

Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Structural Characterization of Y_2O_3 Films Grown on Sapphire
by MBE SHAWN PENSON, SCOTT WEBSTER, RAVEEN KUMARAN, WEI LI, University of British Columbia, THOMAS TIEDJE, University of Victoria — Yttrium oxide is a hard, thermally stable, transparent oxide, making it an excellent host for rare earth ions used in solid state laser waveguides. The structural quality of these thin films can be expected to affect the emission cross section of the active ions and losses in the waveguide due to absorption and scatter. Y_2O_3 films were deposited on A, M, R and C plane sapphire substrates by molecular beam epitaxy. X-ray diffraction and transmission electron microscopy measurements were performed in order to determine the structure of the films. The films exhibited a textured mosaic structure (111) oriented with all substrates. The grains were found to be twinned with strong in plane orientations on A,R and C plane substrates but randomly oriented on M-plane. Grain size and tilt were dependent on the orientation of the sapphire substrate. R-plane substrates gave the highest quality films with larger grains and less mosaic tilt. This is likely due to better lattice matching between the substrate and film.

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Date submitted: 20 Nov 2009

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