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Supramolecular polymer brushes for Janus-like nano-objects and hierarchical self-assemblies

Polymer conformations and self-assemblies can be modularly controlled using bottlebrush-like architectures, where the side chain brushes are physically bonded to the polymer backbones. As the side chain brush molecules can be considered as solvents, the architecture is a specific case of polymer-solvent complexes. Competition between attractive and repulsive interactions is crucial for the self-assemblies. Here we describe recent approaches towards complex architectures and self-assemblies. We first describe triblock terpolymers polystyrene-block-poly(4-vinylpyridine)-block-poly(tert-butyl methacrylate) where the central block has been hydrogen bonded using rod-like 4-(4-pentylphenylazo)phenol molecules based on the relatively strong phenol-pyridine hydrogen bonds. It forms complicated ternary self-assemblies where the supramolecular phase forms cylindrical or lamellar confined self-assemblies within the interfaces between the polystyrene and poly(tert-butyl methacrylate) domains. Quaternization of pyridines and solvent manipulation allows cleaving of self-assembled Janus-objects. Halogen bonding has recently received considerable attention in supramolecular chemistry. Halogen bonding of rod-like 1-iodoperfluoroalkanes to star-shaped ethylene glycol-based low molecular weight polymers with amine hydrochloride end-groups allows smectic nanometric structures aligned up to micrometer length scale without external direction. Finally, we show that halogen bonding rod-like 1,8-diiodoperfluorooctane with the pyridines of polystyrene-block-poly(4-vinylpyridine) allows hierarchical self-assemblies and colloidal supramolecular fibers stabilized by halogen bonds.

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Preferred topic

Other

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