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Thin single crystal Sc2O3 Films on Si (111) with very sharp interface M. HONG, Dept. Mat. Sci. & Eng., National Tsing Hua Univ., H. Y. LEE, National Synchrotron Radiation Res. Center, A. R. KORTAN, Bell Laboratories, USA, J. KWO, Dept. Phys, National Tsing Hua Univ., P. CHANG, Y. L. HUANG, C. P. CHEN[1] — We report the MBE growth and single-crystal synchrotron x-ray characterization of very high quality Sc_2O_3 films grown on Si (111). The Sc_2O_3films of 3.5 and 18 nm thickness were deposited by e-beam evaporation on Si in a multi-chamber MBE/UHV system. Streaky RHEED patterns with a 4x4 reconstruction along the in-plane axes of Si were observed after an oxide growth ∼1 nm in thickness. X-ray diffraction results find that Sc_2O_3 films grow epitaxially in Bixbyite structure with the axis orientations aligned with those of Si. The 3.5 nm film yields a mosaic scan width of 0.044° (158 arc-sec.) for the Sc_2O_3 (444) peak, which is remarkably sharp, and suggests a defect free structure for the epi-layer. Since the bulk lattice constants of Si and Sc_2O_3 are mismatched by 9.2%, the observed perfection in the film structure is very unusual. Electrical measurements of the Sc_2O_3 film exhibit low-leakage currents and cross-section TEM studies on Sc_2O_3/Si show an extremely sharp interface.

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