



UNIVERSITÄT  
DES  
SAARLANDES

Fakultät 7  
Physik und  
Mechatronik

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## **“Nucleation of Ordered Phases in Block Copolymers“**

**Thursday, December 8th, 2011, 4:15 p.m.  
Building C6 3, Lecture Hall II**

Spontaneous formation of ordered structures from amphiphilic molecules has attracted tremendous attentions in the last decades. Among the many different amphiphilic systems, block copolymers with their rich phase behaviour and ordering transitions have become a paradigm for the study of structural self-assembly. For the simplest case of diblock copolymers, which are linear polymers composed of two different sub-chains (A and B blocks), a variety of ordered bulk phases, including lamellae, hexagonally-packed cylinders, body-centered-cubic spheres and a bicontinuous network structure called gyroid, are observed. Theoretical studies of block copolymer phase behavior have been mostly within mean-field approximation, which is capable of describing many of the observed phases. Our recent study is aimed at the understanding of the kinetic pathways of the order-order transitions in block copolymers. As a first step, a linear stability analysis of ordered phases has been performed to determine their metastable region. When the system is in a metastable region, phase transitions proceed via nucleation and growth process. The nucleation of a droplet of stable phase from a metastable phase is examined theoretically. Specifically, nucleation of various ordered phases in block copolymers is studied by examining the free energy landscape within the self-consistent field theory. The minimum energy path (MEP) connecting two ordered phases is computed using a recently developed string method. The shape, size and free energy barrier of critical nuclei are obtained from the MEP, providing information about the emergence of a stable ordered phase from a metastable phase. In particular, structural evolution of embryonic gyroid nucleus is predicted to follow two possible MEPs, revealing an interesting transition pathway with an intermediate perforated layered structure.

Christian Wagner (3003) takes care of the guest

**Interested people are cordially invited**

**Coffee at 4:00 p.m. in front of the Lecture Hall**

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