

Development, Synthesis, and Characterization of Dithienylethenes and Their Incorporation into Crystalline Solids

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Photochromes are a class of molecules well known for their ability to reversibly isomerize in at least one direction induced by light. While the majority of photochromic molecules contain an undesirable thermal reaction driving the molecule back to its original state, one class of photochromes is thermally stable and uses light to drive the reversible isomerization in both directions. This class of photochromes, known as dithienylethenes (DTEs), are good candidates for molecular switches with their five enviable traits: intrinsic thermal stability of both isomers, fatigue resistance, high quantum yields approaching unity, picosecond response time to irradiation, and reactivity in the solid state. Incorporating DTEs into solid state materials requires careful design. While typical DTEs are synthesized with a cyclic ethene bridge to prevent E/Z isomerization; our group is focused on the development, synthesis, and characterization of a series of DTEs comprising a bulky acyclic biphenyl ethene bridge with the 3-thienyl moieties functionalized at the 5-position with imines or carboxylic acids. This functionalization at the 5-position of the thiophene will allow for integration into crystalline solids with conformational purity and enhanced crystallographic resolvability of the molecule using Single Crystal X-Ray Diffraction.