

Abstract Submitted
for the SES08 Meeting of
The American Physical Society

Plasmon polaritons in conducting-metal-oxide films A. EFRE-
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S. FRANZEN, NCSU — We report the evolution with thickness of p-polarized re-
flectance spectra of indium tin oxide (ITO) films deposited on BK-7 glass. ITO is
one of the most common examples of the class of conducting metal oxides. Due to
the low charge carrier density, $\sim 10^{21}/\text{cm}^3$, the spectral features of the plasmon are
observed in the near infrared. The spectra are dominated by two plasmon polariton
structures, which we show are associated with the screened bulk plasmon (SBP) for
very thin films and the surface plasmon for thick films. The conductor skin depth
is the cut-off between the thin and thick film behavior. Remarkably, all features
of these complex spectra are accurately described using only the three-phase model
and the Drude free-electron representation of the dielectric function of the films.
This first observation of the SBP is made possible by the unique features of these
films, which include continuity for even the thinnest films and an absence of compli-
cations from bulk absorption in the spectral region of interest. The observation of
the SBP is possible due to the fact that ITO behaves as a free electron conductor.
Specifically, ITO has no band-to-band transitions that would obscure the intrinsic
screened bulk plasmons.

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Date submitted: 15 Aug 2008

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