Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Optical Properties of Epitaxially Grown Silver Films YANWEN WU[1], CHENDONG ZHANG[2], MATT ZHANG, CHIH-KANG SHIH, XIAOQIN LI, Department of Physics, The University of Texas at Austin, Austin, TX 78712, USA — One major obstacle in the advancing field of plasmonics is the loss in metals. A sizable contribution of this loss comes from grain boundaries and surface roughness introduced during thin film growth using conventional deposition methods. A novel epitaxial growth technique is used to produce silver (Ag) thin films free of such flaws. We investigate the optical properties–namely the dielectric optical constants–of these new epitaxial films in the bulk region and in the ultrathin film limit where quantum mechanical behaviors emerge due to energy quantization in the growth direction. The values for the dielectric optical constants are extracted from the spectral ellipsometry (SE) measurements over a wide range of optical frequencies. By using an adequate model of the sample structure and initial values of the fitting parameters (i.e. the real and imaginary parts of the optical constants), we can extract these measured values for the new Ag films. We have confirmed that in the bulk region, the optical constants converge with the well-known Johnson and Christy measurements [1]. In the ultrathin film limit, however, we observed significant changes near the D-band transition likely due to a quantum well-like density of states.

[1] P.B. Johnson and R.W. Christy, PRB 6 4370 (1972)

[1]Equal contribution. Also affiliated with Department of Physics, The University of South Carolina, Columbia, SC 29208
[2]Equal contribution

Yanwen Wu
Department of Physics, The University of Texas at Austin,
Austin, TX 78712, USA

Date submitted: 10 Dec 2012 Electronic form version 1.4