Electronic Supplementary Material (ESI) for Journal of Materials Chemistry A.

Electronic Supplementary Information

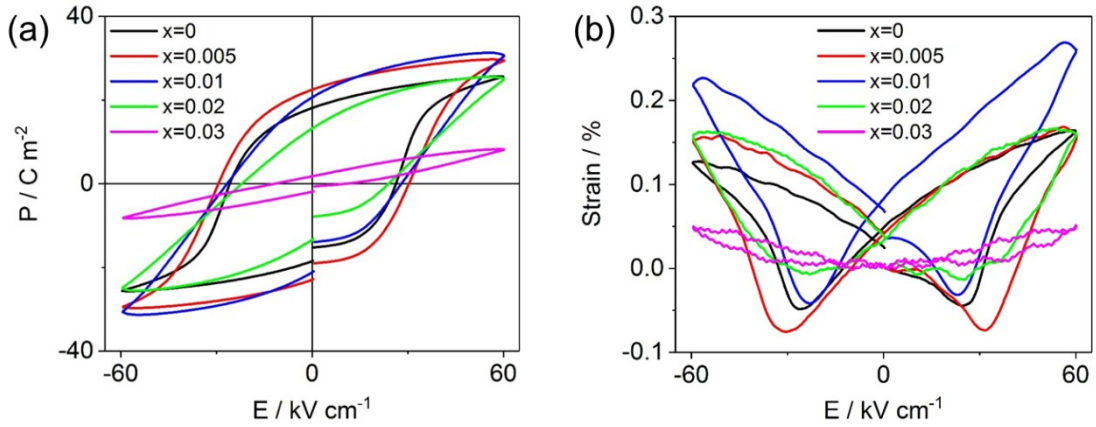

Figure S1 (a) Bipolar P-E loops; (b) Bipolar S-E loops for BF-BT-xNLN ceramics.

