Multiblock Nanofibers from Organic Electronic Materials

Zachary M. Hudson

Techniques for the assembly of hierarchical nanostructures from soft matter have opened the door to many new applications of nanotechnology. Despite these achievements, nanoscale syntheses which rely on self-assembly can be highly dependent on conditions such as solvent and temperature if the integrity of the nanomaterial is to be maintained. Bottlebrush copolymers provide a compelling bottom-up approach to the synthesis of hierarchical nanostructures from soft material, allowing for the preparation of multicompartent structures that remain nanosegregated by virtue of their covalent chemistry. Here we describe methods for the preparation of fiber-like nanomaterials that mimic the multilayer structure of organic electronic devices on individual polymer chains. Narrowly dispersed fibers are prepared from materials commonly used as the hole transport, electron transport, and host materials in organic electronics, with molecular weights on the order of $10^6$ Da. Finally, we use this approach to prepare nanofibers with the structure of multilayer organic devices on single macromolecules, and to reveal new photophysical properties enabled by this unique morphology.