STEVENS INSTITUTE of TECHNOLOGY
THE INNOVATION UNIVERSITY

University Seminar Series

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Designing Robust Omnophobic Surfaces

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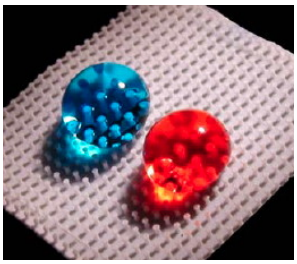
ABSTRACT

Superhydrophobic surfaces with water contact angles greater than 150° and low contact angle hysteresis are becoming commonplace in the materials community. Microscopic pockets of air trapped beneath the high surface tension (γ_{lv} = 72mN/m) water droplets lead to a composite solid-liquid-air interface in thermodynamic equilibrium. Previous experimental and theoretical work suggests that it should not be possible to form similar fully-equilibrated composite interfaces with drops of low surface tension liquids such as alcohols or alkanes (e.g. pentane: γ_{lv} = 16 mN/m). In this lecture I will discuss novel surfaces that possess the required combination of re-entrant topographical texture and surface chemistry to support strongly metastable composite solid-liquid-air interfaces for any liquid. Quantitative design parameters will be introduced to guide the development of these novel omniphobic surfaces. For a given feature size R, two independent design parameters (surface chemistry as revealed in the equilibrium contact angle θ, and texture spacing, embodied in the dimensionless spacing ratio D*= (R+D)/R) can be used to develop surfaces with desirably large values of apparent contact angle (θ*) and robustness of the metastable composite interface. Most revealing is the scaling of the composite interface robustness which indicates clearly why, in the consideration of self-similar arrangements of topographical surface features, 'smaller is better' for producing surfaces that resist wetting by low energy liquids. Examples that have been realized to date include lithographically fabricated features in silicon, randomly deposited electro spun fiber mats, dip-coated textiles and wire meshes.



BIOGRAPHY

Bob Cohen studied at Cornell (BS), Caltech (MS and PhD) and Oxford (Postdoc) prior to joining MIT in 1973. He is the founding Director of MIT's Program in Polymer Science and Technology and the architect of MIT's unique Doctoral Program in Chemical Engineering Practice. He directed the DuPont/MIT Alliance from its inception in 2000 through 2011. His publications reflect interests in polymer structure/property relations. Based on patents produced in his laboratory, he co-founded MatTek Corporation in 1985. He is a fellow of AIChE, APS, and MRS. In 2010 he was elected to the National Academy of Engineering, and in 2012 he received the Paul J. Flory Polymer Education Award from the American Chemical Society.

EVENT DETAILS

DATE:
Wednesday Sept. 12, 2012

TIME:
11:00 AM

LOCATION:
Babbio Center, Room 122
Stevens Institute of Technology

ATTENDANCE:
This event is open to Stevens' Faculty, Students, Staff, and Invited Guests