ESPCI
Laboratoire PMMH
10 rue Vauquelin, 75231 Paris Cedex 05

Séminaire PMMH

Bureau d'Études, Bâtiment L, 2 ème étage

Vendredi 13 mai 2016, 11h00-12h00

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Friction at micro and macro-scale

Friction is a common phenomenon that occurs when to objects are force to move tangentially relatively to each other. During this seminar, we shall present two series of experiments concerning friction at macro and micro-scale.
In a first set of experiment [1], we will study the aptitude of surface with anchored polymer chains to transmit stress through the interface. More precisely, we investigate the friction of a PDMS elastomer sliding on a brush of the same polymer in the dynamical regime, as a function of sliding velocity, grafting density and molecular weight of the tethered chains. At high density, the chains are confined outside the elastomer and the rheology of the thin layer can be studied.
In a second set of experiment, we will focus on another question related to friction : why can we hold a car with two interleaved phonebooks. We have studied the force needed to separate two books as a function of the number of sheets, the thickness of the sheets, and the interleaving distance in a systematic way [2]. We have shown that the strength of the system is due to the operator : the person, car, truck amplifies any small friction arising from the normal force acting on the boundaries of the stack. We have proposed for the first time a model that captures all the data into a single mastercurve. The study of this complex network provides insight into friction with some connections to MEMS, mooring a ship, interactions between DNA and bacteriophage capsid, and even a toy known as the Chinese finger trap.

[1] C. Cohen, F. Restagno, C. Poulard, and L. Léger, Soft Matter 7, 8535 (2011).
[2] H. Alarcón, T. Salez, C. Poulard, J.-F. Bloch, É. Raphaël, K. Dalnoki-Veress, and F. Restagno, Phys. Rev. Lett. 116, (2016).