Title: A Rhodanine Flanked Diketopyrrolopyrrole Electron Acceptor for Photovoltaic Cells

Introduction & Motivation

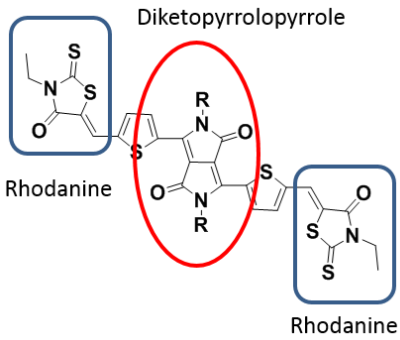
Organic solar cells, which are also called photovoltaic cells, are carbon-based cells that convert solar energy into electricity. There are two types of compounds needed to power organic photovoltaic cells: materials that accept electrons and materials that donate electrons. The electron donating materials are called "p-type," and have been extensively studied and used in materials. However, the electron accepting counterpart, "n-type" materials, have lagged in research and applications. Currently, the universally used n-type material is a carbon molecule called fullerene. Fullerene lacks tunable properties, so researchers have been developing alternative n-type molecules.

Challenges

Many n-type materials are difficult to synthesize and, when developed, lack in one or more of the properties necessary for device implementation: solubility, electrical conductivity, light absorption, cost effectiveness, and tunable properties.

Our Approach

Target Molecule:



To address the challenges, we have proposed a synthesis to the target molecule shown above, which bonds two molecules well-known for their electronic properties. Rhodanine and diketopyrrolopyrrole (DPP), both of which are pigment dyes, have been seen to be viable n-type materials. A similar molecule to the target molecule (two rhodanine bonded to a central core) has also been seen to have viable electronic properties. This molecule can be synthesized through cheap starting materials in bulk, which makes the target molecule cost-effective and appealing at the industrial scale.

Step 1

The target molecule will be synthesized from starting materials readily available in the lab. Every intermediate reaction product will be purified and its structure will be confirmed through characterization instrumentation available in the department.
Timeframe: 8 weeks

Step 2

The target molecule will be purified and characterized for its molecular structure, electrical conductivity, light absorptivity, crystal structure, fluorescence, and solubility.
Timeframe: 6 weeks