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Oxygen Interstitial Defects in Sc2O3 Thin Films Deposited with Reactive Ion Beam Sputtering DREW SCHILTZ, PETER LANGSTON, ERIK KROUS, DINESH PATEL, Colorado State Univ, ASHOT MARKOSYAN, RODGER ROUTE, Stanford Univ, CARMEN MENONI, Colorado State Univ, COLORADO STATE UNIVERSITY TEAM[1], STANFORD UNIVERSITY TEAM[2]
— Numerous defects may develop when depositing amorphous thin films with reactive ion beam sputtering, including interstitials and vacancies. In many cases, these defects limit the functionality of the film, degrading both the mechanical and optical properties. This study aims to investigate the nature of oxygen interstitial point defects in scandium oxide thin films and characterize the effect on composition, optical absorption and mechanical stress. The films are deposited with argon ion beam sputtering of a scandium metal target. The density of defects is correlated with the oxygen partial pressure, revealing an optimal condition where defects are minimized. Furthermore, the defect density also demonstrates a direct correlation with the main ion beam accelerating voltage. The native oxygen defects behave as shallow levels, with binding energies in the 1-2 eV range. Work supported by the DoD Office of Naval Research and the High Energy Laser Program of the DoD Joint Technology Office.

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