Localized and Delocalized Plasmons in Metallic Nanohole Arrays

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Surface plasmons are electromagnetic waves coupled to charge fluctuations, and are fixed to the interface between a metal and a dielectric material. When the surface is patterned, the optical field can scatter to higher-momentum states and excite a surface plasmon polariton. Recently, surface plasmons or plasmonics have received great attention because of their potential applications such as surface plasmon resonance biosensors and surface enhanced Raman spectroscopy (SERS). We report here a versatile method that can generate hierarchical patterns of metallic nanocavities. First, monolayer of monodisperse colloidal particles was spun-cast on polymer films, and the particles were partially embedded in polymer layer. After the removal of colloidal particles, nanostructures with localized and delocalized plasmons were created by e-beam evaporation. This method which is simple, cost-effective is able to integrate nanostructures with hole arrays into biosensors based on surface plasmon resonance.