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Superhydrophobicity enhancement through substrate flexibility¹ THOMAS VASILEIOU, JULIA GERBER, JANA PRAUTZSCH, THOMAS SCHUTZIUS, DIMOS POULIKAKOS, ETH Zurich — Inspired by manifestations in nature, micro/nanoengineering superhydrophobic surfaces has been the focus of much work. Generally, hydrophobicity is increased through the combined effects of surface texturing and chemistry; being durable, rigid substrate materials are the norm. However, many natural and technical materials are flexible, and the resulting effect on hydrophobicity has been largely unexplored. Here, we show that the rational tuning of flexibility can work collaboratively with the surface micro/nanotexture to enhance liquid repellency performance, defined by impalement and breakup resistance, contact time reduction, and restitution coefficient increase. Reduction in substrate stiffness and areal density imparts immediate acceleration and intrinsic responsiveness to impacting droplets, mitigating the collision and lowering the implement probability by $\sim 60\%$ without the need for active actuation. We demonstrate the above discoveries with materials ranging from thin steel or polymer sheets to butterfly wings.

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