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Coupled orthorhombic distortion, antiferromagnetism, and superconductivity in a single twin domain of $Ba(Fe_{1-x}Co_x)_2As_2$ (x=0.047)¹ QIANG ZHANG, WENJIE WANG, B. HANSEN, N. NI, S.L. BUD'KO, P.C. CAN-FIELD, R.L. MCQUEENEY, D. VAKNIN, Ames Laboratory, and Department of Physics and Astronomy, Iowa State University, J.W. KIM, Argonne National Laboratory — The interplay between structure, magnetism, and superconductivity in single crystal $Ba(Fe_{1-x}Co_x)_2As_2$ (x=0.047) has been studied using high-resolution X-ray diffraction by monitoring charge Bragg peaks in each twin domain separately. The emergence of superconducting state is correlated with the suppression of theorthorhombic distortion around T_C , exhibiting the competition between orthorhombicity and superconductivity. Above T_S , the Bragg peak widths gradually broaden, possibly induced by orthorhombic (nematic) fluctuations in the paramagnetic tetragonal phase. Upon cooling, anomalies in the peak width are observed at T_S and also T_N indicative of strong magnetoelastic coupling. Using the capability to study individual twin domains, the peak widths in the *ab*-plane are found to exhibit anisotropic behavior along and perpendicular to the stripe-type AFM wave vector. In contrast, the temperature dependencies of the out-of-plane peak width showan anomaly at T_N , reflecting the connection between Fe-As distance and Fe local moment.

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