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Bimodal island size distribution in heteroepitaxial film growth: $BiFeO_3$ on $SrTiO_3$ PRIYA CHINTA, ISHVIENE COUR, RANDY HEADRICK, Dept. of Physics & Materials Science, University of Vermont, MATTHEW DAWBER, Dept. of Physics, Stony Brook University — Growth and control of complex oxide thin films on an atomic level is highly critical in understanding the behavior of both interfaces and complex oxide system. Real time X-ray scattering measurements during heteroepitaxial film deposition provide details of initial nucleation and growth giving insight into atomic scale processes and growth mechanisms. In this work we present experimental data for growth of multiferroic epitaxial $BiFeO_3$ (001) thin films on $SrTiO_3$ substrates using *in-situ* diffuse x-ray scattering. A bimodal size distribution of two dimensional islands where monodispersed set of large clusters and a broad distribution of smaller islands are observed during coalescence evident from two different components of diffuse scattering. Features observed by *in-situ* x-ray scattering are explained by a model where coalescence of islands determines the growth kinetics with negligible surface diffusion on $SrTiO_3$. Small clusters maintain a compact shape as they coalesce, while clusters beyond a critical size impinge to form large irregular connected islands and a population of smaller clusters forms in the spaces between the larger ones. *Ex-situ* atomic force microscopy (AFM) was used to measure the final surface morphology of the films at each stage.

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None

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