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1,3-*N,O* Ligands and Phosphine Linkers: From Molecular Catalysts to Extended Structures

Abstract:

Homogeneous metal catalysis provides numerous products of importance to society, including pharmaceuticals, detergents, polymers, agrochemicals, and more. However, many homogeneous catalysts of industrial relevance rely on expensive noble metals for which global reserves are rapidly depleting. To address this issue, two distinct strategies have emerged: 1) develop earth-abundant and inexpensive metal alternatives; and 2) improve the efficiency and/or recyclability of noble metal catalysts. Efforts towards the first strategy are discussed in Part 1 of this presentation. 1,3-*N,O*-chelates of earth-abundant, early-transition-metals were investigated, and the resulting complexes were applied in diverse catalytic reactions involving the activation and/or formation of C-E (E = H, C, N, O) bonds. Next, Part 2 discusses the results of employing the second strategy. Using multitopic phosphine linkers, extended structural analogues of an existing noble metal catalyst were synthesized. These materials could be used as recyclable, heterogeneous catalysts for the dehydration of amides to give enamine products. Finally, Part 3 discusses preliminary results from the Griffin Group towards the development of new catalytic materials. Overall, this work helps to address global challenges in sustainable chemical synthesis through two complementary strategies and widens the platform from which improved catalytic materials can be developed.

Bio:

Dr. Samuel E. Griffin grew up in West Kelowna, British Columbia (BC) and completed a B.Sc. degree with Honours in Chemistry from The University of British Columbia – Okanagan in Kelowna, BC, conducting research in the labs of Profs. Wesley Zandberg (analytical glycoscience) and Kevin Smith (organometallic chemistry). Excited by the organometallic chemistry of early-transition metals, he then pursued a Ph.D. in Chemistry at The University of British Columbia in beautiful Vancouver, BC under the supervision of Prof. Laurel Schafer, investigating zirconium-

and vanadium-catalyzed reactions. Shifting gears to late-transition metals and materials chemistry, he subsequently moved to sunny San Diego, California to work in the lab of Prof. Seth Cohen at the University of California, San Diego as a postdoctoral scholar. During this time, his work focused on the development of low-valent metal-organic frameworks with phosphine linkers for catalytic applications. Dr. Griffin began his role as an Assistant Professor in the area of synthetic inorganic chemistry with applications in organometallic and materials chemistry at Mount Allison University in the summer of 2024.