New Developments in Magnetic Coherent Diffractive Imaging
ASHISH TRIPATHI, University of California, San Diego, SANGSOO KIM, Argonne National Laboratory, SEBASTIAN DIETZE, ERIK SHIPTON, ERIC FULLERTON, OLEG SHPYRKO, University of California, San Diego, IAN MCNULTY, Argonne National Laboratory — Magnetism at the nanoscale is central to understanding emergent complexity in transition metal oxides and engineered rare earth-transition metal multilayers, and in designing new magnetic data storage and spintronic technology. We study magnetism at the nanoscale here using coherent x-ray diffractive imaging (CXDI), which is a technique with potentially wavelength-limited spatial resolution that can probe deeply beyond surfaces, and potentially on ultra-fast timescales using new x-ray laser sources. We look at the domain evolution vs. applied magnetic field over the whole hysteresis loop of a ferrimagnetic GdFe multilayer film using x-rays resonant at the Gd M5 edge for domain contrast. We explore complimentary and return point memory by imaging the multilayer over a large field of view. We lastly explore experimental and algorithmic improvements in CXDI using dichroism as contrast mechanism, as well as new opportunities for ultra-fast, single-shot imaging using a variation on the CXDI approach.

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Date submitted: 03 Jan 2011