Triggering large property changes in stimuli-responsive supramolecular polymers

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Abstract

Supramolecular polymers are macromolecular assemblies of monomeric units held together via non-covalent interactions such as hydrogen bonding, metal-ligand complexation, host guest interactions or ion pairing.[1] The dynamic nature of supramolecular polymers makes them perfectly suited for the development of materials that enable stimuli-triggered functions including healing, chromism or changes in shape and stiffness.[2] Most supramolecular polymers reported in the literature are phase segregated systems consisting of a low glass transition temperature (Tg) phase and a crystalline hard phase, which physically cross-links the material and provides mechanical coherence.[3] This design approach provides access to elastomeric stimuli-responsive polymers in which the hard phase dominates the thermomechanical properties. Alternatively, phase-separation can be prevented if the supramolecular monomers are designed to assemble into amorphous, high-Tg networks, which display a completely different set of properties.[4] This contribution will discuss the use of both approaches in the synthesis of several new supramolecular polymer systems with the objective to make new functions accessible. Aspects that will be emphasized in this presentation include the structure-property relationships of the various designs, new materials that permit the in-situ formation of metal nanoparticles and the debonding on demand of supramolecular adhesives.

References

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