Wingin’ it: A biomimetic approach to patterned surfaces

In this work, the fabrication of new materials and the development of new devices has been explored for various applications in analytical chemistry and microfluidic technologies. Such work has included the fabrication and application of custom microstructured fibers as a novel emitter platform for sensitivity enhancement in electrospray ionization mass spectrometry. Other areas of interest have included the synergistic efforts of 3D printing, microfluidics, and spectroscopy for the development of lab-on-a-chip devices. Specifically, a great deal of effort has been put forth towards developing surfaces with patterned wettability capable of spontaneously depositing sub-microlitre volumes. Previous methods to form patterned surfaces require cumbersome and time-consuming lithographic techniques and lack the ability to rapidly prototype a device. Furthermore, the ability to deposit sub-microlitre volumes typically involves laborious techniques or costly instrumentation. Here, a facile method for the fabrication of superhydrophobic surfaces with patterned hydrophilic regions by laser micromachining is presented. In addition, a custom 3D-printed device coupled to a fluorescence spectrometer was developed to detect pre-concentrated halide salts on the hydrophilic patches. In this way, fluorescence quenching constants could be rapidly calculated and the device appears to be a promising start towards more complex on-chip analyses.