Abstract Submitted
for the MAR12 Meeting of
The American Physical Society

Properties of Alq_3 waveguides containing embedded metal layers NIRANJALA WICKREMASINGHE, XIAOSHENG WANG, JONATHAN THOMPSON, Department of Physics, University of Cincinnati, Cincinnati, OH 45221, HEIDRUN SCHMITZER, Department of Physics, Xavier University, Cincinnati, OH 45207, HANS PETER WAGNER, Department of Physics, University of Cincinnati, Cincinnati, OH 45221 — We study the properties of aluminum-quinoline (Alq_3) waveguides with embedded thin (few 10 nm thick) metal layers using the m-line technique at a wavelength of 633 nm. Our goal is to investigate how the guided TM and TE modes and their effective refractive indices are affected by the metal layers. The layered waveguides are fabricated on a glass substrate by organic molecular beam deposition (OMBD). A $Mg_{0.9}Ag_{0.1}$ alloy is used for the metal layers. Pure Alq_3 waveguides serve as reference samples. Our experiments show that TM modes in an Alq_3 waveguide with a single centered metal film are nearly unaffected, except for a slight increase of the bulk refractive index in the sample. TE modes are more strongly affected. Compared to our reference sample, we do not observe the TE_0 and TE_2 mode. Other TE modes whose electric field nodes are at the location of the metal film are visible. A similar behavior is also found in waveguides with embedded multiple metal layers. Our experimental data is compared to a multi-layer model simulation and to an effective-medium model. The results indicate that strategically placed metal layers can potentially be used to tailor waveguides structures.

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Date submitted: 19 Nov 2011 Electronic form version 1.4