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Parallel Raman and surface-enhanced Raman microspectroscopy for biophotonics applications

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Raman spectroscopy can provide molecular information via inelastic light scattering without physical contact. Coupled with microscopic imaging, Raman microspectroscopy is a powerful technique for sensing and material analysis. With the coupling of light into localized surface plasmons, surface-enhanced Raman scattering (SERS) of near-surface molecules can be boost by many orders of magnitude. Existing designs of microspectroscopy imaging system is, however, significantly limiting the throughput. Here we present a novel parallel Raman microspectroscopysystem which enables the acquisition of full Raman spectra from many spots simultaneous without scanning. This scheme is realized by projecting a multiple-point laser illumination pattern using a spatial light modulator (SLM) coupled with wide-field Raman imaging collection. We demonstrate the performance of this scheme by measuring normal spectra from uniform samples and microparticles, within a ~ 1000 x 100 μm^2 field of view. We also demonstrate the rapid collection of SERS spectra from different substrates, allowing the fast characterization of these substrates, as well as the film properties of the surface monolayer coating.

Biography

Wei-Chuan Shih is an Assistant Professor of Electrical & Computer Engineering with a joint appointment from Biomedical Engineering at the University of Houston. Prior to joining UH in Fall 2009, he was a postdoctoral fellow at Schlumberger-Doll Research Center in Cambridge MA. He earned his B.S., M.S., and Ph.D. from National Taiwan University, National Chiao Tung University, and Massachusetts Institute of Technology, respectively. His research interests include nanobiophotonics, biosensors and bioelectronics, N/MEMS, nanofabrication, and computational imaging and sensing. He received the NSF CAREER Award in 2012 and was a recipient of MIT Martin Fellowship in 2006.

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