Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Sorting Category: 03.1.14 (E)

Unjamming of amorphous films probed with a transverse shear ultrasonic oscillator JULIEN LEOPOLDES, GUILLAUME CONRAD, XIAOPING JIA, Université Paris Est, France, LPMDI TEAM — Friction between solids depends essentially on the response of the interfacial amorphous layer to shear and compressive stresses. Hence, the transition from static to dynamic friction corresponds to the unjamming transition of confined amorphous materials [1]. With a shear ultrasonic oscillator, we study the boundary lubrication due to molecular films confined between a plane and a sphere [2]. We observe a linear viscoelastic behaviour at low oscillation amplitude and a nonlinear frictional microslip regime at high amplitude. In a new set of experiments, the system is brought near the unjamming transition by applying a static force. The interfacial layer softens before unjamming, as indicated by the linear response of the oscillator. We suggest an interpretation based on a stress-induced decrease of the free volume, and propose a corresponding heuristic model. Last, we show how ultrasonic in-plane oscillations of ~ 10 nm amplitude can trigger unjamming, and we discuss the possible related mechanisms.

[1] P. Thomson and G. Grest and M.O. Robbins, Phys. Rev. Lett **68**, 3448 (1992)
[2] J. Léopoldès and X. Jia, Phys. Rev. Lett **105**, 266101 (2010)

[X] Prefer Oral Session
[ ] Prefer Poster Session

Julien Leopoldes
julien.leopoldes@univ-mlv.fr
Université Paris Est, France

Date submitted: 08 Dec 2011 Electronic form version 1.4