KANSAS STATE UNIVERSITY

College of Arts & Sciences
Department of Chemistry

ADVANCE Distinguished Lecture Series

Thursday, 05 November | 1:05 pm | King 04

"Triaryl Phosphine, Arsine, Stibine and Bismuthine Metal-Organic Frameworks as Solid-State Ligands for Catalysis in Unique Reaction Environments"



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Abstract: New results from our ongoing investigations into the synthesis of metal-organic frameworks as 'solid-state ligands' for the site-isolated coordination of low-valent metal complexes will be presented. MOFs decorated with guest-accessible Lewis basic ER_3 sites (E = P, As, Sb or Bi) can be post synthetically metalated with low-valent metal complexes of direct industrial relevance to large-scale petrochemical conversions, for electrochemistry, and for chemical sensing of reactive gases (*e.g.*, NH_3, SO_2). Surprisingly to some, SbR_3 and BiR_3 ligands are directly amenable to MOF synthesis under standard self-assembly conditions, opening-up a broad array of new opportunities to study catalysis in the solid-state, using structurally well-defined, low-valent metal complexes. The MOF-based solid-state ligand approach offers opportunities to utilize heavier E^{III} donor atoms in new ways that circumvent facile ligand de-coordination due to weak Lewis basicity (and often, moderate Lewis acidity). It also allows for the preparation of catalysis in uniquely geometrically strained environments, which could be considered as long-lived non-equilibrium states from a molecular coordination perspective. New examples featured in this presentation will include MOFs functionalized with Re^{I}, Os^{I}, Rh^{I}, Ir^{I}, Pt^{II}, Ag^{I} and Au^{I}, and model carbonylation catalysis results.

Bio: Simon M. Humphrey is Professor and Department Chair in the Department of Chemistry at the University of Texas at Austin. He received a Ph.D. from the University of Cambridge in 2005 and was a research fellow at the Lawrence Berkeley National Laboratory. His primary research projects involve: (a) metal-organic framework (MOF) chemistry with a specific focus on the use of organophosphines and related heavier chalcogen-based building blocks for molecular separations and catalysis; (b) synthesis of classically immiscible nanoalloys for applications in gas and liquid phase heterogeneous catalysis and electrocatalysis; (c) synthesis and applications of inorganic mesoporous materials for separation and sequestration. Humphrey is co-founder of Lantha Sensors, a MOF-based detection company based in Austin, Texas. He serves as Deputy Editor of the journal, Coordination Chemistry Reviews.