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A Curious Case of Pnictogen Cations



Prof. Roman Dobrovetsky

School of Chemistry, Tel Aviv University
Tel Aviv, Israel
e-mail: rdobrove@tauex.tau.ac.il

Group 15 species have attracted considerable attention for their potential to activate small molecules and mediate catalytic transformations. In particular, structurally constrained pnictogen centers have emerged as promising platforms for transition metal-like reactivity.

Our research focuses on structurally constrained Pn(III) and Pn(V) cations (Pn = pnictogen), which exhibit distinct but complementary reactivity patterns. As we have recently demonstrated for P(III) systems, structural constraint can promote ambiphilic small-molecule activation and transition-metal-mimicking catalysis. In contrast, P(V) cations can exhibit exceptional Lewis acidity, enabling small-molecule activation and catalytic transformations. In this talk, I will highlight the potential of structurally constrained pnictogen cations as versatile platforms for small-molecule activation and catalysis, presenting recent advances in the chemistry of these species. These include H₂ activation and metallomimetic catalytic hydrogenation mediated by constrained P(III) cations, C–Si bond activation by a structurally constrained Sb(III) cation followed by catalytic silane redistribution, and the development of novel P(V)-based Lewis superacids and their reactivity toward small molecules..

Bio: Roman Dobrovetsky completed his PhD at the Technion in 2011 under the supervision of Prof. Yitzhak Apeloig. His doctoral research focused on the preparation, structure, and reactivity of α -functionalized silyl metal reagents. In the same year, he joined the group of Prof. Doug Stephan at the University of Toronto as a postdoctoral fellow, where he worked on frustrated Lewis pairs (FLPs) and Lewis acid catalysis. In 2015, he began his independent career at Tel Aviv University, where he is currently a Full Professor. His research focuses on the design and reactivity of main-group compounds, with particular emphasis on structurally constrained pnictogen ions and radicals for small-molecule activation and metallomimetic catalysis. He also investigates the chemistry of boron clusters, particularly carboranes, and their use in ligand design for the development of novel catalysts and functional materials.