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10:30 AM – 11:30 AM

Steele 006

“Heavier Cyanate, Nitrile and Nitroso Analogues: New Opportunities in Synthesis”

Abstract: The cyanate (NCO^-), cyanide (CN^-) and nitrosonium (NO^+) ions are stable nitrogen-containing species that serve as functional groups in organic chemistry and ligands to transition metals. They are routinely used as illustrative examples of specific chemical properties. For example, the cyanate ion is an archetypal ambidentate nucleophile, the cyanide ion an exemplary strong-field ligand, and metal nitrosyl compounds are some of the earliest examples of complexes containing non-innocent ligands. By contrast, phosphorus-containing analogues of such species are extremely rare or were entirely unknown until recently. This talk will describe our efforts at developing the chemistry of such compounds. Specifically, we will focus on how the phosphoethynolate ion ($\text{P}=\text{C}=\text{O}^-$; a heavier cyanate analogue),^[1] can be used to access a Grignard-like cyaphide ($\text{C}\equiv\text{P}^-$) transfer reagent,^[2] and how such a species can be used to target multi-metallic complexes. The talk will also describe our recent attempt at accessing phosphinidene oxide, the first example of an unsupported molecular phosphorus (III) oxide.^[3]

Bio: Jose M. Goicoechea is the Veronica Siedle Professor of Chemistry at Indiana University, Bloomington. He carried out his undergraduate and Ph.D. degrees at the Universities of Zaragoza (Spain) and Bath (U.K.), respectively, the latter under the supervision of Professor Michael K. Whittlesey. Between 2003 and 2006, Goicoechea was a postdoctoral research associate at the University of Notre Dame where he worked under the supervision of Professor Slavi Sevov on anionic clusters of the p-block elements (Zintl ions). Prior to joining IU, he was a Professor of Inorganic Chemistry at the University of Oxford, U.K. (2006–2022).

Goicoechea's research group is focused on the design and synthesis of novel compounds based on environmentally abundant main-group elements (e.g. aluminium, silicon, phosphorus). This work ranges from purely fundamental studies (such as the synthesis of elusive small molecules and reactive intermediates), to more applied fields (catalysis and materials science). Research by the Goicoechea group has featured in over 160 publications in leading peer-reviewed journals. His work has been recognized by several prizes and awards including the *Alexander von Humboldt Friedrich Wilhelm Bessel Research Award* (2020), the *RSC Main Group Chemistry Award* (2018), and an *ACS Organometallics Young Investigator Fellowship* (2014).