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Dielectric tuned surface plasmon resonances on metallic gratings[1]

ADAM HAUSER, BILL FLAHERTY, KA MING LAW, EVGENY MIKHEEV, ADAM KAJDOS, SUSANNE STEMMER, S. JAMES ALLEN, Univ of California - Santa Barbara — We explore the effect of substrate dielectric constant on the dispersion of infrared surface plasmons supported by micron scale metal gratings. Of particular interest are substrate dielectrics that can be tuned by electric fields and thereby make possible gated plasmonic devices. Angle resolved s and p polarized reflectivity is used to observe the plasmon dispersion for Pt gratings on various oxide dielectrics and heterostructures, LSAT, $SrTiO_3$, Nb:SrTiO3 and LSAT/$SrTiO_3$/$GdTiO_3$. Most striking is the shift in the plasmon dispersion upon Nb doping of $SrTiO_3$ caused by the free carrier contribution to the dielectric constant. We focus our attention on a metal-oxide-metal heterostructure, Pt/$Ba_xSr_{1-x}TiO_3$/Pt-grating that serves to confine the infrared field to the electric field modulated region enhancing the potential for a gated plasmonic structure.

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