Development of Light-Harvesting Metallopolymers with Tunable Optical and Electronic Properties

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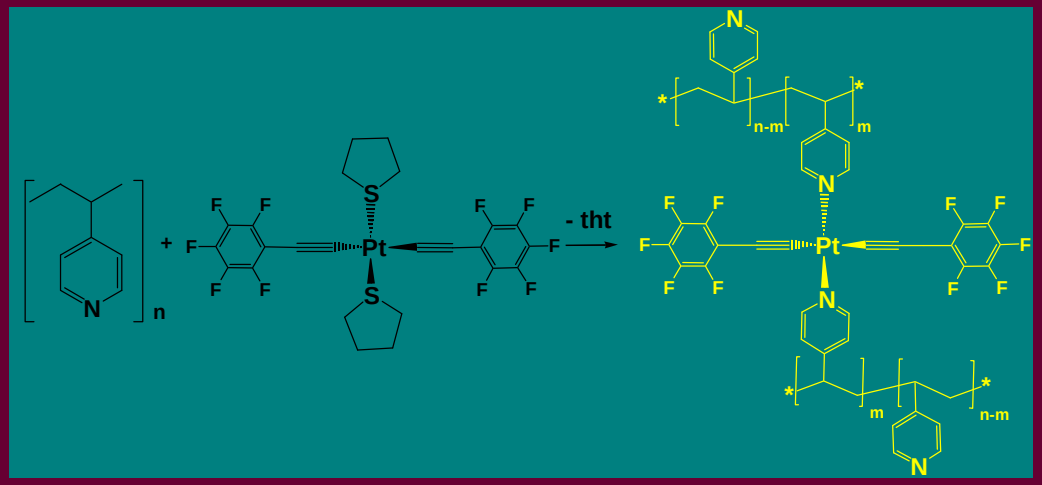
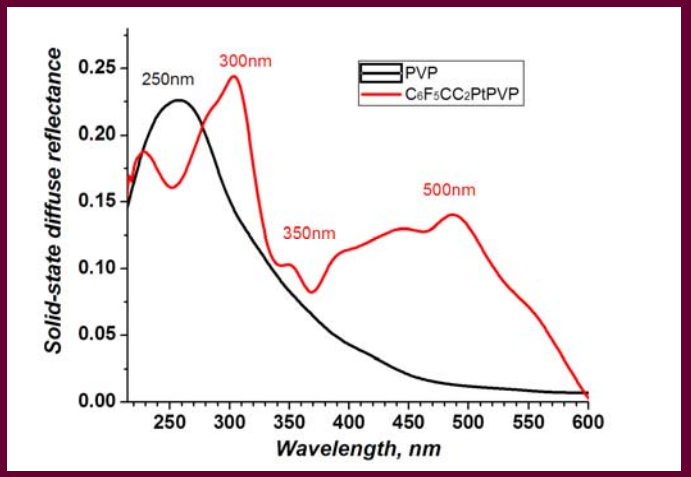
This project aims to improve the optoelectronic properties of polymer-derived transition metal complexes tailored for potential use in photovoltaics. Challenges in the coordination chemistry and electronic structure associated with using select organic polymers as ligands to coordinate transition metal ions are being tackled. We have been synthesizing light-harvesting metallopolymers by complexing polymers with heterocyclic aromatic groups (e.g., polypyridines and polythiophenes) to metal complex precursors of the type ML_nX (where M= metal; L= ligand; X= leaving group; in the example shown M = Pt(II); L = C_6F_5CC; X = tht).





The resulting metallopolymers exhibit charge transfer absorption bands that are red-shifted from the π-π* absorption bands in the parent PVP polymer, as illustrated above. The absorption of these Pt(II)-PVP metallopolymers cover the majority of the visible region, whereas PVP alone exhibits only UV absorption. Ongoing work seeks to alter the coordinating polymer, metal, and/or ligand to further expand the absorption range to cover the entire visible region resulting in ***black absorbers*** with better overlap with the solar radiation. An example of such Ru(II)-based metallopolymers and small molecules is illustrated below.

Metal Precursor

Ligand

Products