Department of **Materials Science & Engineering** seminar series 2019

Ultra-low Water Contact Angle Hysteresis Surfaces: Interfacial Designs Towards Practical Applications

Zhou Xin

Date: 12 April 2019, Friday
Time: 10:00 am to 1:00 pm
Venue: E1-06-08

Abstract

Ultra-low water contact angle hysteresis (CAH<5°) is the key factor in achieving high-performance materials with various useful functions such as self-cleaning, anti-fouling, and anti-icing. Such interfacial characteristic can be exploited to address various engineering issues, e.g., metal-corrosion, oil spill remediation, drag reduction, and anti-biofouling. However, the real implementations of such surfaces are considerably limited by the complexity in the manipulation of surface morphology/chemistry, cost-ineffectiveness, environmental friendless and lack of longevity.

To this end, the main purpose of this study was to develop cost-effective, easy-to-process, long-lasting, fluorine-free and hysteresis-free systems, understand the fabrication principles, study the correlation between their structural and wetting properties, and explore their environmental applications. Accordingly, strategies mainly based on macromolecular self-assembly were developed to construct interfacial materials with superhydrophobic surfaces (SHS), slippery liquid-infused porous surfaces (SLIPS) or liquid-like smooth slippery surfaces (LSS). What these materials share is ignorable CAH, excellent water-repellency and polydimethylsiloxane (PDMS) as the main building block. PDMS is chosen due to its extremely flexible chain, low surface energy, and environmentally friendly as compared with its fluoro-/hydrocarbon analogies. Through proper structural/molecular design, the resulting materials can support robust liquid/solid/air composite interface or highly dynamic interfaces when in contact with water, giving rise to negligible CAH and desirable longevity for practical applications. Besides, the correlation between materials properties (surface chemistry and morphology) and wetting characteristics was also investigated. On top of that, a general guideline for the design of ultra-low CAH surfaces is proposed.

Speaker Zhou Xin

Zhou Xin is now a Ph.D. candidate from A/P He Chaobin' group, NUS. He graduated from Tongji University, China and got a master degree in materials science and engineering in 2015. His current research interests include wetting characteristics of polymers, water-repellent materials with low hysteresis, oil-repellent materials underwater and their implementations in engineering problems.

ALL ARE WELCOME!

Prof Ding Jun Host