Bruker / MIT Symposium 2024

UNCOMMON BONDS IN BORON HETEROCYCLES: FROM ODD-ELECTRON MOLECULES TO LUMINESCENT MATERIALS

Robert J. Gilliard, MIT; e-mail: gilliard@mit.edu

The incorporation of boron into conjugated organic molecules has emerged as a useful strategy to elicit valuable optical and electronic properties which cannot be observed with the analogous all-hydrocarbon systems. Therefore, these types of molecules are currently being studied for various optoelectronic applications, including organic light-emitting diodes. We have synthesized, structurally characterized, and assessed the aromaticity and optical properties of unusual borafluorene cations, radicals, and anions. Our primary goal has been to isolate molecules in rare electronic states and to provide a link between structure and function. We have now initiated efforts aimed at understanding the chemical reactivity of these 5- and 6-membered boron-containing rings, as well as relevant BN- and BP-incorporated analogues. Recently, we discovered that borenium ions can be tailored such that the serve as viable stimuli-responsive materials, possessing thermo-chromic and/or -luminescent properties. In addition to reduced borafluorenes, we have isolated electronically distinct borepin radicals and anions (i.e., 7-membered boron-containing rings). This lecture will cover our most recent results in these research areas, including new studies on boraacenes and π-extended multi-boron-doped systems.