

(Bio-Inspired) Stimuli-Responsive Materials

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Stimuli-responsive polymers, sometimes referred to as “smart”, “intelligent”, or “adaptive”, are macromolecular materials that change at least one property in response to an external stimulus, ideally in a specific and controlled manner. Somewhat like adaptive materials systems found in living organisms, such materials can offer a broad range of complex properties and (emergent) functions, for example mechanical morphing or actuation, healability, mechanochemical transduction, and many others. Due to their dynamic, stimuli-responsive nature, non-covalent interactions represent a versatile design element for the creation of stimuli-responsive polymers with unusual functions. This general approach is also widely used in Nature. The exploitation of particular nanostructures is another design element that has emerged in Nature to achieve specific functions. Several types of materials that rely on these general design approaches will be presented. Interactions that will be highlighted include hydrogen bonds and metal-ligand binding and such motifs were used to assemble small molecules, supramolecular polymers, nanoparticles, and combinations of these building blocks to create mechanically adapting, healable, and other responsive polymeric materials that mimic functions and/or design approaches encountered in Nature’s materials.

BIOGRAPHY



Christoph Weder is Professor of Polymer Chemistry and Materials and Director of the Adolphe Merkle Institute (AMI) at the University of Fribourg, Switzerland. Chris was trained in chemistry and materials science at ETH Zurich, before he joined the MIT as a postdoc. After a Habilitation at ETH he held a faculty position at Case Western Reserve University for nearly a decade, before joining the AMI in 2009. From 2014 to 2020 Chris served as founding director of the Swiss National Center of Competence in Research *Bio-Inspired Materials*. His research focuses on the design, synthesis and investigation of bio-inspired, stimuli-responsive polymers. Chris is an Associate Editor of *ACS Macro Letters*, a member of the Swiss Academy of Technical Sciences, and a Fellow of the American Chemical Society’s Division of Polymer Chemistry.