Advanced Chem/Biosensing and Imaging: Nano-Material, Micro-Device, Macro-System

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Abstract

I will give an overview of our work in advanced chem/biosensing and imaging over the past decade. In particular, I will highlight our efforts from three aspects: nano-material, micro-device, and macro-system. First, I will discuss a novel class of 3D plasmonic nanostructures that feature highly porous yet monolithic architecture, facilitating intense and high-density hot spots, large surface area, and high structural integrity and reproducibility. We have applied them to several analytical Chem/Biosensing platforms for a range of sensing targets by various spectroscopic and imaging techniques. Overall, nanoplasmonic sensors appear to provide potential solutions in a range of applications from “moonshot” cancer precision medicine to point-of-care diagnostics and wearable technologies. We have integrated home-developed plasmonic nanostructures with micro-devices such as fluidics and optical fiber probes for in situ and implantable chem/biosensing, neural stimulation, and environmental monitoring. At the macro-system level, we have developed an arsenal of advanced imaging and spectroscopic instrument ranging from state-of-the-art hyperspectral stimulated Raman imaging, optical robotics with molecular fingerprinting, to low-cost smartphone microscopy for educational, biomedical, and environmental applications.

Biography

Wei-Chuan Shih earned his Ph.D. from MIT. Prior to joining the University of Houston, he was a Schlumberger research fellow. Dr. Shih is Associate Professor of Electrical & Computer Engineering, Biomedical Engineering, Materials Science & Engineering, and Chemistry at the University of Houston. He was a MIT Martin Fellow, and received NSF CAREER Award in Biophotonics, inaugural NASA Early CAREER Faculty Award, UH Award for Excellence in Research and Scholarship, and UH Cullen College of Engineering Faculty Research Excellence Award. He has published more than 70 articles in books, journals and conference proceedings, including 40+ peer-reviewed journal papers. He has more than 12 patents, one of which has been licensed. His research has been featured on CNBC, Forbes, OPN, PBS, UH Moment and many other media outlets. Besides NSF and NASA, his research is also supported by NIH, DOE, and GoMRI with a past 5-year total of nearly $3.5M.  
Website: http://nanobiophotonics.ee.uh.edu