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Tunable Propagation and Localization of Hybrid Surface Plasmon Polaritons in Chirped Metal-Dielectric Waveguides[1] CHEUNG WAI CHAU, SAI KIT YUNG, KIN WAH YU, The Chinese University of Hong Kong — We have studied the propagation of coupled surface plasmon polariton (SPP) waves in a metal-dielectric-metal (e.g. Au/MgF2/Au) waveguide by the transfer matrix method. Due to the evanescent coupling of the SPP waves at the two interfaces in the dielectric layer, three hybridized surface plasmon polariton (HSPP) branches are achieved with a nearly flat branch at intermediate frequencies. The flat HSPP branch is tunable by varying the thickness and/or the permittivity of the dielectric layer. Moreover, by imposing a gradual variation of the permittivity (or thickness) of the dielectric layer along the propagation direction, it is possible to alter the local dispersion relation so that a localization of SPP waves can be realized. Under a parabolic confinement, Hamiltonian optics is used for simulating the propagation and localization of HSSP waves. We demonstrate that HSSP are localized at different locations at different frequencies, which is useful for achieving trapped SPP rainbow. The results of this research can have fruitful applications in optical computing, etc.

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