

Rigidifying and Coplanarizing Pi-Conjugated Molecules and Macromolecules

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Coplanar torsional conformation plays a key role in shaping the unique characteristics and functions of conjugated organic macromolecules. It is still an elusive task, however, to control the coplanar conformation of conjugated polymers for materials performance. We aim to establish general synthetic methodology and comprehensive structure-properties correlations of coplanar pi-systems, through synergistic approaches combining chemical synthesis, process engineering, and materials characterization. In order to achieve this goal, we have designed and implemented multiple strategies, including the use of non-covalent bridging bonds, the employment of dynamic covalent reactions, and the use of highly efficient annulation reactions. Efforts were also made to solve the challenges associated with low solubility of this class of materials for characterization and processing. Unique optical, electronic and mechanical properties of these new materials are investigated and optimized for advanced applications.

