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Emission and propagation properties of surface plasmons on metal nanowires

HONGXING XU, Institute of Physics, Chinese Academy of Sciences, Beijing 100190, China

Manipulating light on the nanometer scale is a challenging topic not only from a fundamental point of view, but also for applications aiming at the design of miniature optical devices. Nanoplasmonics is a rapidly emerging branch of photonics, which offers variable means to manipulate light using surface plasmon excitations on metal nanostructures. Here we report our recent studies about emission and propagation properties of surface plasmons on metal nanostructures. For the propagating properties, we found the propagating plasmons can remotely excite surface enhanced Raman scattering at a few molecules level, and excite the excitons of quantum dots directly. For the emission properties, we observed that light from the end of a silver nanowire, following excitation of plasmons at the other end of the wire, is emitted in a cone of angles peaking at nominally 45-60 degrees from the nanowire axis, with virtually no light emitted along the direction of the nanowire. This surprising characteristic can be explained in a simple picture invoking Fabry- Pérot resonances of the forward and back-propagating plasmons on the nanowire.