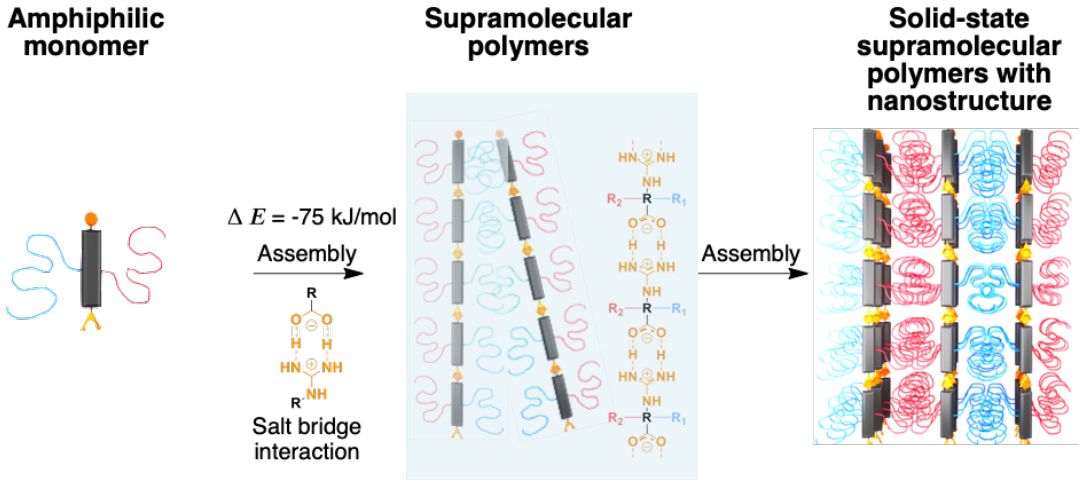
Solid-State Supramolecular Polymers with Ordered Nanostructure

○Zebin Su,[1] Hubiao Huang,[1] Takuzo Aida[1,2] ([1]*RIKEN Center for Emergent Matter Science, 2-1 Hirosawa, Wako, Saitama 351-0198, Japan.* [2]*Department of Chemistry and Biotechnology, School of Engineering, The University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-8656, Japan*)
Tel: +81-70-8430-3966, E-mail: zebin.su@riken.jp
Keywords: Supramolecular Polymer, Ordered Nanostructure, Self-Assembly, Microphase Separation

Supramolecular polymers are defined as polymeric arrays of monomeric units that are brought together by reversible and highly directional secondary interactions, resulting in polymeric properties in dilute and concentrated solutions.[1] Through the years, the research field of supramolecular polymers and their materials have grown to a new discipline in polymer science especially since novel functionalities were incorporated into these supramolecular polymers.[2,3] However, the solid-state behaviors of supramolecular polymers have been rarely explored. Here, I designed and synthesized a library of novel molecules (or monomers), which are attached with thermodynamically incompatible side chains. These monomers polymerized into supramolecular polymers via noncovalent salt-bridge interaction. These supramolecular polymers further self-assemble into various ordered nanostructures by microphase separation due to the thermodynamically incompatible side chains. The ordered nanostructures are unambiguously characterized by SAXS in reciprocal space and TEM in real space. This project makes significant progress in understanding the behaviors of solid-state supramolecular polymers, which shall be a crucial step toward using them as next-generation environmentally friendly materials.



References
[1]. T. Aida, *Isr. J. Chem.* **2020**, *60*, 33-47.
[2]. J. Kang, *Science* **2015**, *347*, 646-651.
[3]. P. K. Hashim, *Prog. Polym. Sci.* **2020**, *105*, 101250.