INORGANIC CHEMISTRY STUDENT EXIT TALK

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“High Temperature Synthesis of B-Functionalized Carboranes”

Abstract: Synthetic modifications of icosahedral carborane molecules traditionally follow wet chemistry techniques utilizing solvent-based systems. In this presentation we showcase an alternative synthetic route; molten salt conditions that engender exopolyhedral functionalization that is not readily accessible via solvent based synthetic methods. Reported icosahedral carborane structures are dominated by carbon vertex substituted species due to the facile lithiation of carborane via organolithium reagents. The synthesis of boron vertex substituted variants of icosahedral carboranes has expanded in breadth in recent years, however there remain boron-element bonds that are not yet accessible by traditional solution-based synthesis. In my presentation, I will show how exopolyhedral B-Sn bonds can be forged by reacting B-mercurocarborane starting material in a $SnCl_2$ molten salt at temperatures exceeding 350 ^{o}C. Investigating the generality of this method, I replaced $SnCl_2$ with $GeBr_2$ as the molten salt medium resulting in an isolable carborane with an exopolyhedral B-Ge bond. Using disubstituted and trisubstituted B-mercurocarborane starting material with molten $GeBr_2$ generates products with two and three B-Ge bonds respectively. Moving from tetrel salts to triels, replacing $SnCl_2$ with InCl as the molten salt medium results in isolable carborane with an exopolyhedral B-In bond. This molten salt synthetic method provides the first opportunity to probe the electronic influence of B-bound carborane cages on these heavy main-group elements, demonstrating that the carborane substituents behave as strongly electron-donating groups, in contrast to conventional electron-withdrawing C-bound carborane substituents. Our findings also reveal an unusual thermal stability profile for several of the carborane-based molecules, challenging some of the longstanding assumptions in the field. I will further highlight the reactivity of these new main-group carborane systems and discuss how these building blocks can be leveraged for the construction of nanoscale architectures.

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4:00 p.m. | YH4222C - Collaboratory
Dongwon Yoo Seminar
& Conference Hall

UCLA College | Physical Sciences Chemistry & Biochemistry

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