Controlling rubber friction: effect of the coating thickness

G. Pallares[1*], R. Sahli[1], I. Ben Ali[2], S. Al Akhrass[2], J. Scheibert[1]

*1.Laboratoire de Tribologie et Dynamique des Systèmes, UMR5513, CNRS / Ecole Centrale de Lyon, Ecully, France, *Corresponding author: gael.pallares@ec-lyon.fr*
2.Ingénierie des Matériaux Polymères, UMR5223, CNRS / Université Lyon 1, Villeurbanne, France

MOTS CLES

rubber, static friction, static shear strength, plane on plane contact, sphere on plane contact, elastomeric coating, film thickness

ABSTRACT

There are many common situations where contact interfaces involving elastomers are used for adhesion and/or friction functions: for example in tire/road contacts in the automotive or plunger/syringe contacts in medicine. For decades, a growing interest has developed in controlling the friction through surface modification (see e.g. [1]), with the main effort being on topographical features (see e.g. [2]). Here, we present an experimental investigation of the changes in friction at the contact between a rubber sample(smooth sphereor rough plane) and a glass plate coated with a rubber film of variable thickness.

We first show that the coating plays a key role in the rupture properties of the contact interface: thestatic shear strength(sphere-on-plane contact)and the static friction coefficient (plane-on-plane contact) increase when the thickness is varied. We interpret these results as the sum of two contributions: a surface dissipation due to friction at the interface and a volume dissipation resulting from the rubber viscoelasticity. We then show how to exploit this volume dissipation through the example of a spatially heterogeneous coated surface.

Références

[1] K. Holmberg, H. Ronkainen, A. Laukkanen, K. Wallin, Friction and wear of coated surfaces - scales, modelling and simulation of tribomechanisms, Surface and Coatings Technology. **202** (2007) 1034
[2] A. Jagota, C.-Y. Hui, Adhesion, friction, and compliance of bio-mimetic and bio-inspired structured interfaces, Materials Science and Engineering: R: Reports, **72** (2011) 253