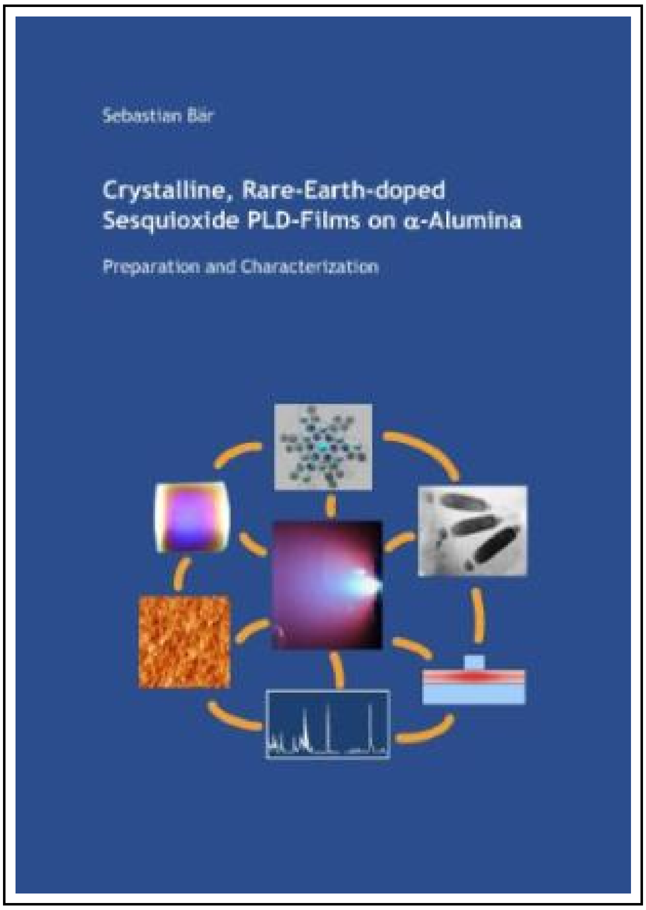
Crystalline Rare-Earth-doped Sesquioxide PLD-Films on alpha-Aluminia



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Reviews

This publication is definitely not simple to begin on studying but quite fun to see. It really is full of knowledge and wisdom I am just effortlessly can get a satisfaction of studying a created pdf.
(Alfreda Bradtke)

CRYSTALLINE RARE-EARTH-DOPED SESQUIOXIDE PLD-FILMS ON ALPHA-ALUMINIA

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) a-alumina substrates. Alumina substrates offer a lattice constant that matches that of cubic Y_2O_3 in the ß111± direction very well. Using Lu_2O_3 and Sc_2O_3, the mismatch of 4.8% related to Y_2O_3 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 ß111± 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 proved. At optimum growth conditions, epitaxial growth of Y_2O_3 along the ß111± direction on the (0001) a-Al_2O_3 was experimentally verified by the observation of channelling in the RBS experiments.The surface morphology of the thin films has been studied using atomic force microscopy (AFM). While amorphous films have no defined surface structure, crystalline films show a triangular surface morphology, which is attributed to the ß111± growth direction. The same structure is observed along the (111) cleavage of an yttria bulk crystal. Thin films with a mean thickness of 5 nm have no completely covered surface, but show island growth, where the...

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