Seminar

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Dynamics of transient networks from macro- and supramolecular polymers

In addition to macromolecules with solely covalent bonds, supramolecular polymers possess non-covalent bonds which are typically highly directional and reversible interactions between subunits, thus offering intrinsic “self-healing” mechanisms. Various types and applications of polymeric networks, e.g. biogels, will first be introduced in the presentation on our current research projects in the field of molecular structure influence on physical properties.

For the main study poly(ethylene-oxide) is used as matrix material for the metallo-supramolecular networks, which is a water-soluble and non-cytotoxic polymer with many medical and pharmaceutical as well as in food and cosmetics applications. Linear and star shaped chain architectures have been compared to supramolecular gel networks with metal-ligand bonding. These specific systems for connecting covalent macromolecular precursors are based on transition metal-bis-terpyridine complexes as model systems to test the dynamics and stimuli responsive behaviour on well-defined supramolecular architectures, such as star networks. The strength of the network is determined by the metal-ligand interactions, e.g. iron and nickel being much stronger than zinc. Metal-ligand associations can increase the gel relaxation time as well as elastic modulus by several orders of magnitude compared to the unmodified matrix polymer. Furthermore, the melting and crystallisation behaviour is investigated regarding the influence of end-groups and bonding since chain folding and local mobility govern the morphology in lamellar crystals.

Wednesday, November 16, 14h15

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