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A joint neutron scattering and micromagnetic simulation approach to understanding magnetoelectric coupling in a mesoscale multiferroic THOMAS FARMER, ERJIA GUO, TIANHAO WANG, RYAN DESAUTELS, LISA DEBEER-SCHMITT, YAOHUA LIU, Oak Ridge National Lab, Q. WANG, Argonne National Lab, AIPING CHEN, TURAB LOOKMAN, QUANXI JIA, Los Alamos National Lab, DUSTIN GILBERT, JULIE BORCHERS, NIST, BEN HOLLADAY, SUNIL SINHA, USCD, JOHAN VAN LIEROP, University of Manitoba, MICHAEL FITZSIMMONS, Oak Ridge National Laboratory — Heterogeneous structures consisting of two materials of different ferroic order with a coherent interface provide a natural path to magnetoelectric coupling. Recently we have been studying nanopillars of magnetostrictive $CoFe_2O_4$ in a matrix of piezoelectric $BaTiO_3$ as a system for strain-mediated electric field control of the magnetic order parameter. Using the newly developed polarization capabilities of GP-SANS at ORNL to perform polarized beam small angle neutron scattering, we have demonstrated an electric field dependence of the $CoFe_2O_4$ magnetization at different magnetic fields. In combination with the neutron data, micromagnetics simulations using the Object Oriented MicroMagnetic Framework (OOMMF) have been employed to probe the spatial dependence of the magnetization. These simulations have established that a shell with large uniaxial anisotropy is required to replicate magnetometry and SANS data, which gives an indication of the depth of strain propagation across the interface.

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