble and base metal cationic and anionic complexes occurs over a wide variety of oxide and carbon supports, and after reduction, this synthesis strategy yields small, well dispersed metal particles.

Applications of the SEA method for selective metal partitioning over mixed oxide supports such as promoted or bound catalysts, and for bimetallic catalysts, will also be demonstrated.