SYNP 1 Noneqilibrium Phenomena in Soft Condensed Matter

Time: Tuesday 09:30–10:30 Room: HSZ 04

Invited Talk

SYNP 1.1 Tue 09:30 HSZ 04

Rising plumes, layering transitions and squeeze-out patterns in soap films — •Steffen Berg[1,2] and Sandra M. Troian[1] — [1]Dept. of Chemical Eng., Princeton University, Princeton, NJ, USA — [2]Shell International Exploration and Production B.V., Kesslerpark 1, 2288 GS Rijswijk (ZH), The Netherlands

In free-standing *microscale* soap films containing surfactant micelles an instability near the film borders creates moving patterns that resemble rising "lava plumes" [1]. Our recent studies indicate that these moving patterns contribute to the drainage dynamics as a rate-determining mechanism impacting on the scaling exponent of the film thickness as function of time $h(t)$ [2]. Aqueous *nanofilms* comprised of micelle-polymer complexes under confinement reveal two novel instabilities linked to the degree of association. The first, triggered by the final thinning transition, generates constant growth fractal patterns whose dimension correlates with the bulk viscosity. A mapping to the Saffman-Taylor instability [3] reveals the critical viscosity contrast for phase segregation. A secondary instability for high polymer molecular weights causes the fractal phase to self-assemble into a macroscopic array of flattened nanodroplets with distinct 4-fold packing symmetry.

[1] K. J. Mysels, K. Shinoda and S. Frankel *Soap Films, Studies of Their Thinning*; Pergamon Press: New York, 1959.
[2] S. Berg, E. A. Adelizzi and S. M. Troian, Langmuir **21**, 3867 (2005).
[3] P. G. Saffman and G. I. Taylor, Proc. Roy. Soc. London, Ser. A **245**, 312 (1958).

Invited Talk

SYNP 1.2 Tue 10:00 HSZ 04

Computer simulation of block copolymers under external fields — •A.V. Zvelindovsky — Centre for Materials Science, Department of Physics, Astronomy & Mathematics, University of Central Lancashire, Preston, PR1 2HE, United Kingdom

Physics of micro-phase separation in various block copolymer systems is investigated by means of dynamic self-consistent field simulation. The emphasis of this talk will be given on dynamics of systems subjected to external fields. Several examples will be discussed. The first example gives a picture of dynamic rearrangement of various structures (lamellar, hexagonally packed cylinders, spherical micelles) in the applied electric field. The second is illustrating kinetics of surface phase transitions in confined systems (thin films). Next, we discuss micro-phase transformation under temperature change. Results on soft confinement (vesicle formation and membrane fusion) will be reported as well.