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Insitu experimental setup to study magneto-electric effects in a single nanoparticle using Bragg coherent diffraction imaging HANNAH RICH, New Mexico State University, DMITRY KARPOV, National Research Tomsk Polytechnic University & New Mexico State University,, ROSS HARDER, Argonne National Laboratory, EDWIN FOHTUNG, Los Alamos National Laboratory —
Phase transitions in multiferroic and ferroelectric materials are important for the development of spintronic devices, solar cells, catalysis, energy and information storage. We report on a recently developed insitu experimental setup to study phase transitions in multiferroic nanostructures by means of Bragg coherent diffraction imaging. By using a system capable of providing variable waveforms of pulsed electric and magnetic field uniformly on sample's crystallographic direction, we were able to map local ferroelectric phase transitions in a single nanoparticle. The system is capable of driving the sample with electric field up to 5MV/cm with a pulse of variable shape and duration while simultaneously applying pulsed magnetic field of up to 0.5mT both synchronously and asynchronously. Hall effect sensors provide real-time feedback for calibration and adjustment of magnetic field. In this poster, we highlight the capabilities of our setup to study hundreds of ps to ms dynamics in a single magneto-electric nanostructure under applied EM-field using Bragg coherent diffraction imaging. Further development will allow to synchronize the pulsed fields and arriving pulses of synchrotron radiation to increase the accessible temporal resolution of the experiment.

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