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Crystalline Rare-Earth-doped Sesquioxide PLD-Films on alpha-Alumina

By Sebastian Bär

Cuvillier Verlag Jul 2004, 2004. Taschenbuch. Book Condition: Neu. 208x146x4 mm. Neuware - The development of integrated optical devices demands the fabrication of high-quality optically active thin films. This work focuses on thin sesquioxide films, which are promising because the sesquioxides are well-known hosts for rare-earth-ions, leading to luminescent materials and solid-state lasers with superior mechanical and thermal properties (e. g. low phonon energies, large thermal conductivity). Optical quality crystalline thin films of rare-earth-doped sesquioxides (yttria, lutetia, and scandia) have been grown by the pulsed laser deposition (PLD) technique on single-crystal (0001) α -alumina substrates. Alumina substrates offer a lattice constant that matches that of cubic Y₂O₃ in the β 111± direction very well. Using Lu₂O₃ and Sc₂O₃, the mismatch of 4.8% related to Y₂O₃ on alumina substrates can be considerably reduced leading to the production of films with less dislocations. The crystal structure of these films (thicknesses from 1 nm to 500 nm) was determined by X-ray diffraction (XRD) and surface X-ray diffraction (SXRD) analysis. These measurements show that the films were textured along the β 111± direction, however with a small polycrystalline component, which is negligible in thick films. Using Rutherford backscattering analysis (RBS), the correct stoichiometric composition of the films could be...

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