Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Spontaneous Formation of Nanopatterns in Velocity-Dependent Dip-Coated Organic Films: From Dragonflies to Stripes P. HUBER, Institute of Materials Physics and Technology, Hamburg University of Technology, M. BAI, Department of Physics and Astronomy, University of Missouri (USA), V. DEL CAMPO, P. HOMM, P. FERRARI, A. DIAMA, Facultad de Fisica, Pontificia Universidad Catolica de Chile, C. WAGNER, Experimental Physics, Saarland University (Germany), H. TAUB, Department of Physics and Astronomy, University of Missouri (USA), K. KNORR, Experimental Physics, Saarland University (Germany), M. DEUTSCH, Physics Department and Institute of Nanotechnology and Advanced Materials, Bar-Ilan University (Israel), M. RETAMAL, U. VOLKMANN, T. CORRALES, Facultad de Fisica, Pontificia Universidad Catolica de Chile — We present the structure of thin, n-alkane films on the oxide layer of a silicon surface, prepared by dip-coating in a n-$C_{32}H_{66}$/n-heptane solution. Electron micrographs reveal two adsorption morphologies depending on the substrate withdrawal speed v. For small v, dragonfly-shaped molecular islands are observed. For a large v, stripes parallel to the withdrawal direction are observed. These have a few hundred micrometer lengths and a few-micrometer lateral separation. With increasing v, the surface coverage first decreases, then increases for $v > v_{cr} \sim 0.15$ mm/s. The critical v_{cr} marks a transition between the evaporation regime and the entrainment regime. The stripes' strong crystalline texture and the well defined separation are due to an anisotropic 2D crystallization in narrow liquid fingers, which presumably results from a Marangoni-flow-driven hydrodynamic instability in the evaporating dip-coated films.

Patrick Huber
Institute of Materials Physics and Technology,
Hamburg University of Technology

Date submitted: 31 Jul 2015 Electronic form version 1.4