DREXEL UNIVERSITY
Materials Science and Engineering
College of Engineering

Spring Seminar Series

Putting Boron into Polymers: From Optoelectronic to Supramolecular Materials

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The ability of tricoordinate borane moieties to participate in pi-delocalization can have a dramatic effect on the optical properties of conjugated materials by selectively lowering the LUMO orbital levels. The electron-deficient character of boron also enables Lewis acid-base interactions, resulting in strong perturbations of the electronic structure. These materials have been studied for applications in areas ranging from biological imaging, lasing, organic photovoltaics, to photochromic materials and molecular switches.

In our recent work, we have explored the effects of boron incorporation into conjugated oligomers, macrocycles, and polymers. We have also demonstrated that directed electrophilic aromatic C-H borylation provides an effective means to generate luminescent B-N containing conjugated materials with unusual properties such as self-sensitized singlet oxygen generation. Finally, we have found that "smart" dynamic materials can be obtained by embedding both Lewis acid and Lewis base sites into polymer networks.

In this talk I will discuss these discoveries and highlight their potential impact in applications ranging from luminescent materials, sensors, solar cells to stimuli-responsive and dynamic materials.

Frieder Jäkle is a Distinguished Professor and 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 the area of 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), an Alfred P. Sloan fellowship (2006), a Friedrich Wilhelm Bessel Award of the Alexander von Humboldt Foundation (2009), the ACS Akron Section Award (2012), the Boron Americas Award (2012) and the Board of Trustees Research Award at Rutgers University (2017). He has served on the editorial advisory boards of several journals, including Macromolecules, ACS Macro Letters, and Organometallics.