46th Leeds-Lyon Symposium on Tribology - September 2-4, 2019, Lyon, France

FRICTIONAL SLIDING OF AN ELASTOMERIC/GLASS CONTACT: EXPERIMENTAL STUDY OF REAL CONTACT AREA

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KEYWORDS
Friction; Experiments in tribology; Contact and adhesion; Real Contact Area.

ABSTRACT
Contact mechanics of elastomers is a crucial issue in many daily applications [1] (e.g. road/tire, shoe/ground or piston /syringe contact) all the more so as new needs have been identified in emerging fields like haptic devices, flexible electronics and remote surgery.

In this context, we studied the dynamics of elastomer/glass contacts near the transition between static and kinetic friction. We carried out experiments on a laboratory-built tribometer (Figure 1a) [2] that allows in-situ imaging and high resolution measurement of the evolution of the real contact area on model sheared interfaces.

Firstly, we study the evolution, under increasing shear, of the real area between a crosslinked polydimethylsiloxane (PDMS) sphere and a smooth glass plate, for a wide range of normal forces, from -0,001N to 5N. We observe a significant anisotropic reduction of the contact area with the increase of the tangential force (Figure 1b). We compare those results with a recent fracture based adhesive models from the literature [3].

Secondly, we report experimental observations and quantitative measurement on how a small initial misalignment of the glass plate can strongly affect the contact dynamics.

Finally, these results on the frictional behavior of single elastomeric contacts represent the necessary basis for designing more complex functional multi-asperity interfaces.

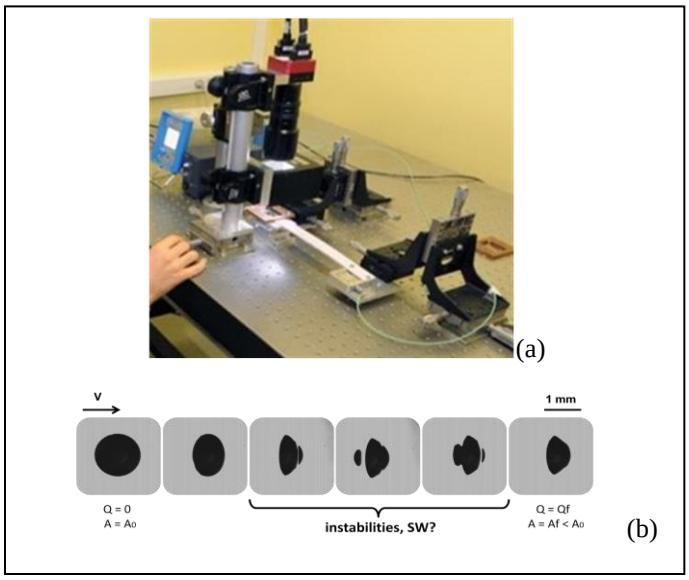

Fig.1 In-situ visualization tribometer (a). Evolution of the contact area morphology (in black) in a PDMS/Glass interface during shearing (b).

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