

Supporting Information

Ba_{0.85}Ca_{0.15}Zr_{0.1}Ti_{0.9}O₃/CoFe₂O₄/Ba_{0.85}Ca_{0.15}Zr_{0.1}Ti_{0.9}O₃ Nanoscale Composite Films with 2-2 Connectivity for Magnetoelectric Actuation.

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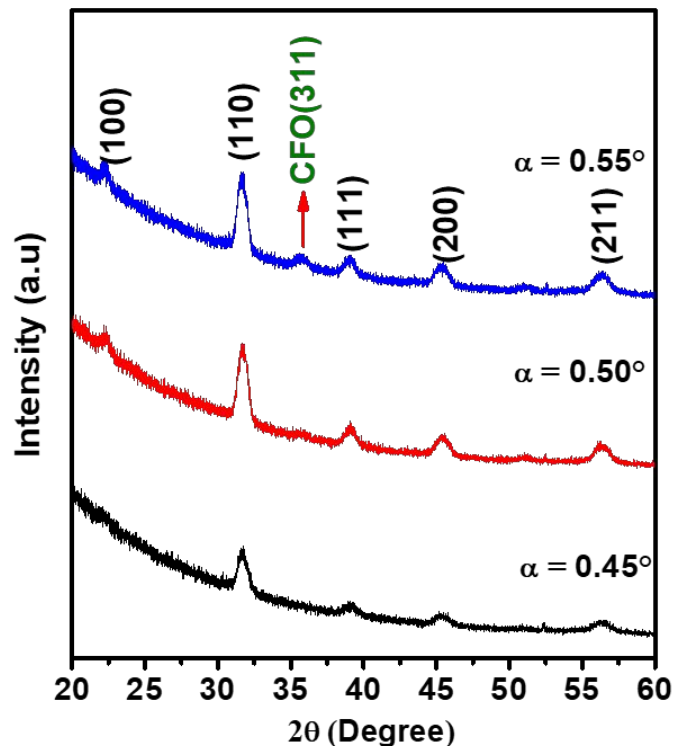


Figure S1: Grazing incidence scan at a different incidence angle on TL1 ME composite.

Figure S1, shows GI scan at alpha (0.45°,0.50°,0.55°). These scans reveal the absence of CFO reflections when alpha = 0.45° and 0.50°. At alpha =0.55°, CFO (311) reflection starts appearing, indicating that the particular alpha x-ray probing area is at the vicinity of the interface.

