

MATHEMATICS COLLOQUIUM

The Ohta–Kawasaki theory of diblock copolymers: A mathematical study.

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In a diblock copolymer molecule a sub-chain of A-monomers is grafted covalently to a sub-chain of B-monomers. Because of the repulsion between the unlike monomers, the different sub-chains segregate locally to form a morphology pattern/phase of A-rich and B-rich micro-domains. The density functional theory of Ohta and Kawasaki views the free energy as a functional of the A-monomer density field. The unusual feature of this functional is a nonlocal relationship between the free energy field and the monomer density field.

The Euler-Lagrange equation of this functional is a singularly perturbed integro-differential equation, which can also be written as an elliptic PDE system. Using rigorous mathematical techniques such as Gamma-convergence, finite dimension reduction, critical eigenvalue analysis, and bifurcation we find solutions with various shapes of interfaces that separate A-rich micro-domains from B-rich micro-domains. Examples of these interfaces include lamellar interfaces, wriggled lamellar interfaces, circular interfaces, and wriggled circular interfaces.

Date: Monday, January 30, 2006
Time: 3:00pm-4:00pm
Place: MAGC 1.410

Refreshments will be served at 2:50pm.

For further information or for special accommodations, contact Dr. Karen Yagdjian at 381-2145, via email at yagdjian@utpa.edu, or visit www.math.panam.edu/colloquia.html