# Frieder Jaekle Laboratory

Polycyclic aromatic hydrocarbons (PAHs) with their large planar π-conjugated framework are attractive building blocks in the development of new π-conjugated materials, and suitably functionalized derivatives are widely applied in advanced electronic applications (OLEDs, OPVs, OFETs, etc.), as chemical sensors, in catalysis, bioimaging, and so on. Doping and functionalization of π-conjugated systems with main group heteroatoms is emerging as a powerful tool to tune their electronic structures. Among the main group elements, boron is particularly attractive because of its inherently electron-deficient character that enables extension of π-conjugation via its empty p-orbital in the tricoordinate state as well as the formation of Lewis acid-Lewis base (LA-LB) complexes in which boron adopts a tetrahedral coordination environment.

The goal of the project is to develop new boron-doped polycyclic aromatic hydrocarbons, explore their photophysical and electronic properties, and pursue potential applications as photocatalysts and/or building blocks of novel stimuli-responsive materials. The incorporation of boron-doped polycyclic aromatic hydrocarbons into polymeric materials holds great promise for development of materials that respond to photoirradiation, changes in temperature, or application of a mechanical force. On the other hand, boron-doped polycyclic aromatic hydrocarbons themselves may also serve as photosensitizers for the synthesis of organic polymers by organo-catalyzed free radical polymerization.

As part of the synthetic procedures the Scholar will learn to apply Schlenk line and glove box techniques for handling of air-sensitive compounds, purify and isolate PAHs by column chromatography or recrystallization, as well as monitor reaction progress and verify successful synthesis by Mass Spectroscopy (MS) and Nuclear Magnetic Resonance Spectroscopy (NMR). The polymer analysis typically involves Gel Permeation Chromatography (GPC) to determine molecular weights and may also involve more specific techniques to examine the optical, electronic and thermomechanical properties of the materials.

A major component encompasses training in the use of this instrumentation and the interpretation of the acquired data with the assistance of a graduate student or postdoctoral researcher. The Scholar will also be trained to effectively communicate the research results by participating in and presenting their work in our regular group meetings and at conferences. To that effect, training will be provided in the use of chemistry-specific programs (e.g., Chemdraw, NMR and MS data processing software, Excel or Origin for data presentation) and assembly of compelling powerpoint presentations.