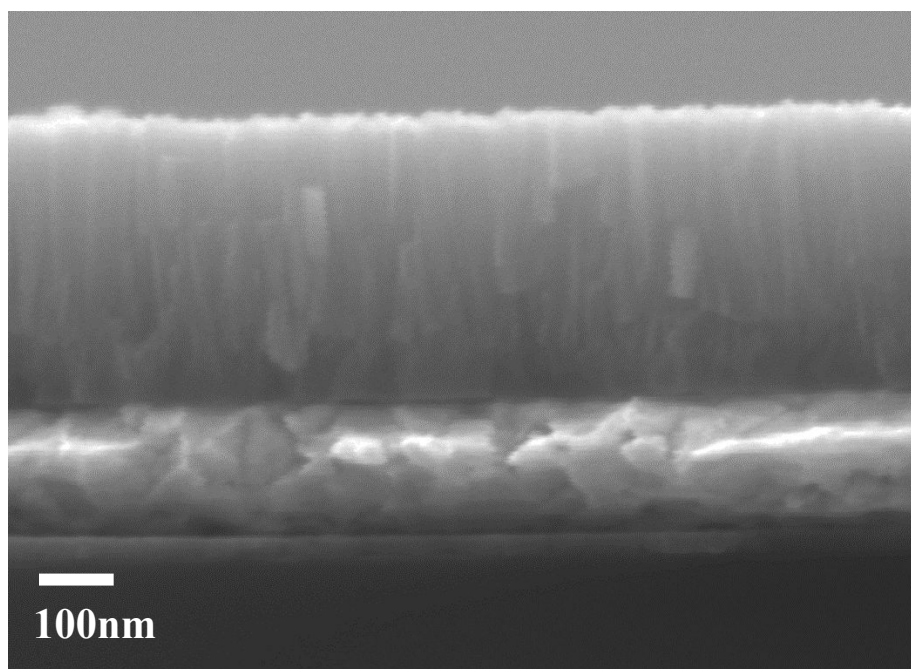


Figure S2: SEM image of individual BCZT layer (400nm) which shows the identical morphology of TL1 ME composite.

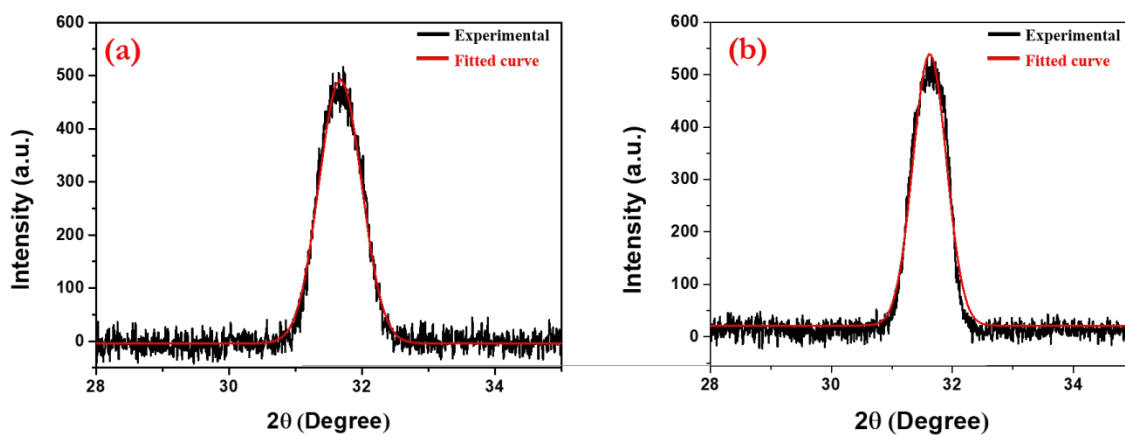


Figure S3: (a) Peak fitting for BCZT (110) reflection of TL1 and (b) BCZT (110) of individual layer with Gaussian fitting for $\alpha=0.5^\circ$.

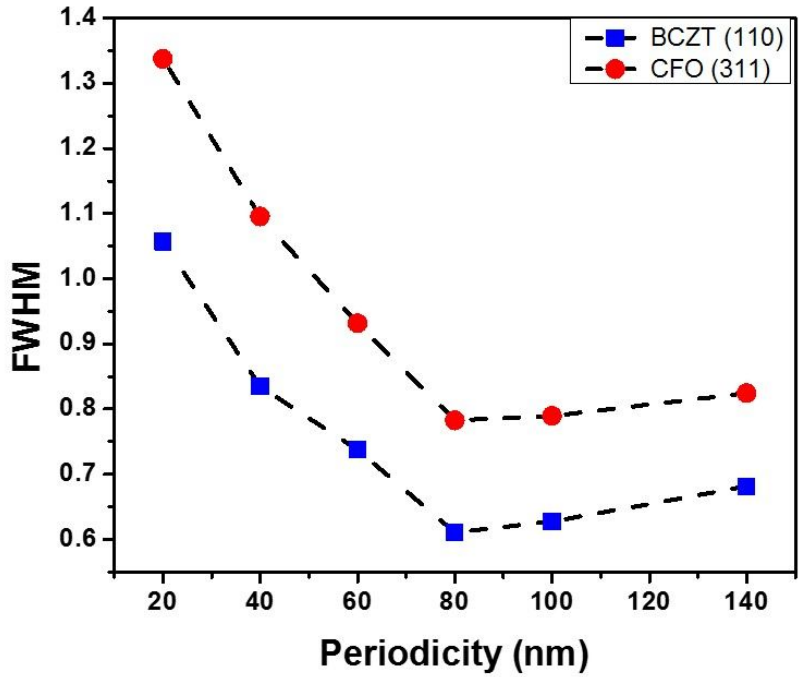


Figure S4: Full-Width Half Maximum of BCZT (110) and CFO (311) reflection for multilayers showing the higher value FWHM for ML 20 due to the presence of interfacial strain.

