Metainterfaces: designing rough contacts that obey specified friction laws

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Many devices, including touchscreens and robotic hands, involve frictional contacts. Optimizing those devices requires fine control of the interface's friction law. We lack systematic methods to create dry contact interfaces whose frictional behaviour satisfies preset specifications. In this talk, I will present a generic surface design strategy to prepare dry rough interfaces that have predefined relationships between normal and friction forces [1]. Such metainterfaces circumvent the usual multiscale challenge of tribology [2], by considering simplified surface topographies as assemblies of spherical asperities. Optimizing the individual asperities' heights enables specific friction laws to be targeted. Through various centimeter-scaled elastomer-glass metainterfaces, I will illustrate different types of achievable friction laws, including linear laws with a specified friction coefficient and unusual non-linear laws. This design strategy represents a scale- and material-independent, chemical-free pathway toward energy-saving and adaptable smart interfaces.

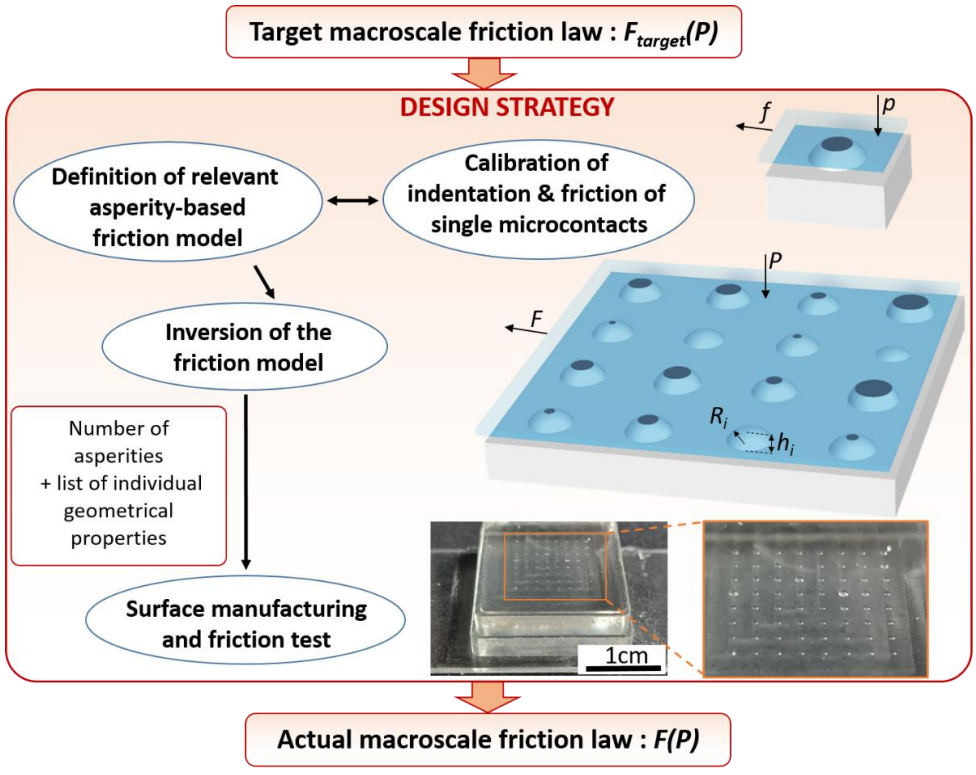

Figure 1 Flowchart of the design strategy for metainterfaces with specified friction laws [1].

References :

[1] A. Aymard, E. Delplanque, D. Dalmas, J. Scheibert, Science 383 (2024) 200-204.

[2] A. I. Vakis, et al., Tribology International 125 (2018) 169-199.

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