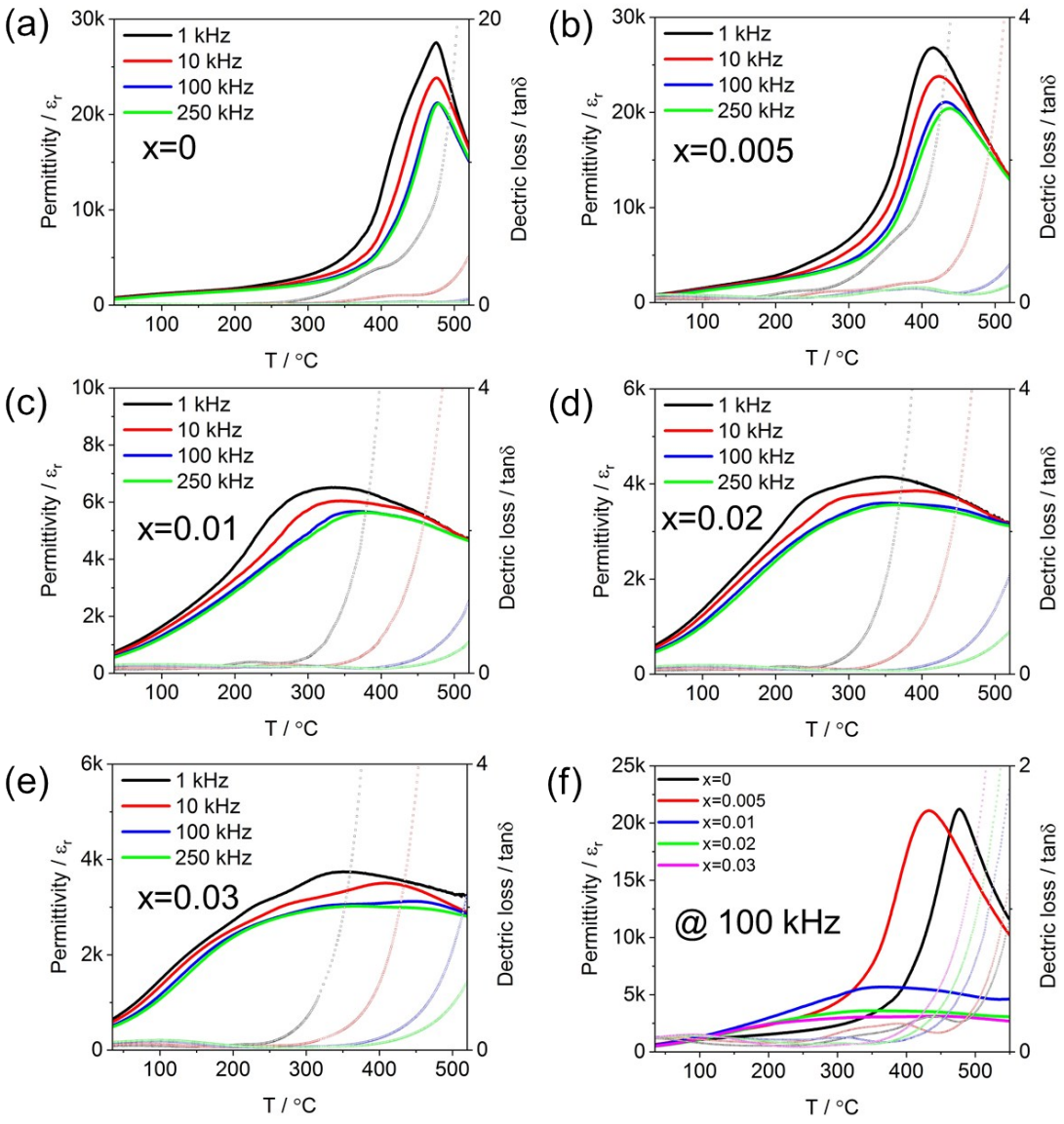

Figure S2. Frequency-dependent permittivity and loss curves for BF-0.3BT-xNLN with (a) x=0, (b) x=0.005, (c) x=0.01, (d) x=0.02 and (e) x=0.03; (f) Temperature-dependent permittivity and loss curves at 100 kHz for BF-BT-xNLN ceramics.

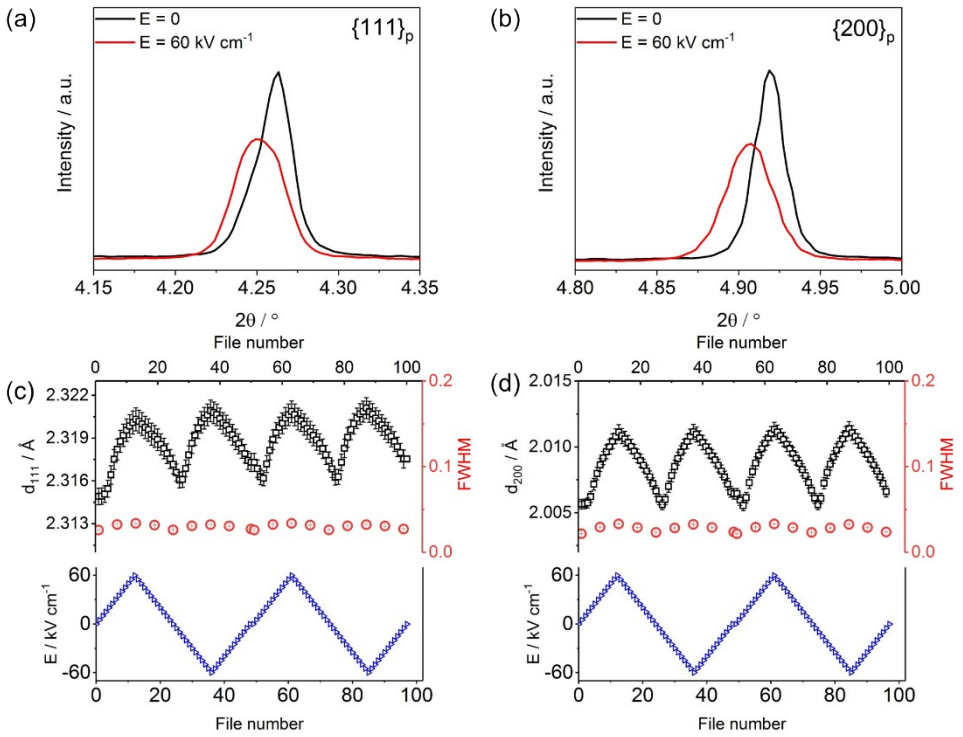

Figure S3. (a) $\{111\}_p$ and (b) $\{200\}_p$ XRD reflections at 0 and 60 kV cm^{-1} for BF-0.3BT at $\beta = 0°$; d-spacing and FWHM of (c)$\{111\}_p$ and (d) $\{200\}_p$ XRD reflection at $\beta = 0°$ obtained from the *in-situ* XRD experiment for BF-0.3BT, with two cycles of electric field poling under ± 60 kV cm^{-1}

