

Dr. Michael Land
Department of Chemistry
Mount Saint Vincent University
Halifax, NS

Date: Friday, October 3, 2025
Time: 11:30 AM (AST)
Location: Atrium AT101



Bending the Rules of Phosphorus: New Directions for Transfer Reagents

Abstract:

Rigid, nitrogen-rich ligands create unusual environments at phosphorus centers, allowing access to oxidation states and geometries not predicted by simple VSEPR models. These ligands stabilize highly Lewis acidic phosphorus(III) dications that can serve as effective transfer reagents, enabling the construction of new phosphorus-containing frameworks. Their redox flexibility further reveals stable phosphorus(I) cations, which open additional pathways for P(I) transfer and reactivity. Together, these systems illustrate how careful ligand design can unlock unconventional bonding and reactivity at the main group elements.

Building on this foundation, the controlled oxidation of phosphorus(III) complexes has recently yielded the first examples of phosphorus(V) dications capable of acting as P(V) transfer reagents. These compounds expand the accessible chemistry of phosphorus by providing direct routes to otherwise challenging high-valent species, and they demonstrate reactivities such as deoxygenations and nucleophilic aromatic substitutions. The broader picture that emerges is one of modular phosphorus transfer across multiple oxidation states, offering new opportunities for synthesis and catalysis rooted in the design of rigid ligand frameworks.

Bio:

Michael obtained a Honours Bachelor of Science in Chemistry, and a Masters of Applied Science from Saint Mary's University under the supervision of Professor Jason Clyburne. He then earned his PhD in chemistry with Professor Seán Barry at Carleton University as an NSERC Alexander Graham Bell Graduate Scholar. His doctoral research focused on the synthesis and thermal characterization of volatile molybdenum-containing compounds, where he developed a low-temperature method to prepare ultra-pure molybdenum nitride thin films.

Following his doctoral studies Michael pursued an NSERC funded postdoctoral fellowship at Dalhousie University, working with Professors Saurabh Chitnis and Charles Macdonald. During his postdoctoral research, he prepared the first example of high molecular weight cyclo-linear polyphosphazenes and developed versatile phosphorus transfer reagents. During this time, he also developed and taught a graduate level course focusing on vapor-phase deposition mechanisms.

Michael began his independent career as an Assistant Professor of Inorganic Chemistry at Mount Saint Vincent University in July 2025. His broader research interests focus on the design and synthesis of novel ligand scaffolds that promote unique reactivity and unconventional bonding motifs in both transition metal and main-group complexes.