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Dynamic Covalent Functionalization as a route to Controlling Self Assembly of Organic Molecules

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Efforts to optimize the optoelectronic properties of conjugated organic materials are ongoing across many fields of science and engineering. For example, in bulk heterojunction polymer solar cells, researchers seek to optimize absorption of the solar spectrum by the active materials, form interpenetrating domains of p-type and n-type materials to facilitate exciton dissociation, and improve interactions between electrode, charge blocking layers, and active layers to ensure rapid charge transport. One advantage of organic polymers compared to inorganic materials (e.g., silicon), is the low cost and ability process the materials in solution. Moreover, assembly of conjugated organic materials in solution or in the solid state (i.e., films) can be used to optimize both a material's optoelectronic properties and its interface with surfaces and other materials, addressing many of the concerns listed above. Unfortunately, such solution processability requires appendage of insulating alkyl chains to the conjugated frameworks, which don solubility, but are also insulating and thus can hurt device performance. This presentation will report recent results from the Pentzer Lab from Case Western Reserve University on using functional alkyl chains that serve to control self-assembly, control interfaces with other materials, or can be removed by an external stimulus as a route to optimizing the materials for solar cell applications.