Research Summary

A primary goal of our research is to develop sensizers for Dye Sensitized Solar Cells (DSSCs) that contain earth abundant transition metals such as Copper and Iron. Copper sensitizers are a suitable replacement for Ruthenium dyes in DSSC applications. Both Cu(I) and Ru(II) have charge transfer states that are accessible in the visible region that are strong enough reductants to “reduce” the semiconductor film they are bound to in a process called “injection”. Copper sensitizers show relatively short excited state lifetimes compared to ruthenium sensitizers unless the pseudo-tetrahedral geometry of the copper complex is maintained during the MLCT transition. This is done by making the complex rigid with steric bulk substituted in the coordinating ligand. My research focuses on the synthesis, characterization, and application of a novel trinuclear Cu(I) heteroleptic dye, designed for use in DSSCs that achieves rigidity not only from the steric bulk on the coordinating ligands but also the binding mode of the molecule on the semiconductor surface. As a joint project between the McCusker and Hamann groups here at MSU, we intend to study and optimize the photophysics as well as the device properties of this Cu(I) sensitizer.

References:


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