High-Performance reshapable bioinspired composite materials via dynamic supramolecular chemistry

Initiative: Integration molekularer Komponenten in funktionale makroskopische Systeme (beendet, nur noch Fortsetzungsanträge)

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Laufzeit: 3 Jahre

The project aims at developing strategies for (i) shaping/reshaping and (ii) flawless joining of films into bulk and gradient materials. The focus lies on hierarchical self-assembly strategies, combining molecular, polymer and colloidal length-scales to prepare waterborne, cm-scale nacre-mimetics (highly reinforced, layered nanocomposites) to achieve novel macroscopic properties by control of molecular interactions. The key scientific approach uses a library of homo- and hetero-arm star polymers with selected thermo-reversible supramolecular connectors at their end groups, tethered via adhesive catechols to high strength nanoplatelets. Heating induces a step-change dissociation of these supramolecular units leading to an order of magnitude transition from a hard, glassy network to a soft viscoelastic fluid (thermal self-healing)impossible to achieve for thermoplastics/- sets. This transition allows frictional sliding and bending of nanoplatelets and enables macroscopic deformation. Once cooled, supramolecular bonds reform and the new shape will be locked into place, recovering the original properties without residual internal strain.

Projektbeteiligte

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