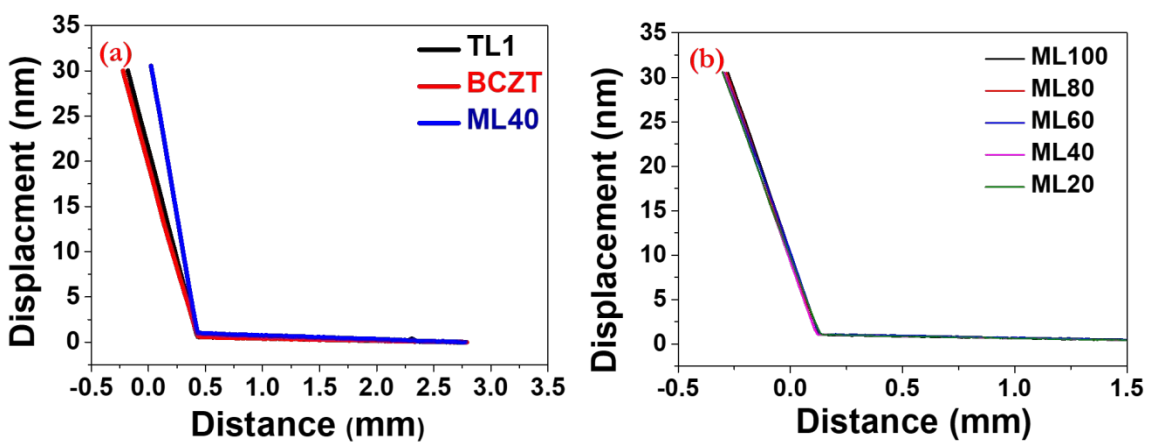


Figure S5: (a) Force-Displacement curves measured on TL1, BCZT and ML40 showing the enhanced stiffness for ML20. (b) FD curve measured on Multilayers with different periodicities

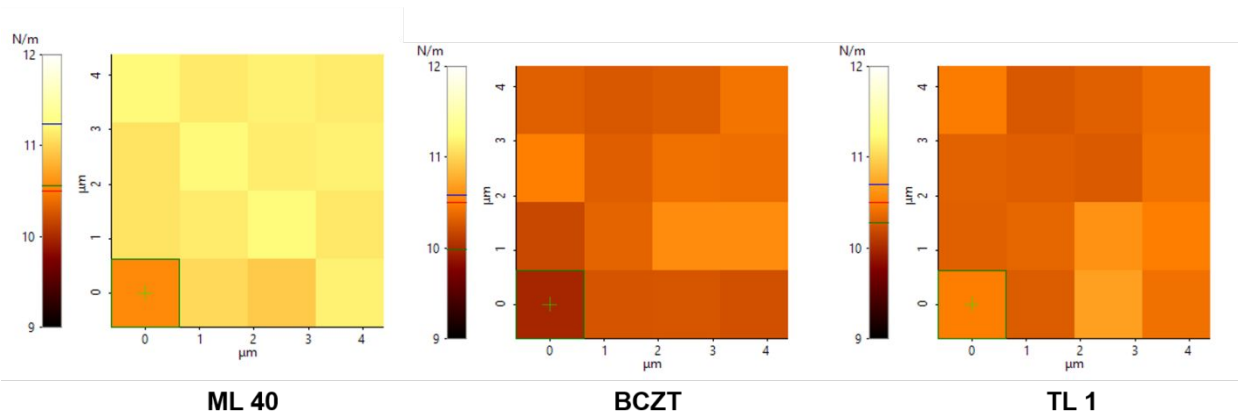


Figure S6: Stiffness mapping performed on ML 40, BCZT and TL1 indicating the uniform distribution of stiffness across the morphology.

