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Superhydrophobic Behavior on Nano-structured Surfaces[1]
DANIEL SCHAEFFER, Brigham Young University-Idaho — Superhydrophobic behavior is observed in natural occurrences and has been thoroughly studied over the past few years. Water repellant properties on uniform arrays of vertically aligned nano-cones were investigated to determine the highest achievable contact angle (a measure of water drop repellency), which is measured from the reference plane on which the water drop sits to the tangent line of the point at which the drop makes contact with the reference plane. At low aspect ratios (height vs. width of the nano-cones), surface tension pulls the water into the nano-cone array, resulting in a wetted surface. Higher aspect ratios reverse the effect of the surface tension, resulting in a larger contact angle that causes water drops to roll off the surface. Fiber drawing, bundling, and redrawing are used to produce the structured array glass composite surface. Triple-drawn fibers are fused together, annealed, and sliced into thin wafers. The surface of the composite glass is etched to form nano-cones through a differential etching process and then coated with a fluorinated self-assembled monolayer (SAM). Cone aspect ratios can be varied through changes in the chemistry and concentration of the etching acid solution. Superhydrophobic behavior occurs at contact angles $>150^\circ$ and it is predicted and measured that optimal behavior is achieved when the aspect ratio is 4:1, which displays contact angles $\geq 175^\circ$.

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