Controlled super-hydrophobicity on metallic substrates: Lessons from nature

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Inspiration from nature, micro/nano scale structures and surface chemistry are the most effective parameters in making superhydrophobic surfaces. It has been shown that laser irradiation techniques applied on metallic surfaces can (i) create a plethora of different patterns that possess dual scale structure necessary for superhydrophobicity and (ii) change the surface chemistry to render them hydrophobic in many cases. This presentation will discuss the various regular patterned structures created by laser irradiation on metals and ways to control the surface morphology and henceforth the level of superhydrophobicity. The various patterns are manufactured depending on the laser parameters such as scanning speed, laser fluence and laser beam overlap. A two-dimensional (2D) thermodynamic model is proposed to predict the contact angle and contact angle hysteresis of different types of surface geometries. These microstructures are analyzed thermodynamically through the use of the Gibbs free energy to obtain the equilibrium contact angle and contact angle hysteresis. The effects of the geometrical details of microstructures on maximizing the superhydrophobicity of the nano-patterned surface are also discussed in an attempt to design surfaces with desired and/or optimum wetting characteristics.

Savvas G. Hatzikiriakos received his Diploma in Chemical Engineering from the Aristotle University of Thessaloniki (AUTh), Greece, in 1984, before obtaining his M.Sc.E. from the University of Toronto (Canada) in 1988 and then his PhD in Chemical Engineering from McGill University in 1991 (Canada). Since 1991 he has been a Professor in the Department of Chemical Engineering at the University of British Columbia, Vancouver, Canada, where he is the Director of the Polymer Rheology and Processing and Surface Science laboratory. He is the author of over 170 refereed papers and over 250 presentations in Conferences on Polymer Processing, Rheology, and Surface Science.