Improved TTF Functionalization of Polymers for Two-Dimensional Charge-Transfer Networks

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Covalent conjugation of tetrathiafulvalene (TTF) moieties to macromolecular backbones combines unique properties of polymers, such as processability and high functional group density, with the outstanding redox properties of TTF to expand applications in organic electronics, chemical sensors, molecular switches, and nonlinear optical materials among others. Herein, we report the synthesis of a polymethacrylate backbone with 4-(hydroxymethyl)TTF (hmTTF) as the pendant group using post-polymerization modification of poly(*N*-hydroxysuccinimide methacrylate) to obtain the product polymer with a wide range of molecular weights ($18 \leq M_n \leq 126$ kDa) and up to ca. 70 mol% (76 wt%) TTF. The electrochemical and electronic properties of phmTTFMA are analogous to that of monomeric TTF. Film-forming phmTTFMA-based charge-transfer complexes (CTCs) with various electron acceptors including iodine, TCNQ, and chloranil showed an isotropic electrical conductivity. The magnitude of the conductivities of phmTTFMA-based CTCs is primarily affected by the electron affinity of the electron acceptors. The morphology of the amorphous phmTTFMA is strongly dependent on its electronic interactions with small-molecule electron acceptors. For example, a lamellar-like structure is observed when phmTTFMA is mixed with chloranil.

Automated Genome Mining Reveals Novel Peptide Structures, Expanding Ribosomal Natural Product Space

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Discovery of novel natural product scaffolds remains not only a promising strategy for the development of new therapeutics across all areas of medicine, but also a challenge in optimizing effort and minimizing rediscovery of known compounds. Leveraging the growing number of sequenced genomes against elucidated pathways in ribosomal post-translationally modified peptides (RiPPs), we have developed an algorithm to mine genomes for new lasso peptides. This system prioritized screening of bacterial strains, which allowed rapid screening and validation to yield several new natural products, significantly expanding this RiPP family. This genome mining platform offers an attractive method for discovering new natural products, and can be expanded for other classes of RiPPs.