Department of Materials Science and Engineering Seminar

Dr Dan Daniel

All are welcome to join

Bioinspired super-repellent surfaces and how to characterize them

19 Nov 2019 (Tue), 11.00am – 12.00pm@ EA-06-04

Abstract

In nature, the need to repel liquid contaminants can be a matter of life and death. For example, insects must avoid getting trapped by falling raindrops and plants need to keep their leaves dry for efficient gas exchange through the stomata. It is not surprising therefore that many state-of-the-art liquid-repellent surfaces have been inspired by examples in nature. In this talk, I will discuss two classes of ultra-repellent surfaces inspired by the lotus leaf and the cartilage surface, as well as new ultra-sensitive techniques we developed to characterize their wetting properties. Using a custom-built setup and a modified AFM technique, we are able to map micron-scale wetting variations on surfaces and measure the forces experienced by a moving droplet down to the pN level. The ultra-sensitive nature of our technique will ultimately allow us to probe the intermolecular forces that ultimately give rise to the wetting properties observed–an important information that will help us design better surfaces at the molecular level.

Speaker

Dan Daniel earned his degrees at the University of Cambridge (BA in physics, 1st class honours) and Harvard University (PhD in applied physics). For his doctoral work, he studied various anti-fouling surfaces inspired by the lotus leaf and the pitcher plant. In 2017, he joined the Institute of Materials Research and Engineering (A*STAR, Singapore) as a research scientist. His work concentrates on developing new Atomic Force Microscopy techniques to map wetting properties of surfaces with unparalled sensitivity. He primarily works on fundamental questions in wetting science, but actively collaborates with groups in Singapore and Canada on more applied topics, such as enhanced oil recovery techniques and oil-repellent surfaces.