Simplifying the Synthesis of Smart Polymers and Actuators

Jiaojiao Shang,[1] Patrick Theato,[2,3,*]

[1]Institute for Technical and Macromolecular Chemistry, University of Hamburg, Hamburg, Germany
[2]Institute for Chemical Technology and Polymer Chemistry, Karlsruhe Institute of Technology (KIT), Karlsruhe, Germany
[3]Soft Matter Synthesis Laboratory, Institute for Biological Interfaces III, Karlsruhe Institute of Technology (KIT), Eggenstein-Leopoldshafen, Germany. *Correspondence:* *patrick.theato@kit.edu*

Polymers play an indispensible role in modern society, with applications ranging from clothing and packaging to smart materials. Incredible progress has been made in synthetic polymer chemistry to control the molecular structure and architecture of polymer chains. The development in this field is still very intense and dynamic, leading to ever increasing molecular complexity.
However, this increasing complexity on the molecular level demands for highly advanced specialists possessing the skillset to synthesize such chemical structures. This clearly limits or slows down the advancement to new scientific areas. Hence, we have addressed this challenge over the years by developing simple synthetic routes, while maintaining a molecular complexity, thereby providing the synthetic tools for many scientists to prepare highly functional smart polymer materials with unprecedented molecular precision.
Synthetic routes, possibilities, and opportunities for smart polymers will be discussed with the aim to develop polymeric actuators by simplest possible ways.

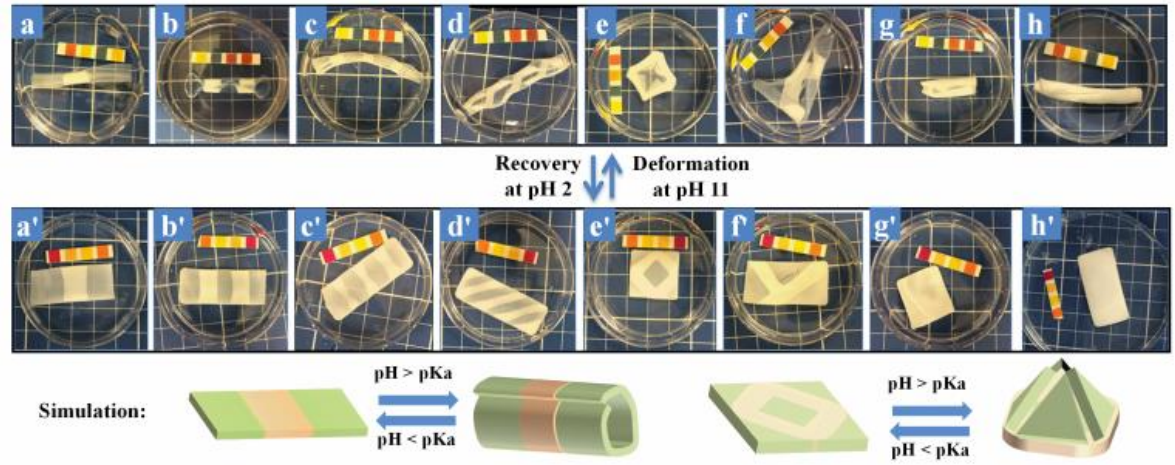

Fig. 1: Images of hydrogels: (a-g) correspond to bending deformation of the prepared hydrogels at pH 11, in which (a-f) are composite hydrogels composed of PNIPAM/PAA and PAA with a lateral inhomogeneity of within the hydrogel composition and dimension. (g) represents the full composite hydrogel PNIPAm/PAA. (h) is the bilayer hydrogel. (a′ -h′) stand for the recovery state upon pH 2 buffer solution from bent hydrogels at pH 11. The width of grids as the scale bar is 10 mm.

References

[1] J. Shang, P. Theato, ”A Smart composite hydrogel with pH-, ionic strength-and temperature-induced actuation” *Soft Matter* **14**, 8401-8407 (2018).