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Strain dependence of transition temperatures, structural symmetry, and phase coexistence of BiFeO3 within the tetragonal-like structure WOLTER SIEMONS, CHRISTIANNE BEEKMAN, GREGORY MACDOUGALL, ADAM ACZEL, MICHAEL BIEGALSKI, Oak Ridge National Laboratory, JEREL ZARESTKY, Iowa State University, SHUHUA LIANG, ELBIO DAGOTTO, University of Tennessee, STEVE NAGLER, HANS CHRISTEN, Oak Ridge National Laboratory — We have investigated the influence of strain-imposed in-plane lattice symmetry on the structural and magnetic properties of tetragonal-like $BiFeO_3$. We find that an increase in the in-plane distortion results in an increase of the Néel temperature from 313 K to 324 K for films grown on YAlO₃ and LaAlO₃ respectively. The change in magnetic ordering temperature is reproduced in 3D Heisenberg Monte-Carlo simulations. The structural transition temperatures, from M_C to M_A monoclinic around 100 $^{\circ}$ C and to a true tetragonal phase at higher temperature, are also found to depend on strain. Some of the strain is relieved through the creation of an additional polymorph, which causes stripe patterns in the surface morphology. We present how the abundance and shape of these patterns changes with the amount and symmetry of strain. These results show strain cannot be treated as a single scalar number or simply as a direct consequence of the lattice mismatch between the film material and the substrate. Research supported by the U.S. Department of Energy (DOE), Basic Energy Sciences (BES), Materials Sciences and Engineering Division, and performed in part at ORNL's Spallation Neutron Source and Center for Nanophase Materials Sciences (sponsored by DOE-BES).

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