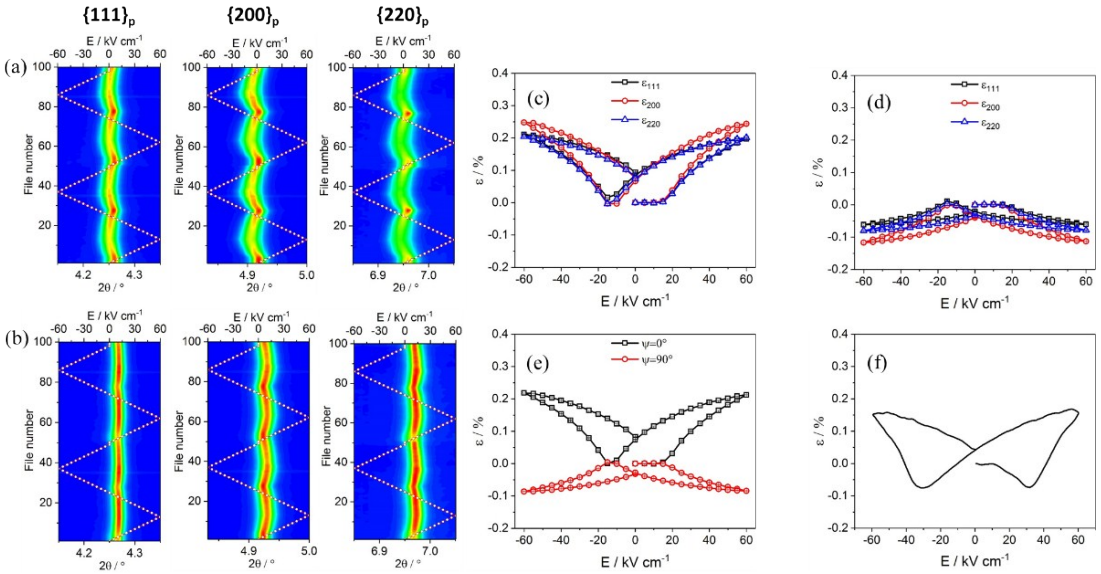

Figure S4. Contour plots of the {111}, {200} and {220} peak profiles at (a) β = 0° and (b) β = 90° obtained from the *in-situ* XRD experiment for BF-0.3BT-0.005NLN, with two cycles of electric field poling under ± 60 kV cm^{-1}; effective lattice strains calculated from representative peaks with grain orientations of (c) β = 0° and (d) β = 90° for BF-0.3BT-0.005NLN; (e) Total estimated macroscopic strain for β = 0° and β = 90° for BF-0.3BT-0.005NLN; (f) Directly measured macroscopic S-E loop for BF-0.3BT-0.005NLN.

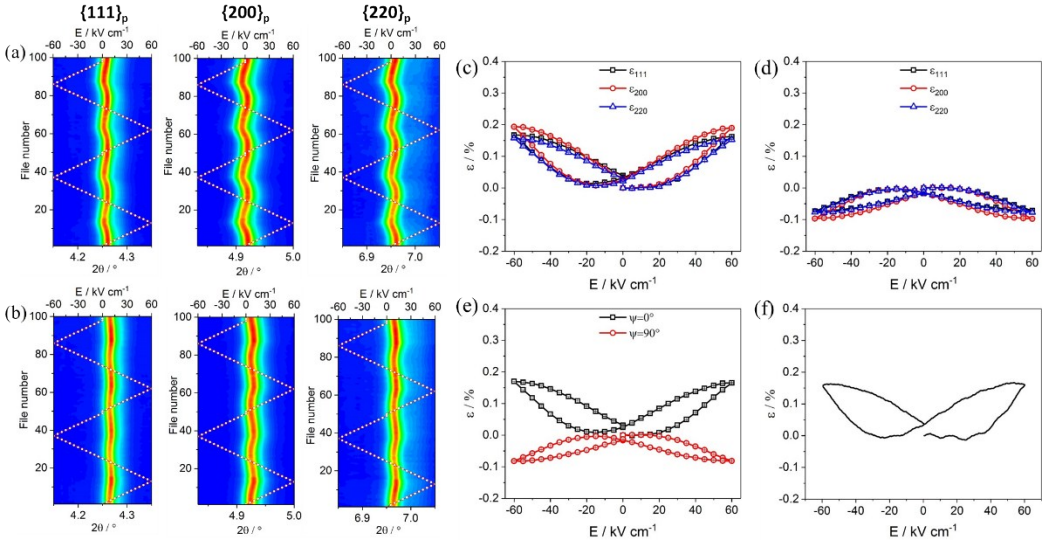

Figure S5 Contour plots of the {111}, {200} and {220} peak profiles at (a) β = 0° and (b) β = 90° obtained from the *in-situ* XRD experiment for BF-0.3BT-0.02NLN, with two cycles of electric field poling under ± 60 kV cm^{-1}; Effective lattice strains calculated from representative peaks with grain orientations of (c) β = 0° and (d) β = 90° for BF-0.3BT-0.02NLN; (e) Total estimated macroscopic strain for β = 0° and β = 90° for BF-0.3BT-0.02NLN; (f) Directly measured macroscopic S-E loop for BF-0.3BT-0.02NLN.

