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"Nanonails" – a Simple Geometrical Approach to "Superlyophobic" Surfaces TOM KRUPENKIN, AMIR AHUJA, ASHLEY TAYLOR, ALEX SIDORENKO, TODD SALAMON, EDGAR LABATON, Bell Labs, Lucent Technologies — Modern nanofabrication techniques allow creation of a wide range of sophisticated surface topographies that strongly enhance wetting properties of solids. Such surfaces serve as a basis for so-called superhydrophilic and superhydrophobic materials that demonstrate a range of remarkable properties. In both of these cases the topography acts to "amplify" the type of wetting behavior, which is already determined by the surface energies of the liquids and solids involved. In this work we propose and experimentally demonstrate a unique three-dimensional nanoscale geometry that dramatically extends the influence of topography on the wetting properties of the substrate. Using this approach we are able to transform ordinary Teflon-like fluoropolymer surfaces, which are readily wetted by the majority of common low-surface tension liquids into nanostructured substrates with profound superlyophobic behavior. The resulting surfaces are essentially non-wetting and support highly mobile liquid droplets with contact angles close to 150° for a wide variety of liquids with surface tensions ranging from 72.0 mN/m (water) to 21.8 mN/m (ethanol). The proposed approach provides a simple, material-independent method for creating practically useful superlyophobic surfaces.

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