Tunable and quantum metaphotonics (Presentation Video)

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ABSTRACT

Progress in understanding resonant subwavelength structures has fueled an explosion of interest in fundamental processes and nanophotonic devices. The carrier density and optical properties of photonic nanostructures are typically fixed at the time of fabrication, but field effect tuning of the potential and carrier density enables the photonic dispersion to be altered, yielding new approaches to energy conversion and tunable radiative emission. Electrochemical in metals yields tunable resonances and reveals the plasmoelectric effect, a newly-discovered photoelectrochemical potential. Finally, while plasmons are usually described in a classical electromagnetic theory context, under single photon excitation quantum coherent states emerge. We demonstrate entanglement or coherent superposition states of single plasmons using two plasmon-quantum interference in chip-based plasmon waveguide directional couplers.

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