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Time-resolved *in-situ* X-ray Study of Homoepitaxial $SrTiO_3$ Growth Using Reactive Molecular-Beam Epitaxy I.C. TUNG, Advanced Photon Source, Argonne National Laboratory; Department of Materials Science and Engineering, Northwestern University, Z.L. LUO, Materials Science Division, Argonne National Laboratory; National Synchrotron Radiation Laboratory, University of Science and Technology of China, J.H. LEE, H. HONG, Advanced Photon Source, Argonne National Laboratory, S.H. CHANG, J.A. EASTMAN, Materials Science Division, Argonne National Laboratory, M.J. BEDZYK, Department of Materials Science and Engineering, Northwestern University, J.W. FREELAND, Advanced Photon Source, Argonne National Laboratory, D.D. FONG, Materials Science Division, Argonne National Laboratory — Functional materials based on complex oxides in thin film form offer new and exciting strategies for meeting many energy challenges. Unfortunately, synthesis of such oxide films can be a major challenge even when utilizing reactive molecular-beam epitaxy (MBE). To understand the fundamental physics of complex oxide thin film growth, we have developed the world's first reactive MBE system with *in-situ* synchrotron x-ray scattering capability at the Advanced Photon Source (APS). Here we present the results of *in-situ* surface x-ray scattering measurements taken during homoepitaxial growth of $SrTiO_3$ on (001) $SrTiO_3$ substrates. We compare the shuttered growth technique with codeposition to understand the nature of the distinctly different approaches. Work at the APS, Argonne is supported by the U.S. Department of Energy, Office of Science, and Office of Basic Energy Sciences, under Contract No. DE-AC02-06CH11357.

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