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Optical properties of tips for apertureless near-field microscopy NAM-HEUI LEE, RYAN HARTSCHUH, DISHA MEHTANI, ALEXANDER KISLIUK, MARK FOSTER, ALEXEI SOKOLOV, IGOR TSUKERMAN, The University of Akron — Apertureless near-field optical microscopy techniques provide unique chemical characterization with nanoscale resolution, overcoming the diffraction limit of light via surface plasmon resonance generation on a metal tip. The surface plasmon resonance depends on the type of metal used for the tip, morphology of the metal surface, and cone angle of the tip. The proximity of the incident wavelength to the resonance wavelength for the tip is another important factor, and this has been studied for gold- and silver-coated tips. Electric field enhancement is maximized when the plasmons resonate at the probing wavelength. Thus, identifying the resonance frequency of the tip apex is crucial and challenging to effective near-field optics. A dark-field scattering spectroscopy used with a side-illumination nano-Raman spectrometer has been exploited to experimentally determine the optical properties of various tips. The dependence of the optical resonance on the metal deposited is shown for silver- and gold-coated tungsten tips and silicon nitride tips. The enhancement of the Raman signal for silicon with gold-coated silicon nitride tips is ~ 3 times stronger for a wavelength of 647 nm than for a wavelength of 514.5 nm. The former wavelength is closer to the plasmon resonance observed for this tip at $\sim$680 nm.

Nam-Heui Lee
The University of Akron

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