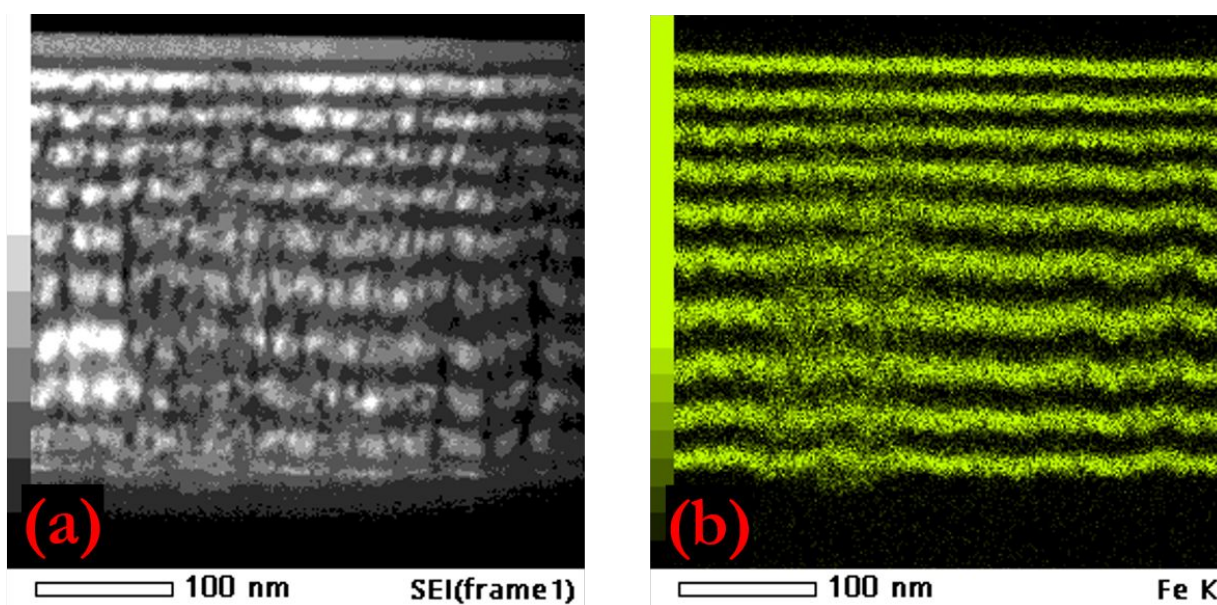


Figure S7: (a)TEM image of ML40 (b) Elemental mapping of Fe in ML40 showing the reduced interface roughness compared to ML20.

