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Interfacing Optical Fiber with Plasmonic Nanoantenna for Enhanced Light Nanofocusing[1] KHANT MINN, BLAKE BIRMINGHAM, BRIAN KO, Department of Physics, Baylor University, Waco, TX 76798, USA, HOWARD LEE, Department of Physics, Baylor University, Waco, TX 76798, USA. Department of Physics Astronomy, University of California, Irvine, CA 92697, USA, ZHENRONG ZHANG, Department of Physics, Baylor University, Waco, TX 76798, USA — The major challenges in the study of light-matter interaction in the deep subwavelength regime are the inefficient conversion of far-field to nearfield energy, low signal-to-noise ratio, complicated device designs requiring complex multi-step fabrication processes. Metallic nanowires supporting surface plasmon polaritons can localize optical fields at nanoscale tapered ends for near-field imaging. We propose a fiber-plasmonic hybrid device that efficiently couples linearly polarized fiber core mode to radial plasmons on plasmonic tip for nano-scale confinement of light. First, we report the numerical analysis of the light-coupling and focusing mechanism. Next, we report the fabrication and far-field characterization of the device. The needle-shaped platinum tip is grown by electron beam assisted chemical deposition on the photonic crystal fiber's end facet. By controlling the deposition parameters, height and base diameter of the antenna can be tuned to optimize plasmonic resonance conditions. The cross-polarization analysis of far-field emission to the side of the tip demonstrates the excitation of surface plasmons. The proposed device is highly desirable for applications in medical procedures, biomedical imaging and near-field spectroscopy.

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