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Dropwise Condensation on Hierarchical Uncoated Metallic Surfaces DANIEL OREJON, University of Edinburgh, I2CNER, ALEXANDROS ASKOUNIS, University of East Anglia, DANIEL ATTINGER, Iowa State University, YASUYUKI TAKATA, I2CNER, Kyushu University — Dropwise condensation is receiving increasing attention in the past decade. Traditionally, for the fabrication of hydrophobic and superhydrophobic surfaces able to perform in a dropwise condensation manner, the application of a conformal hydrophobic coating was required. In this work, we demonstrate that by passive exposure of our metallic hierarchical micro- and nano-structured copper oxide surface resembling the wetting behavior of a lotus leaf, superhydrophobicity and dropwise condensation can be achieved. The change in wettability from hydrophilic to hydrophobic is due to the adsorption of volatile organic compounds present in the ambient. On contrast, on a similar copper etched surface without copper oxide nanostructures resembling the wetting behavior of a rose petal, filmwise is the final condensation reported. Experimental observations at the micro- and at the macro-scale coupled with droplet morphology and surface coverage analysis, as well as a surface energy analysis are presented to support the different condensation behavior. We conclude on the feasibility of dropwise condensation by the coupling mechanisms of surface structure and hydrocarbon adsorption without the need for a manmade hydrophobic coating. The authors gratefully acknowledge WPI-I^{2}CNER and ThermaSmart for their support.

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