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Structure of ferroelectric polarization domains written by PFM
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In ferroelectric materials, polarization and atomic structure are intimately coupled. PFM is commonly used to image and write polarization domains in ferroelectric thin films, but the local structure of the resulting domains is unclear due to the uncertainty in depth sensitivity of the PFM imaging process. X-ray nanoprobe diffraction was used to simultaneously probe the structure and image polarization domains patterned by PFM into an 80nm-thick $Pb(Zr_{0.45}, Ti_{0.55})O_3$ thin film. The Bragg reflections are broader within the written domains, indicating that regions within the film are strained by the writing process. In addition, atomic planes tilt near the domain walls. This means the PFM writing process creates a more complicated structure than predicted by existing electrostatic models.

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