

From Conducting Polymers to Mild Semiconductor Synthesis in Solution: Main Group Chemistry at Work

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About a decade ago, we were able to form the first stable complexes of inorganic methylenes (EH_2) and ethylenes (H_2EEH_2 ; $\text{E} = \text{Si}, \text{Ge}$ or Sn), and converted some of these GeH_2 adducts into Ge nanoparticles and films via thermolysis.^[1] This presentation will describe our recent application of a class of P-B frustrated Lewis pair (FLP) chelate to gain access to various main group hydrides, for the deposition of the semiconducting materials Si, Ge and InP under mild conditions from solution.^[2] I will also mention our attempts to apply the same FLP methodology toward the preparation of boron nitride (BN),^[3] a highly sought insulator for the electronics industry. The second part of this lecture will describe a new class of polyacetylene bearing redox-active boron-, nitrogen-, and phosphorus-based groups, with enhanced air-stability, narrow optical band gaps, and redox-triggered optical switching in the telecommunications region (1500 nm) noted.^[4]

[1] For reviews on this topic, see: a) E. Rivard, *Chem. Soc. Rev.* **2016**, *45*, 989; b) M. M. D. Roy, A. A. Omaña, A. S. S. Wilson, M. S. Hill, S. Aldridge, E. Rivard, *Chem. Rev.* **2021**, *121*, 12784.

[2] a) A. A. Omaña, R. K. Green, E. Rivard *et al.*, *Angew. Chem., Int. Ed.* **2021**, *60*, 228; b) B. L. Frenette, J. Trach, M. J. Ferguson, E. Rivard, *Angew. Chem., Int. Ed.* **2023**, *62*, e202218587.

[3] B. L. Frenette, A. A. Omaña, M. J. Ferguson, Y. Zhou, E. Rivard, *Chem. Commun.* **2021**, *57*, 10895.

[4] B. T. Luppi, A. V. Muralidharan, N. Ostermann, I. T. Cheong, M. J. Ferguson, I. Siewert, E. Rivard, *Angew. Chem., Int. Ed.* **2022**, *61*, e202114586.

Biography:

Prof. Eric Rivard completed his Ph.D. at the University of Toronto under the supervision of Professor Ian Manners in 2004. After NSERC sponsored postdoctoral work with Professors Jonas Peters (Caltech) and Philip Power (University of California, Davis), and a brief research stay with Professor Cameron Jones (Monash University), he joined the University of Alberta in 2008, where he is now a Full Professor. He has given about 200 invited lectures worldwide and was an Alexander von Humboldt Experienced Researcher Fellow in Germany (2017-2019). He was also a Japan Society for the Promotion of Science (JSPS) Long-term Visitation Fellow in 2015 and a JSPS Short-Term Visitation Fellow in 2023, an RCMS Visiting Professor at Nagoya University in 2016, was the inaugural 2016 Michael Lappert Lecturer (Royal Society of Chemistry, UK), and won the 2018 Strem Chemicals Award for Pure and Applied Inorganic Chemistry (Canadian Society for Chemistry). He is currently on the Editorial Advisory Boards for *Chemical Society Reviews* and *Inorganic Chemistry*. The Rivard group studies fundamental low-coordinate and main group hydride chemistry, catalysis, semiconducting nanomaterial synthesis, and the development of phosphorescent materials and conjugated polymers based on main group elements.