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Particle boundary in agglomerate enhances ferromagnetism in bismuth ferrite nanoparticles

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The nature of ferromagnetism in multiferroic bismuth ferrite (BiFeO3 or BFO) nanoparticles is still the subject of intense debate. The Time Differential Perturbed Angular Correlation (TDPAC) technique monitors local fields at the atomic scale without altering the structure of the materials under investigation. Using such an approach, we investigate that BFO nanoparticles exhibit strong ferromagnetic order at the unit cell level. Our previous data indicated that the vanishing magnetic order is already contained in the unit cell structure, at the non-magnetic sublattice (Bi site) in bulk BFO. In BFO nanoparticles, however, the temperature dependent magnetic field at the Bi site obeys the Brillouin curve of the ferromagnetic phase transition. Supported by other microscopic techniques, including transmission electron microscopy and X-ray diffraction, it is suggested that the lattice strains induced by the particle boundary in the agglomerate control the ferromagnetism in BFO nanoparticles.

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