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INVITED

Semiconducting Nanostructures for Mid-infrared Plasmon-Enhanced Spectroscopy

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Plasmon-enhanced spectroscopy, in particular surface-enhanced and tip-enhanced Raman scattering (SERS and TERS), can obtain structural information down to even the single molecule level [1,2], due to the large optical field enhancement provided by noble metal nanoparticles. The extension of these concepts to the IR spectral range would enable direct probing of structure through IR vibrational modes, and provide access to additional low energy excitations. Semiconductors are ideal for strong light concentration in the mid-IR spectral range, due to their low plasma frequencies, precise fabrication methods, and robustness. I will discuss the characterization of semiconducting nanostructures, in particular in silicon, fabricated using both top-down and bottom-up fabrication approaches for control of geometry and the spatial distribution of dopants [3]. I address the potential of these structures for mid-infrared plasmonics, taking advantage of the enhanced fields derived from this approach for nano-spectroscopy and surface-enhanced IR absorption.

References:
1. Kneipp, K., Wang, Y., Kneipp, H., Perelman, L. T., Itzkan, I., Dasari, R. & Feld, M. S. Single molecule detection using surface-enhanced Raman scattering (SERS). Phys Rev Lett 78, 1667-1670 (1997).
2. Neacsu, C. C., Dreyer, J., Behr, N. & Raschke, M. B. Scanning-probe Raman spectroscopy with single-molecule sensitivity. Physical Review B 73, 193406 (2006).
3. Christesen, J. D., Pinion, C. W., Zhang, X., McBride, J. R. & Cahoon, J. F. Encoding abrupt and uniform dopant profiles in vapor-liquid-solid nanowires by suppressing the reservoir effect of the liquid catalyst. ACS Nano 8, 11790-11798 (2014).