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Experimental demonstration of gradient index plasmonics MAIKEN H. MIKKELSEN, THOMAS ZENTGRAF, YONGMIN LIU, JASON VALENTINE, XIANG ZHANG, NSF Nanoscale Science and Engineering Center, University of California, Berkeley — Plasmonics is an emerging field essential for bridging nanoelectronics and diffraction-limited photonics. One central objective of plasmonics research is modifying the propagation of surface plasmon polaritons (SPPs) in order to implement diverse functionalities in the context of two-dimensional optics. Here, we demonstrate an effective approach to manipulate SPPs by adiabatically tailoring the topology of a dielectric layer adjacent to a metal surface using grey-scale lithography. In such a way, we are able to continuously modify the propagation constant of SPPs, analogous to traditional gradient index optics. Applying this method, we design and experimentally demonstrate two different devices: a plasmonic Luneburg lens to focus SPPs and a plasmonic Eaton lens to bend SPPs.[1] Our approach has the potential to achieve low-loss functional plasmonic elements and provides a scheme to realize more complex structures using transformation optics.

[1]T. Zentgraf*, Y. Liu*, M. H. Mikkelsen*, J. Valentine, X. Zhang, *Submitted*, (2010)

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