

OR0604

Hierarchical, Plasma Nanotextured, Superamphiphobic Polymeric Surfaces

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A facile, mass production amenable, rapid method for making superamphiphobic/amphiphobic surfaces by random plasma nanotexturing of polymers in oxygen plasmas is presented. Plasma etched and simultaneously randomly roughened (nanotextured) polymethylmethacrylate (PMMA) Polyether-ether-ketone (PEEK), Cyclic-olefin-copolymer (COC) and Polydimethylsiloxane (PDMS) substrates show hierarchical roughness and complex high-aspect-ratio morphology [1,2,3]. Here, they are investigated as superamphiphobic surfaces, after plasma deposition of a thin fluorocarbon film. We show that polymer surfaces etched in oxygen (PMMA, PEEK, COC) or SF₆ (PDMS) plasma for few minutes' (with small texture height < 600nm) exhibit excellent superamphiphobic behaviour, while surfaces treated for longer time show highly porous nanofibrous morphology (several microns texture height), which is coalesced and stabilized upon wetting, allowing their potential long-term use. Superamphiphobic/amphiphobic behaviour is observed in all cases.

[1] A. K. Gnanappa, D. Papageorgiou, E. Gogolides, A. Tserepi, A. Papathanasiou, A. Boudouvis, Hierarchical, Plasma Nanotextured, Robust Superamphiphobic Polymeric Surfaces Structurally Stabilized Through a Wetting-drying Cycle, *Plasma Process. Polym.* 2011, 8, 000-000.

[2] K. Ellinas, A. Tserepi, and E. Gogolides, From Superamphiphobic to Amphiphilic Polymeric Surfaces with Ordered Hierarchical Roughness Fabricated with Colloidal Lithography and Plasma Nanotexturing, *Langmuir*, 2011, 27 (7), pp 3960-3969.

[3] A. Tserepi, M-E. Vlachopoulou, E. Gogolides, Nanotexturing of poly(dimethylsiloxane) in plasmas for creating robust super-hydrophobic surfaces, *Nanotechnology* 17 (2006) 3977-3983.

Keywords

Amphiphobicity

Plasma Nanotexturing

Polymer Nanostructures

Amphiphilicity