Vita

Candidate's name: Sarah Lianna Walker

Universities Attended:

University of New Brunswick (2017)
Bachelor of Science

University of New Brunswick (2020)
Masters of Science

Publications/Conference Presentations:

B. L. Frenette, N. Arseneault, S. L. Walker, J. A Murphy, A. Decken, C. A. Dyker, "Tetra(Iminophosphorano) Substituted Bispyridinylidenes as Powerful Organic Electron Donors". (Manuscript in preparation)

S. L. Walker, B. L. Frenette, N. M. Arseneault, C. A. Dyker (June 2019), "Reduction Capabilities of Powerful Tetra(Iminophosphorano)-Substituted Bispyridinylidenes" at the 102nd Canadian Chemistry Conference and Exhibition, Québec City, QC, Canada (MSc. Work- Oral Presentation- National Conference)

The Synthesis and Application of Highly Reducing Bispyridinylidene Electron Donors

UNIVERSITY OF NEW BRUNSWICK

THESIS DEFENCE AND EXAMINATION

in Partial Fulfillment

of the Requirement for the Degree of
Master of Science

by

Sarah L. Walker

in the Department of Chemistry

U.N.B., Fredericton, N.B.

Thursday, April 23rd, 2020
1:00 p.m.

via TEAMS

Examining Committee

Dr. Adam C. Dyker	Supervisor
Dr. Ghislain Deslongchamps	Internal Examiner
Dr. William Ward	Int-Ext Examiner
Dr. Gilles Villemure	Chair of Oral Examination

Abstract

The incorporation of iminophosphorano substituents (-N=PR_3) onto the electron-rich bispyridinylidene (BPY) scaffold has allowed for the development of electron donors with exceptionally low redox potentials. By substitution of the –R group on phosphorus, various reductive strengths of the BPY can be achieved, allowing for enhanced selectivities. In order to expand the application of these reductants in organic synthesis, the range of redox potentials must be further developed, thereby increasing the need for stronger electron donors.

In recent years, a tetrasubstituted BPY was prepared utilizing four triphenyl- iminophosphorano groups (-N=PPh_3), located *ortho* and *para* to the pyridyl nitrogen of the BPY scaffold. This resulted in the strongest organic electron donor to date, with a record-breaking redox potential of -1.70 V vs. SCE. The donor was probed for its reductive capabilities, establishing success in the ground-state reduction of various challenging substrates. Recently, a novel tetra(iminophosphorano)-substituted BPY of increased reductive strength has been prepared. This study will describe its utility in reducing similar challenging organic substrates, in efforts to provide milder reaction conditions, as well as increasing the substrate scope. In addition, the synthesis of a novel bis(iminophosphorano)-substituted BPY, derived from a highly electron-rich phosphine, was explored. This study will describe a proposed synthetic route toward its preparation, where its synthesis could assist in expanding the range of reduction potentials accessible by organic reductants.