B-N Units as Versatile Motifs in the Design of Innovative Molecular and Polymeric Materials

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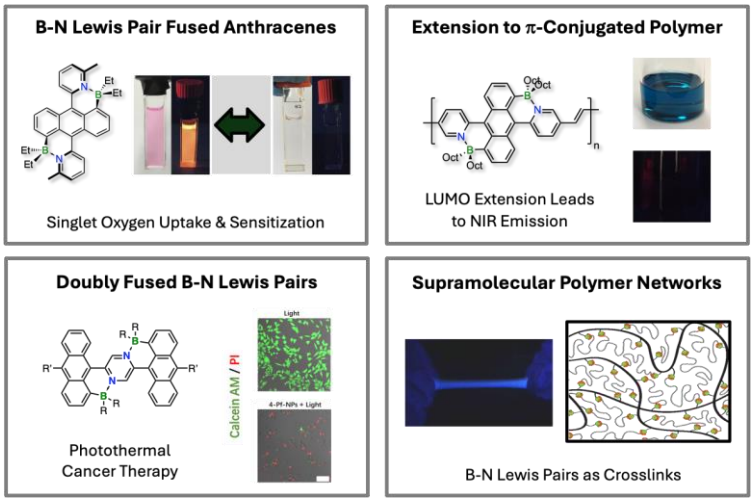
The incorporation of main group elements into polymeric materials is frequently exploited to achieve unusual properties and to enable new functions. For instance, tricoordinate boron's participation in π-delocalization can have a dramatic effect on the optical properties by selectively lowering the LUMO orbital levels. The electron-deficient character of boron also enables dynamic Lewis acid-base interactions, which trigger strong perturbations of the electronic structure. The products have been studied for applications ranging from imaging, lasing, organic photovoltaics, molecular switches, to supramolecular materials.

Our group has developed versatile approaches for incorporation of borane Lewis acids and Lewis pairs into conjugated molecular, macrocyclic and polymeric materials. For instance, we have demonstrated that Lewis base-directed electrophilic aromatic C-H borylation effectively generates B-N Lewis pair-functionalized conjugated materials with exciting properties and potential applications in organic electronics and the biomedical field.[1] Furthermore, we have pioneered the selective attachment of borane Lewis acids to polyolefins through direct polymerization and post-polymerization approaches.[2] These polymers are finding applications as supported catalysts and as building blocks of supramolecular polymer networks.[3]

In this talk, I will discuss some of these discoveries, highlighting the effect of B-N functionalization on the material properties and the impact in diverse application fields.



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[3] [a] F. Vidal, J. Gomezcoello, R. A. Lalancette and F. Jäkle, *J. Am. Chem. Soc.* **2019**, *141*, 15963-15971.
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Biography: Frieder Jäkle is a Distinguished Professor and currently the Chair of the Department of Chemistry at the Newark Campus of Rutgers University. He received his Diploma in 1994 and Ph.D. in 1997 from TU München, Germany, under the direction of Prof. Wagner. After a postdoctoral stint with Prof. Manners at the University of Toronto he joined Rutgers University in 2000. His research interests revolve around main group chemistry as applied to materials and catalysis, encompassing projects on organoborane Lewis acids, conjugated hybrid materials, luminescent materials for optoelectronic and sensory applications, stimuli-responsive and supramolecular polymers. He is the recipient of an NSF CAREER award (2004), Alfred P. Sloan fellowship (2006), *Friedrich Wilhelm Bessel Award* of the Alexander von Humboldt Foundation (2009), ACS Akron Section Award (2012), Boron Americas Award (2012), Board of Trustees Research Award of Rutgers University (2017). In 2019 he was named a *Fellow* of the American Chemical Society and in 2024 an Ambassador to the French CNRS. He has served on the editorial advisory boards of several journals, including Macromolecules, ACS Macro Letters, Organometallics, and Materials Today Communications.