Atelier
« Ordre partiel dans les matériaux : analyse, simulations et sujets connexes »
21—30 juin 2016

Workshop
"Partial order in materials: Analysis, simulations and beyond"
June 21—30, 2016

Low density phases in geometric and phase field models of uniformly charged liquids

Cyrill Muratov[*]

muratov@njit.edu

This talk is concerned with the macroscopic behavior of global energy minimizers in the three-dimensional Ohta—Kawasaki model of diblock copolymer melts. The model represents a paradigm for energy-driven pattern forming systems in which spatial order arises as a result of the competition of short-range attractive and long-range repulsive forces. We are interested in the large volume behavior of minimizers in the low volume fraction regime, in which one expects the formation of a periodic lattice of small droplets of the minority phase in a sea of the majority phase. Under periodic boundary conditions, we prove that the considered energy Γ-converges to an energy functional of the limit "homogenized" measure associated with the minority phase consisting of a local linear term and a nonlocal quadratic term mediated by a screened Coulomb kernel and exhibiting a transition from trivial to nontrivial minimizers. Asymptotically, the mass of the minority phase in a nontrivial minimizer spreads evenly across the domain. For the minimizers of the associated geometric variational problem, we also prove that the energy density distributes uniformly across the domain as well, and that minimizers appear as a uniformly distributed array of droplets, most of which minimize the energy density for the volume constrained whole space problem.

This is joint work with H. Knuepfer and M. Novaga.

[*]Department of Mathematical Sciences, University Heights, NJIT, Newark, NJ 07102, USA .