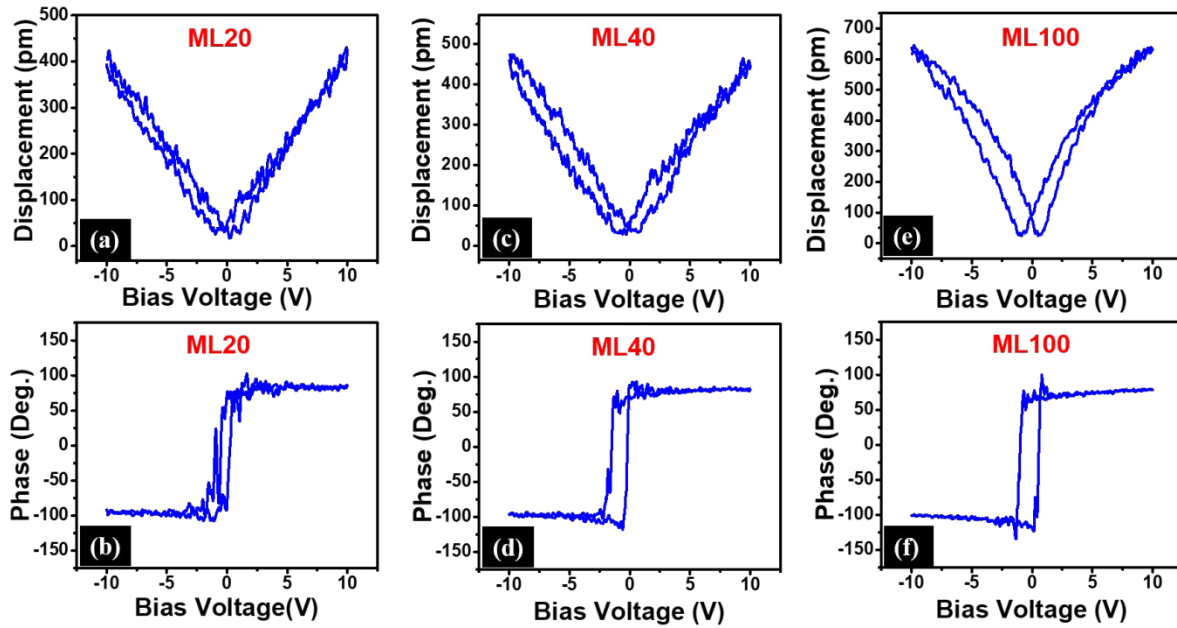


Figure S8: (a),(c),(e) shows the butterfly curve obtained from ML20, ML40 and ML100. (b),(d) &(f) PFM local hysteresis curve from ML20,ML40 and ML 100.

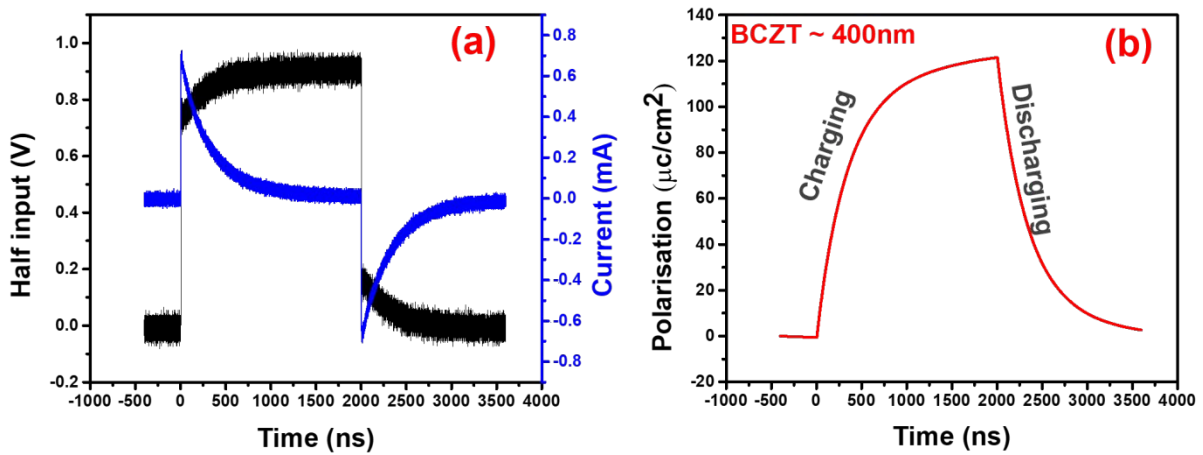


Figure S9: (a) voltage-time and Current -time curve for individual BCZT film. (b) polarization - time curve for individual BCZT film.

