Notice of the Final Oral Examination
for the Degree of Doctor of Philosophy

of

SAURABH CHITNIS

BASc (McMaster University, 2010)

“P-P and P-Sb Coordination Chemistry”

Department of Chemistry

Monday, April 13, 2015
9:00AM
Engineering/Computer Science Building
Room 130

Supervisory Committee:
Dr. Neil Burford, Department of Chemistry, University of Victoria (Supervisor)
Dr. Robin Hicks, Department of Chemistry, UVic (Member)
Dr. J. Scott McIndoe, Department of Chemistry, UVic (Member)
Dr. Sadik Dost, Department of Mechanical Engineering, UVic (Outside Member)

External Examiner:
Dr. François Gabbaï, Department of Chemistry, Texas A&M University

Chair of Oral Examination:
Dr. Laurence Coogan, School of Earth and Ocean Sciences, UVic
Abstract

The coordination chemistry of compounds featuring P-P and P-Sb bonds has been investigated to define the fundamental features of bonding in these systems. New reaction methodologies to form P-P bonds have been evolved based on careful consideration of bond strengths in the gas and condensed phase. Insights revealed from systematic studies of molecular structures have been used to augment and expand the scope of existing models for structural prediction (e.g. VSEPR theory). Unique classes of catena-antimony compounds have been discovered, illustrating a remarkable structural and electronic diversity for this heavy p-block metal. Detailed mechanistic examination has revealed an as-yet unrecognized mode of ligand activation for phosphine complexes of very electrophilic acceptors. Stable sources of the hitherto unisolated and highly reactive tris-triflate reagents, E(OTf)3 (E = P, As, Sb, Bi), have been prepared and their coordination chemistry as Lewis acids and oxidizing agents has been mapped. Collectively, the findings described here span a range of coordination chemistry paradigms for p-block elements that may be broadly applicable across the periodic table. A robust plan has been proposed for applying these insights towards the preparation of fundamentally interesting molecular frameworks and towards new strategies for small molecule activation.