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Hierarchical roughness of sticky and non-sticky superhydrophobic surfaces MUHAMMAD AKRAM RAZA, STEFAN KOOIJ, AREND VAN SILFHOUT, HAROLD ZANDVLIET, BENE POELSEMA, University of Twente, PHYSICS OF INTERFACES AND NANOMATERIALS TEAM — The importance of superhydrophobic substrates (contact angle $>150^\circ$ with sliding angle $<10^\circ$) in modern technology is undeniable. We present a simple colloidal route to manufacture superstructured arrays with single- and multi-length-scaled roughness to obtain sticky and non-sticky superhydrophobic surfaces. The largest length scale is provided by (multi-)layers of silica spheres (1μm, 500nm and 150nm diameter). Decoration with gold nanoparticles (14nm, 26nm and 47nm) gives rise to a second length scale. To lower the surface energy, gold nanoparticles are functionalized with dodecanethiol and the silica spheres by perfluorooctyltriethoxysilane. The morphology was examined by helium ion microscopy (HIM), while wettability measurements were performed by using the sessile drop method. We conclude that wettability can be controlled by changing the surface chemistry and/or length scales of the structures. To achieve truly non-sticky superhydrophobic surfaces, hierarchical roughness plays a vital role.

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