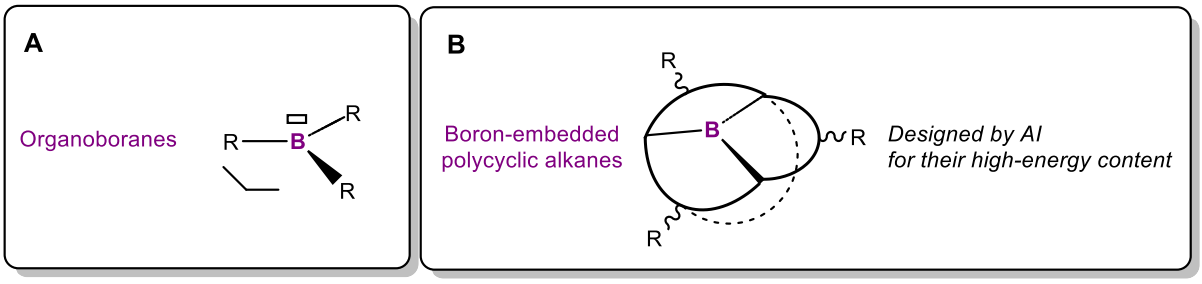
Master 2 internship project

Institut des Sciences Chimiques de Rennes, OMC team

Synthesis of boron-embedded polycyclic alkanes

Boron belong to the group 13 of the periodic table and, within a molecule, it usually shares 3 valence electrons with neightbouring atoms in an overall trigonal planar geometry (Figure, A). Perpendicular to the plane of the molecule, boron bears an electronic vacancy that confer to the element its intrinsic electrophilicity and position boranes as essential compounds in a variety of fields such as transition-metal catalysis, Frustrated Lewis Pair chemistry[1] or the development of electronic materials.[2] A facet of boron that is usually less recognized is its importance as a key element of energetic materials, which is well exemplified by the use of carboranes in hypergolic propellants.[3] In this context, triorganoboranes, organic boron compounds featuring three B–C bonds, are particularly appealing candidates due to their high energy content. In this internship, we propose to tackle the synthesis of a new type of boron-embedded polycyclic alkanes of high energy content (Figure, B). This project relies on the expertise of our group in organoboranes synthetic chemistry[4] and the expertise of the Alysophil company, specialist of the use of Artificial Intelligence to design molecules with dedicated properties.



During this main-group chemistry project, the internship student will have the opportunity to extend his theoretical knowledge by opening up to the chemistry of heteroelements. The student will be confronted with demanding experimental techniques due to the sensitivity of the targeted compounds (manipulations under controlled atmosphere). Finally, the student will be asked to carry out bibliographic survey as well as to present his results through written and oral reports throughout the internship. Due to the confidentiality of the proposed project and the involved partners, only french students are invited to apply.

References:

[1] D. W. Stephan *J. Am. Chem. Soc.* **2015**, *137*, 10018–10032.
[2] C. D. Entwistle, T. B. Marder *Angew. Chem. Int. Ed.* **2002**, *41*, 2927-2931.
[3] T. C. W. Mak et al. *J. Am. Chem. Soc.* **2020**, *142*, 12010–12014.
[4] M. Devillard, M. Cordier, T. Roisnel, C. Dinoi, I. Del Rosal, G. Alcaraz *Chem. Commun.* **2022**, *58*, 1589 ; M. Devillard, J. John, M. Izari, C. Roiland, M. Cordier, T. Roisnel, C, Dinoi, S. Arjunan, I. Del Rosal, G. Alcaraz *Org. Chem. Front.* **2026**, *13*, 5777.

Contact : Marc Devillard, UMR CNRS 6226, marc.devillard@univ-rennes.fr