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Photonic crystal fiber assisted nano-antenna for tip-enhanced Raman spectroscopy KHANT MINN, Department of Physics, Baylor University, Waco, TX, BLAKE BIRMINGHAM, The Institute for Quantum Science and Engineering, Texas AM University, College Station, TX, BRIAN KO, Department of Physics, Baylor University, Waco, TX, MARLAN SCULLY, HOWARD LEE, The Institute for Quantum Science and Engineering, Texas AM University, College Station, TX; Department of Physics, Baylor University, Waco, TX, ZHEN-RONG ZHANG, Department of Physics, Baylor University, Waco, TX — Metallic nano-probes supporting plasmon polariton modes can localize the optical fields at nanoscale for near-field imaging and sensing applications such as tip-enhanced Raman spectroscopes. In this paper, we report the design, fabrication, and far-field characterization of a photonic-plasmonic probe. Our device couples the light highly confined in a photonic crystal fiber with the plasmonic mode on the surface of a needle-shaped nano-antenna. The nano-antenna is grown via electron beam assisted chemical deposition of platinum in the center of a photonic crystal fiber's end facet. By controlling the deposition parameters, the height and base diameter of the antenna can be tuned to optimize plasmonic resonance conditions. Optical spectra and mode profiles transmitted through the probes are analyzed to characterize the optical response of the probes. Far field side emission from the probes demonstrates the excitation of surface plasmons on the antennae. The probe can be implemented into tip-enhanced Raman microscope setup to obtain topographic and chemical spectroscopic information to study light-matter interaction at the nanoscale.

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