Tips and Tricks to the Isolation of Low-Valent p-Block Elements, Radicals and Multiply Bonded Compounds

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The advent of the 21st century has witnessed enormous attention in developing compounds with low-valent main-group elements due to their interesting electronic features and unusual reactivities.[1] Theoretical study has been revealed that compounds with the low valent main group centered such as heavier carbene homologous, homo/heteroatomic multiple bonded compounds, and radicals possessing smaller HOMO-LUMO gaps are enabled to activate small molecules (e.g. H_2, NH_3, CO_2, etc.), which was previously considered the domain of transition metal complexes.[1] Thus, utilizing these molecules as a catalytic alternative to the expensive transition metals is one of the sole goals for the organometallic chemist. However, isolation of these compounds under ambient temperature is a challenging task due to their inherent reactivities and tendency to undergo oligomerization or polymerization. Therefore, coherent steric and electronic stabilization factors are required to stabilize these molecules. In this talk, the chemical tricks to taming the transient group 13 and 14 low-valent elements and radical compounds will be presented.[2-4] Additionally, rational designing, synthesis, structure, bonding, and the unusual reaction of a neutral 2π aromatic three-membered disilaborirane will be discussed.[5]

Recently, triarylborane containing compounds have received considerable attention owing to their potential applications in anion-sensing, biological imaging, and optoelectronic devices. Whereas, tetracoordinate boron–dipyrromethene (BODIPY) dyes have been extensively used as fluorescent probes for environmentally and biologically important analytes and as functional chromophores/fluorophores in photovoltaic cells and artificial light-harvesting systems for their excellent photo-physical properties. In this presentation, the photophysical properties and applications of Triarylborane-π-BODIPY conjugates will be presented briefly.[6-8]

References

1. (a) P. P. Power, *Nature,* **2010,** *463* (7278), 171–177; (b) D. Martin, M. Soleilhavoup and G. Bertrand, *Chem. Sci.*, **2011**, *2*, 389–399; (c) C. Weetman and S. Inoue, *ChemCatChem*, **2018**, *10*, 4213–4228; (d) M.-A. Légaré, C. Pranckevicius and H. Braunschweig, *Chem. Rev.*, **2019**, *119*, 8231–8261; (e) R. L. Melen, *Science*, **2019**, *363*, 479–484.

2. S. K. Sarkar, M. M. Siddiqui, S. Kundu, M. Ghosh, J. Kretsch, P. Stollberg, R. Herbst-Irmer, D. Stalke, C. Stückl, B. Schwederski, W. Kaim, S. Ghorai, E. D. Jemmis and H. W. Roesky, *Dalton Trans.*, **2019**, *48*, 8551–8555.

3. M. M. Siddiqui, S. K. Sarkar, S. Sinhababu, P. N. Ruth, R. Herbst-Irmer, D. Stalke, M. Ghosh, M. Fu, L. Zhao, D. Casanova, G. Frenking, B. Schwederski, W. Kaim and H. W. Roesky, *J. Am. Chem. Soc.*, **2019**, *141*, 1908–1912.

4. M. M. Siddiqui, S. K. Sarkar, C. Köhler, R. Herbst-Irmer, D. Stalke, J. Cai, L. Zhao, G. Frenking, and H. W. Roesky, *J. Am. Chem. Soc.,* **2021**, *143*, 1301–1306.

5. S. K. Sarkar, R. Chaliha, M. M. Siddiqui, S. Banerjee, A. Münch, R. Herbst-Irmer, D. Stalke, E. D. Jemmis and H. W. Roesky, *Angew. Chem.,* **2020**, *132*, 23215–23219.

6. S. K. Sarkar and P. Thilagar, *Chem. Commun.*, **2013**, *49*, 8558–8560.

7. S. K. Sarkar, S. Mukherjee and P. Thilagar, *Inorg. Chem.*, **2014**, *53*, 2343−2345.

8. S. K. Sarkar, G. R. Kumar and P. Thilagar, *Chem. Commun.*, **2016**, *52*, 4175−4178.