How slippery are water-repellent surfaces? (w/ Video)

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Scientists at Aalto University have measured the low but non-zero friction of droplets moving on slippery water-repellent surfaces.

In their article published in *Nature Communications*, the researchers placed a water droplet containing magnetic nanoparticles on a water-repellent superhydrophobic surface and observed its oscillation in a magnetic field. The oscillation amplitude of the droplet decreases, as caused by the friction between droplet and surface. By modelling of the droplet motion, it was possible to extract information on the friction and kinetic energy dissipation.

For many years researchers have observed that water droplets easily slide from superhydrophobic surfaces, but so far no suitable methods could probe the friction accurately.

"It is remarkable that our method for measuring slipperiness becomes even more sensitive the lower the friction is," said Dr. Robin Ras of Aalto University. "Furthermore, unlike any previous method, we are able to discriminate between two sorts of friction, namely friction caused by viscous effects and contact angle hysteresis."

Water-repellent superhydrophobic materials have huge potential for self-cleaning applications, where surfaces do not get dirty. The first superhydrophobic surfaces are already on the market, such as self-cleaning clothing, and it is anticipated that they become more and more important in various technologies. Also superhydrophobic surfaces are

appealing for microfluidics, where tiny amounts of liquid flow through channels for lab-on-a-chip applications.

"To develop superhydrophobic technologies further, it is important to know the friction droplets experience on these surfaces, and our method will contribute to that," explains Dr. Jaakko Timonen. "The compatibility to conventional contact angle meters will hopefully facilitate widespread use of our method."

The article is titled "Free-decay and resonant methods for investigating the fundamental limit of superhydrophobicity".

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Provided by Aalto University