OMICS International
conferenceseries.com

Yongmei Zheng, J Material Sci Eng 2015, 4:3
http://dx.doi.org/10.4172/2169-0022.S1.019

International Conference on
Smart Materials & Structures
June 15 -17, 2015 Las Vegas, USA

Bioinspiredmulti-gradient surface materials for water-collection/repellency

Yongmei Zheng
Beihang University, China

Biological surfaces with the gradient features in micro- and nanostructures display smart wettability such as spider silk, beetle back, butterfly wings, and plant leaf, etc. Since spider silk collect water in mist, taking on scene of large pearly droplets, wehave revealed the mechanism of the cooperation between surface energy gradient and difference of Laplace pressure. Recently series of bioinspired fibers have been designed at micro- and nano-level by the developing novel techniques such as dip-coating, PSMid-coating, tilt-angle coating, electrospun and self-assembly, to combine the Rayleigh instability. These bioinspired fibers take on unique abilities such as the capturing of extreme hanging-drop; the directional driving of tiny condensed droplets on photo or temperature responsive spindle-knots and joint; the hetero-structured bead-on-string fiber for humidity response; the controlling of condensed droplets in directional transport in long range gradient spindle-knots. By integrative gradient features of surfaces between spider silk and beetle back, a kind of wettable star-shape pattern surface also realizes the effect water repellency rather than others. To develop the functional surface, the wettable gradients in different modes are fabricated on the high adhesive surface, thus the high adhesive surface realize the controlling of droplet spreading in directions. Otherwise, butterfly wing and plant leaf display water repellency and low-temperature superhydrophobicity. So, bioinspired surfaces with optimal micro- and nanostructures display distinctly anti-icing, ice-phobic and de-ice abilities. It is also demonstrated further that the oriented or asymmetric features on geometries at micro- and nano-level can generate the driving of droplets that is resulted from the surface energy gradient, in addition to the trapped-air in multi-structures at Cassie's state. Especially, the superhydrophilic oriented-nanohaired surface exhibits the directional transport of drop as the surface is at high temperature. These studies are greatly significant to help to design the novel functional engineering surfaces.

Biography

Yongmei Zheng, is Professor at School of Chemistry and Environment, and Key Laboratory of Bio-inspired Smart Interfacial Science and Technology of Ministry of Education, in Beihang University. Research interests are focused on biological surfaces and bioinspired surface materials with gradient multi-structures to realize the dynamic wetting-controlled functions. The integrating methods of physical, chemical, and nanotechnology are used to develop novel technique into fabrication of bioinspired surfaces. Wetting mechanisms, including water repellency or water collecting, droplet driving, ice-phobic, anti-icing and anti-frosting, are revealed at micro- and nano-level. Publications include in Nature, Sci. Rep., Adv. Mater., Angew. Chem. Int. Ed., ACS Nano, Adv. Funct. Mater., Small, Chem. Commun., J. Mater. Chem. A, Nanoscales, ACS Appl. Mater. Interface, Soft Matter, Langmuir, Appl. Phys. Lett., etc., with 12 Cover stories.

zzym@iccas.ac.cn

Notes: