

Excitonic Resonant Emission-Absorption of Surface Plasmon in Transition Metal Dichalcogenides for Chip-level Electronic-Photonic Integrated Circuits

Dr. Jiming Bao

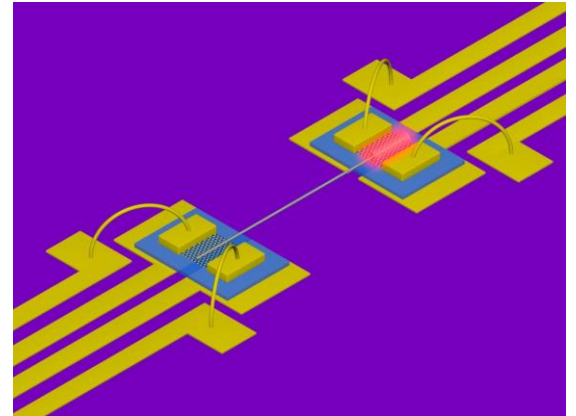
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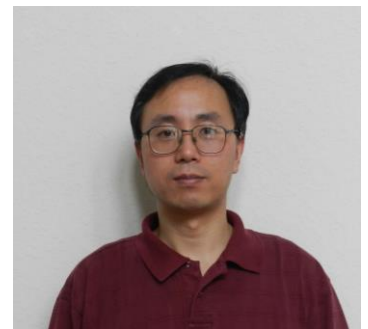
1:30 – 2:30 PM

Venue: **GL 100A, MMC**

Abstract: The monolithic integration of electronics and photonics has attracted enormous attention due to its potential applications. However, the realization of such hybrid circuits has remained a challenge because it requires optical communication on the nanometer scale. Using photoexcitation, direct optical imaging, spectral analysis and numerical simulations, we show the perfect spectral overlap between absorption and photoluminescence in WS₂ monolayers; we then show the resonant coupling of WS₂ photoluminescence to surface plasmons of silver nanowire waveguides; finally, we prove the resonant absorption of the surface plasmons by the same WS₂ monolayers. This strong absorption by WS₂ is distinguished from that of the Ohmic propagation loss of silver nanowires and is further confirmed by numerical calculations. Such emission-absorption resonance is a manifestation of a unique excitonic transition in WS₂. The demonstration of optical generation and detection of surface plasmons at the same wavelength paves the way for on-chip optical communication and electronic- photonics integrated circuits.



Biography: Dr. Bao is an associate professor of Electrical and Computer engineering at the University of Houston. He obtained his Ph.D. in applied physics in 2003 from the University of Michigan, where he used ultrafast laser pulses and Raman scattering to study fundamental excitations in semiconductor nanostructures. Before joining UH in 2008, he did post-doctoral research at Harvard University, where his research focused on nanophotonics and nanomaterials as well as their devices applications. His current research covers many interdisciplinary topics ranging from solar energy conversion to fiber optic sensing. More information can be found from Dr. Bao's group website at <http://nano.ee.uh.edu/>.



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