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Magnetic Structure of Engineered Multiferroic Thin Films¹

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The intriguing properties of multiferroics, i.e., materials exhibiting the coexistence of magnetism and ferroelectricity, have stimulated intense research interest in recent years. From the viewpoint of practical applications, one needs to exploit the thin film architectures of multiferroic materials. However, fewer studies have addressed the magnetic structures of multiferroic thin films. I will present recent experimental works on two multiferroic films, BiFeO₃ and EuTiO₃, physical properties of which can be engineered via the epitaxial growth on appropriate substrates. Neutron diffraction studies on BiFeO₃ films deposited on vicinal SrTiO₃ substrates show that the magnetic structure of these films is closely correlated with the ferroelectric states that depend on the chosen substrate miscut [1]. Epitaxial EuTiO₃ grown on DyScO₃ substrate, which is a paraelectric antiferromagnet in its bulk form, is strain-tuned into multiferroics, displaying both ferroelectric and ferromagnetic characters [2]. The relationship between the strong magnetic anisotropy and the film microstructure will be discussed.

[1] X. Ke, P. P. Zhang, S. Baek, J. Zarestky, W. Tian, and C. B. Eom, Phys. Rev. B **82**, 134448 (2010).

[2] J. H. Lee, L. Fang, E. Vlahos, X. Ke, Y.W. Jung *et al.*, Nature **466**, 954 (2010).

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