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Stiffness-guided motion of a droplet on a solid substrates

JUNE, 12

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Seminar room S2.02
CEITEC BUT, Purkynova 123

A range of technologies require the directed motion of nanoscale droplets on solid substrates. A way of realizing this effect is durotaxis, whereby a stiffness gradient of a substrate can induce directional motion without requiring an energy source. In biology, directed droplet motion on gradient substrates of tissue is also known to determine a number of crucial processes in eukariotic cells pertinent to evolution.

In a series of computer experiments with nano-droplets on substrates with variable stiffness, carried out by means of Molecular Dynamics simulations [1], we have found that durotaxis' efficiency is determined by a delicate balance of the stiffness gradient strength, degree of surface wettability, and even by the size of the droplets themselves. Our results establish the change in interfacial energy between the droplet and substrate as the driving force for durotaxis, and we anticipate that this work will provide further insight into the mechanisms of nanoscale directional motion that has general implications in novel technologies and applications in biology and health care.

[1] P. E. Theodorakis , S. A. Egorov , and A. Milchev, J. Chem. Phys. 146, 244705 (2017)