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Real-Time Grazing Incidence Small Angle X-Ray Scattering Studies of the Growth Kinetics of Sputter-Deposited Silicon Thin Films
ALEXANDER DEMASI, Department of Physics, Boston University, Boston MA, GOZDE ERDEM, Division of Materials Science and Engineering, Boston University, Boston MA, PRIYA CHINTA, Department of Physics, University of Vermont, Burlington VT, RANDALL HEADRICK, Department of Physics and Materials Science Program, University of Vermont, Burlington VT, KARL LUDWIG, Department of Physics, Boston University, Boston MA — The fundamental kinetics of thin film growth remains an active area of investigation. In this study, silicon thin films were grown at room temperature on silicon substrates via both on-axis and off-axis plasma sputter deposition, while the evolution of surface morphology was measured in real time with *in-situ* grazing incidence small angle x-ray scattering (GISAXS) at the National Synchrotron Light Source. GISAXS is a surface-sensitive, non-destructive technique, and is therefore ideally suited to a study of this nature. In addition to investigating the effect of on-axis versus off-axis bombardment, the effect of sputter gas partial pressure was examined. *Post-facto*, *ex-situ* atomic force microscopy (AFM) was used to measure the final surface morphology of the films, which could subsequently be compared with the surface morphology determined by GISAXS. Comparisons are made between the observed surface evolution during growth and theoretical predictions. This work was supported by the Department of Energy, Office of Basic Energy Sciences.

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