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On the stability of Cassie-Baxter type super-hydrophobic condition and degradation mechanism.

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The phenomenon of super-hydrophobicity and related mechanisms are attractive not only scientifically, but also from the industrial point of view, because extreme water repellency is desired in several applications. Superhydrophobicity can potentially be exploited for example in non-wetting, non-fogging, non-icing, and self-cleaning surfaces, in droplet transportation and in nano- and microfluidic devices. [1] Nature has guided us to understand the mechanisms of superhydrophobicity by introducing a wide range of topography variations that exist on superhydrophobic surfaces of plants and insects. It is very important to fully understand the mechanism responsible for the degradation of the state of heterogeneous wetting (Cassie-Baxter type of superhydrophobicity). This information is critical in designing superhydrophobic surface for applications require water repellency. There is agreement among various investigators that the transition from the Cassie-Baxter to Wenzel state is the mechanism responsible for degradation. However the origin of such transition is still under debate by various investigators [2, 3]. Her a mechanism is proposed for such a transition.

[1] Carré, A., Mittal, K. L., Eds.; Superhydrophobic Surfaces; Brill: Leiden, The Netherlands, 2009; 495 pp.

[2] Jung, C.J. and Bhushan, B. Surface Science 57, 1057 (2007).

[3] Reyssat, M., Yeomans, J.M., and Quere D. Europ. Physics Letter, 81, 26006 (2008).

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