Photophysical Characterization of Free-base Bis(arylethynyl)porphyrin Diacids and Aggregates

Kathryn E. Splan
Department of Chemistry, Macalester College
St. Paul, MN

For several decades porphyrins have been at the center of basic research efforts in molecular-scale solar energy conversion. They are key components in biomimetic, donor-acceptor systems that emulate photosynthesis and serve as light-harvesting materials in molecular photovoltaics and dye-sensitized solar cells. Exploration of new porphyrins, especially those that exhibit broad spectral coverage, will expand the functionality of porphyrins in energy conversion applications. Our project characterizes fundamental photophysical properties of free-base arylethynylporphyrins that feature substantial absorption in the red region of the spectrum and will contribute to research efforts in the study of photoactive materials for charge and energy transport.

- We have completed the first photophysical study of free-base arylethynyl porphyrins in both the neutral and diacid form. Protonation of the porphyrins enhances light absorption in the red-region of the visible spectrum and perturbs other excited-state properties. The impact of protonation on porphyrin photophysics can be correlated with the structural changes of the molecule upon protonation.
- We next plan to synthesize porphyrins capable of forming extended aggregate strucutres wherein the light-harevesting properties of the assemblies can be synthetically modulated.