Main Group Supramolecular Building Blocks

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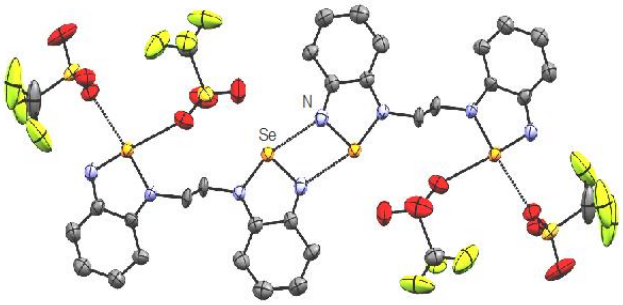
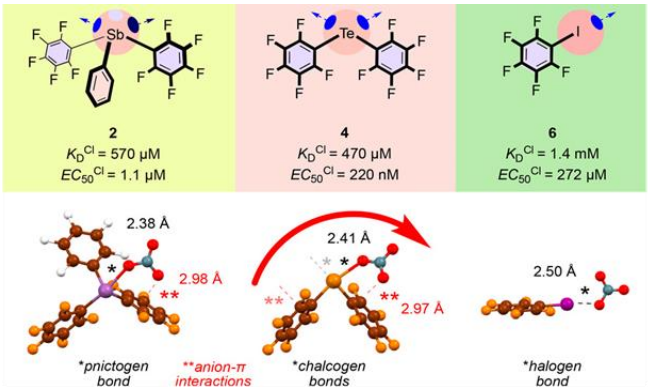
In supramolecular chemistry, secondary bonding interactions (SBIs) are commonly observed in the assembly of small molecular building blocks containing heavy main group elements. These interactions are characterized by distances that are longer than those of typical single bonds but much shorter than the corresponding sum of van der Waals radii. This talk focuses on the development of robust supramolecular systems formed using pnictogen, chalcogen, or halogen bonding interactions (highly directional classes of SBIs based on the heavy main group element involved), and investigates potential applications for these systems. To this extent, methods to enhance the strength of the Se-N SBIs formed from 1,2,5-chalcogenadiazoles were examined (previously work has shown that Se-based analogues form relatively weak SBIs compared to Te-based species, though the utility of the latter is limited due to moisture sensitivity), including increasing the electron acceptor ability of the chalcogen by attachment of a Lewis acid,[1] transition metal,[2] boron trihalide[3] or alkyl group.[4] In addition, the application of SBIs to transmembrane ion transport using Large Unilamellar Vesicles (LUVs) was investigated by comparing the ion transport activity of a series of perfluorophenyl compounds; it was found that SBIs stemming from a tellurium-based species were stronger and more stable than those in antimony or iodine-containing analogues.[5] Finally, preliminary results are provided for utilizing chalcogen bonding interactions in the assembly of gold nanoparticles.





References

[1] a) Cozzolino, A.; Vargas-Baca, I.; Mansour, S.; Mahmoudkhani, A. *J. Am. Chem. Soc.* **2005**, *127*, 3184. b) Cozzolino, A. F.; Elder, P. E.; Lee, L. M.; Vargas-Baca, I. *Can. J. Chem*. **2013**, *91*, 338. [2] Lee, L. M.; Elder, P. J. W.; Dube, P. A.; Greedan, J. E.; Jenkins, H. A.; Britten, J. F.; Vargas-Baca, I. *CrystEngComm*. **2013**, *15*, 7434. [3] Lee, J.; Lee, L. M.; Arnott, Z.; Jenkins, H.; Britten, J. F.; Vargas-Baca, I. *New J. Chem*. **2018**, *42*, 10555. [4] Lee, L. M; Corless, V.; Tran, M.; Jenkins, H.; Britten, J. F.; Vargas-Baca. *Dalton Trans*. **2016**, *45*, 3285. [5] Lee, L. M.; Tsemperouli, M.; Poblador-Bahamonde, A. I.; Benz, S.; Sakai, N.; Sugihara, K.; Matile, S. *J. Am. Chem. Soc*. **2019** *141*, 810.