Department of Materials Science and Engineering Seminar Series 2024

TUNING SURFACE PROPERTIES FOR HIGH PERFORMANCE MECHANO-CHEMICAL SENSING

Wang Xinyu

Date and time: 15 April, 2pm - 4pm

Venue: E3-06-10

Abstract

Specialized wettability behaviors have increased applications, extending in sensing and energy harvesting technologies. Integrating surface design by tuning surface energy and morphology, not only produces water-resistant or self-cleaning surfaces for electronic devices but also holds the potential to enhance electronics performance, which provide a new strategy for sensor design and optimization. In our research, three distinct surface types - liquid-infused slippery surfaces, solid slippery surfaces, and amphiphobic surfaces – were designed and integrated to three different types of sensors. The liquid-infused slippery surfaces were uniformly applied onto a 3D structure, establishing a frictionless multiphasic interface as the pressure sensing element. For the solid slippery surface, we synthesized a slippery surface with enhanced stability even at full solid states, ensuring a more reliable and reusable chemical detection surface. For the amphiphobic surface, we employed a facile microphase separation method for the surface fabrication to monitor water quality and contaminations, including both aqueous and organic phases. Leveraging the unique properties of these surfaces, the sensors demonstrated superior performance, achieving near-ideal pressure sensing, reliable chemical sensing, and rapid response water quality sensing, respectively. This research suggests that the synergy of surface science and sensor design can inspire future advancements in sensor functions and apply to more diverse application scenarios.

Biography

Wang Xinyu received her M.Sc. degree from National University of Singapore. She is currently a Ph.D candidate under the supervision of Assoc. Prof. Benjamin Tee. Her research focuses on designing and tuning the surface properties for enhancing the performance of mechano-chemical sensing.

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