Localized Surface Plasmon Resonance on Nanohole Arrays

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Recently, the optical properties of noble metal thin films with subwavelength hole structures has received great attention because of their potential applications such as surface plasmon resonance biosensors and surface enhanced Raman spectroscopy (SERS). Up to now, a number of methods using focused ion beam (FIB), nanoimprint lithography, and self-assembled colloidal template followed by electrochemical deposition of noble metals have been proposed to fabricate nanostructures with hole or void arrays, in which both surface and localized plasmons take place. We reported here a versatile method that can generate hierarchical patterns of metallic nanocavities. In addition, we showed that certain features in the reflectance spectra of nanohole arrays are associated with LSPR on the rims of the nanoholes in the upper gold film, as well as in the lower metal disks. Finally, quantitative computational electrodynamics modeling was conducted to provide a more understanding of LSPR of nanohole arrays by using Finite- Difference Time-Domain (FDTD) simulation.