Wetting dynamics for structured surfaces

Sun, Ling; Søgaard, Emil; Andersen, Nis Korsgaard; Larsen, Simon T.; Taboryski, Rafael J.

Publication date:
2016

Document Version
Peer reviewed version

Wetting dynamics for structured surfaces

Ling Sun, Emil Søgaard, Nis K. Andersen, Simon T. Larsen, and Rafael Taboryski

Department of Micro- and Nanotechnology, Technical University of Denmark, 2800 Kongens Lyngby, Denmark
Email:rata@nanotech.dtu.dk, web site: http://www.nanotech.dtu.dk/Research-mega/Forskningsgrupper/POLYMIC

We study the wetting dynamics of polymer micro-nanostructured surfaces upon immersion of the surfaces in water. The surface structures are hierarchical and consist of micro-cavities superimposed with a "nanograss" structure. Structures are originated by state of the art nano-lithography and subsequently replicated by injection molding. [1] The analytical study is performed using reflection and transmission optical microscopy. We analyze the influence of immersion time and liquid pressure on the degree of water intrusion into individual micro-cavities on these surfaces, as well as the lifespan of their superhydrophobicity. We show that transitions between the three wetting states (Cassie, Cassie-impregnating, and Wenzel) occur with a certain pressure threshold. [2]

Figure 1A shows a scanning electron microscopy (SEM) image of the surface structure. B shows a reflectance image of the surface when immersed in water, while C shows the corresponding control image, acquired with fluorescence microscopy.

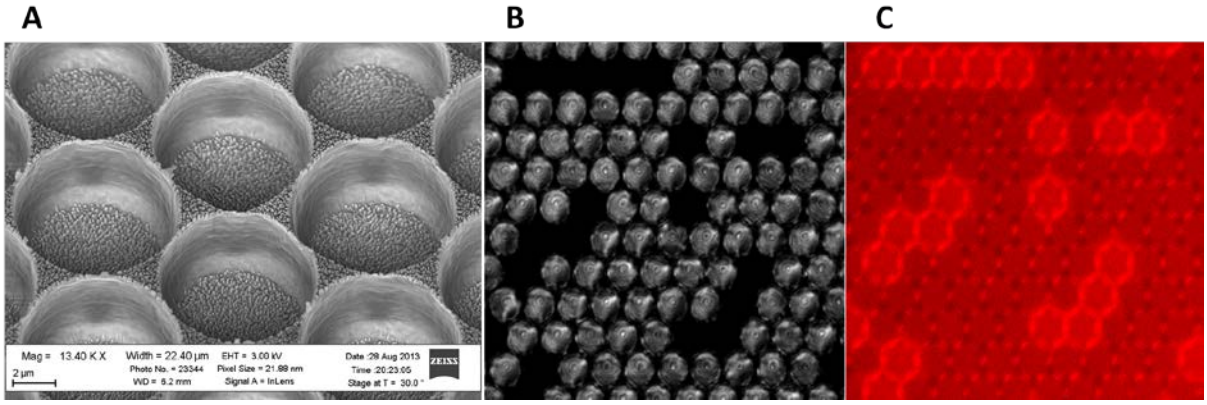

Fig1. A: Hierarchical micro-cavity surface structure. B: Reflection image dark areas are in Wenzel State. C: Corresponding fluorescence image bright red micro cavities are in Wenzel State.

1. Simone Tanzi, Peter Friis Østergaard, Marco Matteucci, Thomas Lehrmann Christiansen, Jiri Cech, Rodolphe Marie and Rafael Taboryski, *J. Micromech. Microeng.* **22,** 115008 (2012)
2. Emil Søgaard, Nis K. Andersen, Kristian Smistrup, Simon T. Larsen, Ling Sun, and Rafael Taboryski, *Langmuir* **30**, 12960−12968 (2014)

Presentation Method (Invited/Regular Oral/Poster): Invited