



## Polymers under Multiple Constraints

# Polymer- & Soft-Matter-Seminar

## Prof. Dr. Ulrich Wiesner

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### “Structure formation and function via molecules at organic-inorganic nanomaterial interfaces”

Tuesday,  
17<sup>th</sup> December  
2019

at: 5.15pm

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

Interfaces play a crucial role both in fundamental structure formation processes as well as function and properties of organic-inorganic composite nanomaterials. This talk will provide an overview of the chemistry and physics of such functional nanohybrids based on organic molecule self-assembly phenomena of low molar mass surfactants as well as macromolecular block copolymers. These phenomena are used to structure direct various classes of periodically porous inorganic solids, including insulators, semiconductors, metals, and superconductors. Work will cover structure formation at or close to the thermodynamic equilibrium as well as approaches where systems are systematically driven away from equilibrium. Experiments will be compared to theoretical predictions to provide physical insights into formation principles and specific properties. The aim of the described work is to understand the underlying fundamental chemical, thermodynamic and kinetic formation principles as well as nanostructure-property correlations enabling generalization of results over a wide class of materials systems. It will be shown that the distinction between soft condensed and hard condensed matter physics is starting to blur in these materials as concepts established for atomically crystalline solids are being translated to mesoscopically periodic crystalline solids derived from soft matter self-assembly. Such materials exhibit a wealth of new physics ranging from optics/nanophotonics to charge transport to quantum phenomena including superconductivity and topologically protected quantum states. Where possible, the talk will try to close the loop from fundamental aspects of advanced materials all the way to applications, ranging from nanomedicine to separation processes to energy storage and conversion.

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