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Optical Wave Propagation in Epitaxial Nd:Y_2O_3Planar Waveguides WEI LI, SCOTT WEBSTER, RAVEEN KUMARAN, SHAWN PENSON, University of British Columbia, Vancouver, Canada, T TIEDJE, University of Victoria, Victoria, Canada — Optical wave propagation in neodymium doped yttrium oxide (Nd:Y_2O_3) films grown on R-plane sapphire substrates by molecular beam epitaxy has been studied by the prism coupler method. The measurements yield propagation loss data, precise values for the refractive index and the dispersion relation. The refractive index of the Nd:Y_2O_3 at 632.8nm is found to be 1.909, which is close to the available data for bulk Y_2O_3 crystal (1.923 at 645nm from Handbook of Optical Constants of Solids II). The lowest propagation loss measured is 0.9±0.2 cm^{-1} at 1046 nm with a spin-on polymethyl-methacrylate top cladding layer on a film with 6 nm RMS surface roughness. The loss measurements suggest the majority loss of this planar waveguide sample is due to scattering from surface roughness. The loss measurements are in good agreement with the model of Payne and Lacey (Opt. and Quantum Electron **26** (1994) 977-986) in which we use the experimental value for the surface autocorrelation obtained from AFM measurements.

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