Physics Colloquium

Multimodal Nanoscale Infrared Microscopy with sub 10 nm Spatial Resolution

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While Abbe's optical diffraction limit prevents nanometer-scale spatial resolution for conventional microscopy and spectroscopy, the combination of optics and scanning probe microscopy provides a way to bypass the diffraction limit. One type of imaging technique is to utilize the near-field light scattering from a metallic AFM tip to locally probe the optical properties of the sample. The other type of high spatial resolution imaging technique is to measure the light-induced thermal expansions in the sample and related that to the local optical or infrared absorption. In my presentation, I will first describe our recent development of the scattering-type infrared near-field microscopy for three-dimensional mapping of near-field responses on polaritonic low-dimensional materials. Then, I will present our latest invention of peak force infrared (PFIR) microscopy that provides infrared imaging, broadband spectroscopy, and mechanical property mapping at a spatial resolution as high as 6 nm. In the end, I will describe applications of PFIR microscopy on the characterization of urban aerosols and into the understanding of the biomineralization process of a mussel shell. The exploration of nanoscale phenomena will be facilitated by these nanoscale infrared imaging techniques in revealing hidden secrets of the nanoworld.

Xiaoji Xu *grew up in Beijing, China. He received his BSc degree from Peking University in 2004 and Ph.D. degree from the University of British Columbia in 2009. After postdoctoral fellow research at the University of Toronto, Xiaoji joined Lehigh University as an assistant professor in the department of chemistry in November 2014. His research combines scanning probe microscopy with laser spectroscopy to reveal the chemical and physical phenomena at the nanoscale. He also has a passion for developing tools for analytical chemistry for nanoscale chemical identification.*

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4:10PM
Lewis Lab. 316

Refreshments at 3:45PM