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High Speed Nanoscale Ferroelectric Domain Reading and Writing RAMESH NATH, University of Connecticut, RAMAMOORTHY RAMESH, University of California, Berkeley, BRYAN HUEY, University of Connecticut, UNIVERSITY OF CONNECTICUT COLLABORATION, UNIVERSITY OF CALIFORNIA, BERKELEY COLLABORATION — Piezo Force Microscopy is commonly employed for nanoscale studies of ferroelectric thin films, providing images of local domain orientation and piezoelectric properties. However, applications of PFM to dynamic studies are limited because image acquisition times are long (typically >100 sec.). A recent variation in Atomic Force Microscopy, High Speed Scanning Property Measurements, overcomes this challenge by allowing image frame rates on the order of one second, for image sizes from nanometers to tens of micrometers. For epitaxial thin films of PZT and BiFeO3, domain nucleation and growth is statistically studied at the nanoscale based on hundreds of images acquired at time steps of one second. For uniform films homogeneous exponential domain growth is observed, while heterogeneous domain growth is detected at epitaxial PZT grain boundaries. Finally, individual domain reading and writing is achieved at the highest tip speeds reported, beyond 1 centimeter/second, revealing a two-stage relationship between domain size and tip speed discussed experimentally and theoretically.

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