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Controlling surface plasmons and local field by two-dimensional arrays of metallic nano-bottles HEI IU, DANIEL H.C. ONG, JONES T.K. WAN, JIA LI, Chinese University of Hong Kong — In recent years, studies of surface plasmon polaritons (SPPs) have been intensive. It is of great interest to control SPPs with great precision and flexibility. In this talk, we present our recent work on SPPs manipulation by using two-dimensional arrays of bottle-shaped, metallic cavities. We propose that by tuning the geometry of such "nano-bottle" contained in a two-dimensional nano-scale array it is possible to control the resonance frequencies and near field patterns of different SPP modes. The dispersion relations are not sensitive to the sizes and depths of the nano-bottles, but depends strongly on the polarization In particular, by using different polarizations, it is observed that different types of SPPs, either propagating or localized, can be excited independently. Moreover, we attempt to control the local field by closing up the aperture of the nano-bottle. We have found that the local field slowly moves up from the bottom to the neck of bottle by increasing its depth. In addition, the field intensity can be fine-tuned by controlling the topology of the bottleneck, for example, a smaller and thinner neck leads to stronger field intensity. As a result, we believe these nano-bottle arrays are good candidates for making high sensitivity chemical and biological sensors.

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