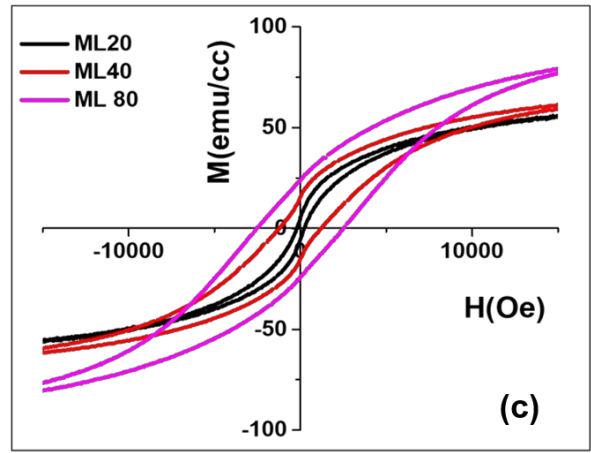
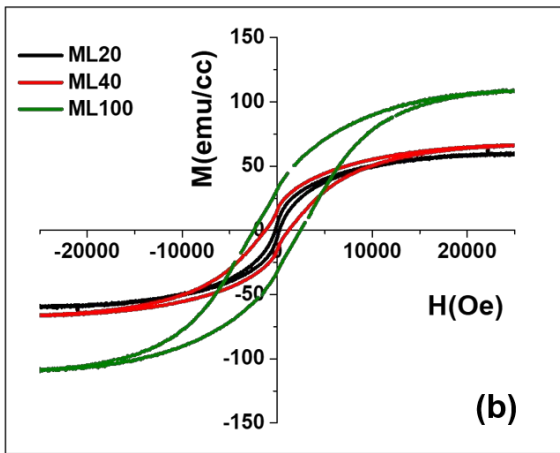
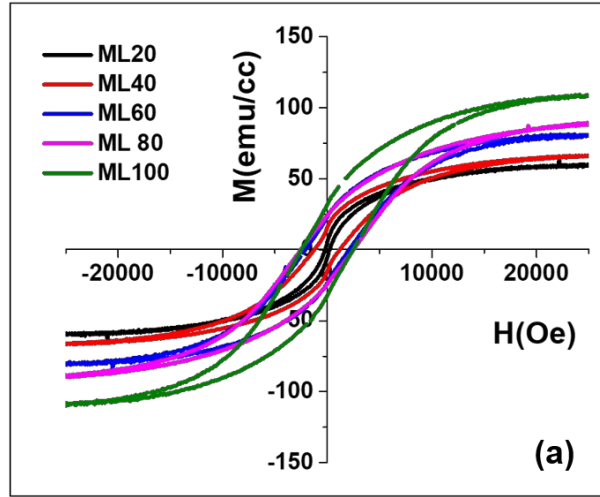


Figure S10: The inplane M-H curve obtained for the multilayers with different periodicities upto 2.5 tesla.(b) and (c) magnified view of MH curve for ML20, ML40 and ML80 showing the sudden drop in the magnetisation for ML40 at zero fields.

Table S1: Details of the Multilayers

Sample Name	Thickness of BCZT/CFO	Periodicity (Δ)
Multilayer (ML20)	10nm/10nm	20nm
ML40	20nm/20nm	40nm
ML60	30nm/30nm	60nm
ML80	40nm/40nm	80nm
ML100	50nm/50nm	100nm

Table S2: Measurements of d_{33} with and without Applying a Magnetic Field and Percentage Increase in d_{33} for All Multilayers.

Periodicity (Δ)	d_{33} (without field) (pm/V)	d_{33} (with field) (pm/V)	% increase
20	42-43	48-49	16
40	45-46	57-58	26
60	47-48	59-60	23
80	55-57	67-68	21
100	63-65	74-77	20

Since the noise is inherent in nanoscale measurements the values of d_{33} has been rounded off to whole number.

Table S3: Details of Relaxation Time (τ) for Samples with Different Periodicities.

Sample name	Relaxation time in 'ns'
ML20	67 ± 2
ML40	89 ± 2
ML60	97 ± 2
ML80	105 ± 2
ML100	108 ± 2
BCZT 400nm	387 ± 2