Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Superlubric-pinned Aubry transition of two dimensional monolayers in optical lattices.[1] DAVIDE MANDELLI, SISSA, Trieste, ANDREA VANOSSI, CNR-IOM Democritos and SISSA, Trieste, NICOLA MANINI, University of Milano, ERIO TOSATTI, SISSA and ICTP, Trieste — Two-dimensional (2D) crystalline colloidal monolayers sliding over a laser-induced optical lattice "corrugation" potential emulate friction between ideal crystal surfaces. Static friction is always present when the monolayer and the optical lattices are commensurate, but when they are incommensurate the presence or absence of static friction depends upon the system parameters. In 1D, at the Aubry dynamical phase transition the static friction goes continuously from zero (superlubricity) to finite as the periodic corrugation strength is increased. We look for the Aubry-like transition in the more realistic 2D case of a monolayer in an incommensurate periodic potential using molecular dynamics simulations. Results confirm a clear and sharp 2D superlubric-pinned transition upon increasing corrugation strength. Unlike the 1D Aubry transition which is continuous, the 2D transition is first-order, with a jump of static friction. At the 2D Aubry transition there is no change of symmetry, a sudden rise of the colloid-colloid interaction energy, and a compensating drop of the colloid-corrugation energy. The observability of the superlubric-pinned colloid transition is proposed and discussed [1]. [1] D. Mandelli, et al., Phys. Rev. B, to be published (2015).

[1]This work has been supported by ERC Advanced Grant N. 320796 MODPHYSFRICT.

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Date submitted: 06 Nov 2015 Electronic form version 1.4