Polymers under Multiple Constraints

Polymer- & Soft-Matter-Seminar

Sonderveranstaltung

Thursday, 26nd October 2017

at: **5.15pm**

VDP4 1.27, Von-Danckelmann-Platz 4, 06120 Halle

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"Molecular Force Sensors: from molecular mechanisms towards applications in biology and materials science"

Biological systems are highly sophisticated smart materials. They are stimuli-responsive and possess impressive self-reporting and self-healing properties. They are consequently an important source of inspiration for materials scientists who aim to implement these properties in synthetic and biomimetic materials. In this context, we are specifically interested in (bio)molecules that act as molecular force sensors. In biological systems, these sensors detect a mechanical stimulus and convert it into a biochemical signal. Mimicking their natural counterparts, a number of different force sensors have been designed and synthesized in recent years that generate an optical output (fluorescence). Following a calibration of their mechanical properties, these artificial force sensors can report on molecular forces in situ in a highly sensitive manner.

In this lecture, I will summarize our efforts towards designing and characterizing molecular force sensors, focusing on two classes of force sensors that are based on fundamentally different molecular mechanisms: The first class utilizes biological molecules that form thermodynamically stable, non-covalent interactions, such as short, double-stranded DNA duplexes or coiled coil interactions. These force sensors report on forces in the range between 10-200 piconewton, making them ideal candidates for applications in biological systems. The second class is based on covalent bonds, which require forces above 400 pN to become activated. One example is the mechanical activation of triazoles as they are formed in a typical 'click chemistry' reaction. With these molecular force sensors at hand, our goal is to utilize these sensors for detecting cellular traction forces or for visualizing force propagation pathways in polymeric materials.