

Focus Session on

Structure and Dynamics of Responsive Hydrogels

organized by

Thomas Hellweg (Uni Bayreuth, thomas.hellweg@uni-bayreuth.de)

Regine von Klitzing (TU Berlin, klitzing@chem.tu-berlin.de)

Peter Müller-Buschbaum (TU München, muellerb@ph.tum.de)

in Regensburg / Germany at the 22th March 2010 in the framework of the spring meeting of the Division Condensed Matter of the Deutsche Physikalische Gesellschaft (DPG). The symposium is held by the division Chemical and Polymer Physics (CPP).

Synopsis of the symposium:

Responsive hydrogels are water-based cross-linked polymer networks that can be designed to expand and contract in response to various external stimuli such as temperature, pH, liquid composition, electric stimulation. Thermoresponsive aqueous polymer systems are known to exhibit large, reversible conformational changes in response to small thermal stimuli. Thermosensitive polymer materials, often called intelligent, can be used as actuators, artificial muscles, solute separators, drug delivery systems, thermoresponsive surfaces, light modulation systems, optical switching devices and molecular recognition agents.

Depending on the type of cross-links, physical and chemical gels are distinguished. Physical gels are held together by polymer chain entanglement and/or by attractive forces present between the network polymers, whereas in chemical gels the polymers are covalently cross-linked.

Thermosensitive systems are probably among the most studied hydrogels. Typical systems such as for example Poly(*N*-isopropylacrylamide) (PNIPAM) in water exhibit a phase transition at a lower critical solution temperature (LCST), which has been investigated by a variety of experimental techniques in the dilute and concentrated regimes. The LCST of PNIPAM in water is approximately at 32 °C and thus slightly less than body temperature, which makes PNIPAM a representative of environmental-sensitive polymers studied for biomedical applications. The temperature-driven change in the conformation of single PNIPAM chains and the macroscopic phase separation reflects rather subtle changes in polymer/water interactions, primarily the release of water molecules from a polymer hydration layer into bulk water. Several models have been described to account for the coil-to-globule collapse of PNIPAM in water and the complex water/PNIPAM phase diagram. At low temperatures, intermolecular hydrogen bonds between water and polar groups of PNIPAM solubilize the polymer. Above LCST the hydrogen bonds break and hydrophobic associations between the collapsed polymer chains take place.

In thin films, micro- and nano-particles the complexity of hydrogels is even increased and especially multiresponsive gel-nanoparticle hybrids offer completely new perspectives with respect to applications but also in fundamental research. For biology related applications, hydrogel films are of importance due to the ability to accommodate proteins and membranes.

This symposium addresses students, experienced researchers and senior scientists working in the field of and exploiting the potentials of responsive hydrogels. Aim of the symposium is to present the state of the art in this class of materials, to highlight new experimental and theoretical developments and to allow for discussions among experts about latest trends and ideas.

Invited talks will provide an overview of dedicated topics of responsive hydrogels. In special contributed lectures each topic will be deepened and illustrated by additional examples. A large poster session concludes the symposium. The symposium language is English.

Invited speakers:

Francoise Winnik (Universite de Montreal)
L. Andrew Lyon (Georgia Tech, Atlanta) - (to be confirmed)
Walter Richtering (RWTH Aachen)
Matthias Ballauff (HZB, Berlin)

Registration:

The registration for the focus session is embedded in the registration for the spring meeting of the Deutsche Physikalische Gesellschaft (DPG).

To register your contribution (submission of abstract), please follow the link

<http://www.dpg-tagung.de/r10/submission.html?language=en>

which directs you to the Contribution Submission

and select: CPP Chemical and Polymer Physics Division

followed by pressing the 'Next step: submission form' button

and in topic select: Focus: Structure and Dynamics of Responsive Hydrogels

Additional info: <http://regensburg10.dpg-tagungen.de/index.html?lang=en&>