Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Depinning transition and 2D superlubricity in incommensurate colloidal monolayers[1] DAVIDE MANDELLI, SISSA, Trieste, Italy, ANDREA VANOSSI, CNR-IOM Democritos, and SISSA, Trieste, Italy, NICOLA MANINI, Universita di Milano, Milano, and SISSA, Trieste, Italy, ERIO TOSATTI, ICTP, and CNR-IOM Democritos, and SISSA, Trieste, Italy — Colloidal monolayers sliding over periodic corrugated potential are highly tunable systems allowing to visualize the dynamics between crystalline surfaces [1]. Based on molecular dynamics, Vanossi and coworkers [2] reproduced the main experimental results and explored the potential impact of colloid sliding in nanotribology. The degree of interface commensurability was found to play a major role in determining the frictional properties, the static friction force Fs becoming vanishingly small in incommensurate geometries for weak corrugation U0.Lead by this result,here we systematically investigate the possibility to observe a 2D Aubry-like transition [3] from a superlubric state to a pinned state for increasing U0. By using a reliable protocol, we generate annealed configurations at different values of U0 for an underdense monolayer. We find Fs to be vanishingly small up to a critical corrugation Uc coinciding with an abrupt structural transition in the ground state configuration. Similarly to what is observed in the Frenkel Kontorova model,this transition is characterized by a significant decrease in the number of particles sampling regions near the maxima of the substrate potential.

[1] T. Bohlein, Nat. Mat.,11,126; [2] A. Vanossi, PNAS USA,109,16426; [3] S. Aubry, Phys.D,8,381.

[1]Research partly sponsored by Sinergia Project CRSII2 136287-1 and ERC 2012ADG320796 MODPHYSFRICT.

Davide Mandelli
SISSA, Trieste

Date submitted: 15 Nov 2013 Electronic form version 1.4