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**Index matching of TE and TM modes in organic multilayer waveguides** JONATHAN THOMPSON, University of Cincinnati, HEIDRUN SCHMITZER, Xavier University, Cincinnati, HANS PETER WAGNER, University of Cincinnati — We investigate transverse electric (TE) and magnetic (TM) mode propagation in organic multilayers consisting of aluminum quinoline ($Alq_3$) and perylenetetracarboxylic dianhydride (PTCDA). In particular, we analyze two multilayer waveguides, $Alq_3$-PTCDA-$Alq_3$ and PTCDA-$Alq_3$-PTCDA, engineered to give index matching according to modeling. The waveguides were grown on a glass substrate via organic molecular beam deposition. Fabry-Perot oscillations observed from reflection measurements were used to confirm the individual layer thicknesses. We were able to observe refractive index matching between $TE_0$ and $TE_1$, as well as $TE_2$ and $TE_3$ modes for the PTCDA-$Alq_3$-PTCDA waveguide due to the light propagation through the top and bottom PTCDA layers, respectively. In addition, we were able to match $TE_1$ and $TM_1$, as well as $TE_3$ and $TM_3$ modes in the $Alq_3$-PTCDA-$Alq_3$ multilayer due to the birefringence of the PTCDA layer. Furthermore, we are able to create mode matching for a range of wavelengths due to the similar effective refractive index dispersion of different waveguide modes. The ability to phase match different waveguide modes opens a wide range of potential applications including polarization-insensitive propagation and mode switching by adding a thin magnetic metal film within the waveguide and applying an external magnetic field.

Jonathan Thompson
Univ of Cincinnati

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