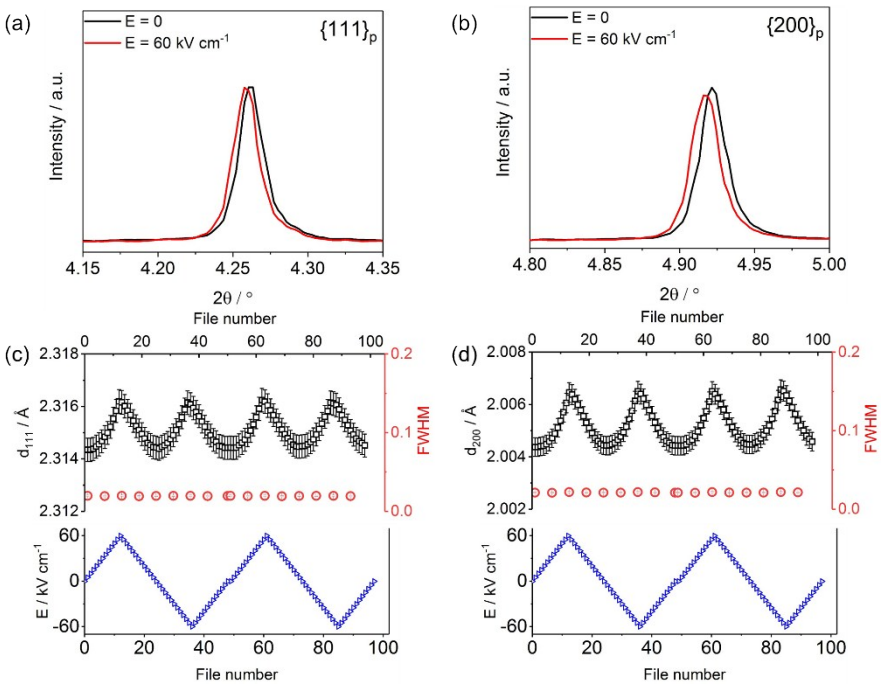

Figure S6. (a) $\{111\}_p$ and (b) $\{200\}_p$ XRD reflections at 0 and 60 kV cm^{-1} for BF-0.3BT-0.03NLN at β = 0°; d-spacing and FWHM of (c)$\{111\}_p$ and (d) $\{200\}_p$ XRD reflection at β = 0° obtained from the *in-situ* XRD experiment for BF-0.3BT-0.03NLN, with two cycles of electric field poling under ± 60 kV cm^{-1}.

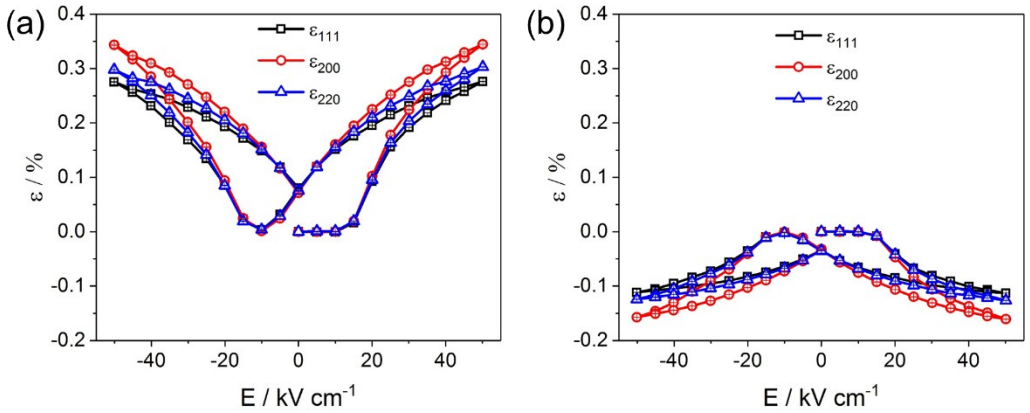

Figure S7 Effective lattice strains calculated from representative peaks with grain orientations of (a) β = 0° and (b) β = 90°, obtained from the *in-situ* XRD experiment for 5%$BiScO_3$ doped BF-BT ceramics, with two cycles of electric field poling under ± 50 kV cm^{-1}

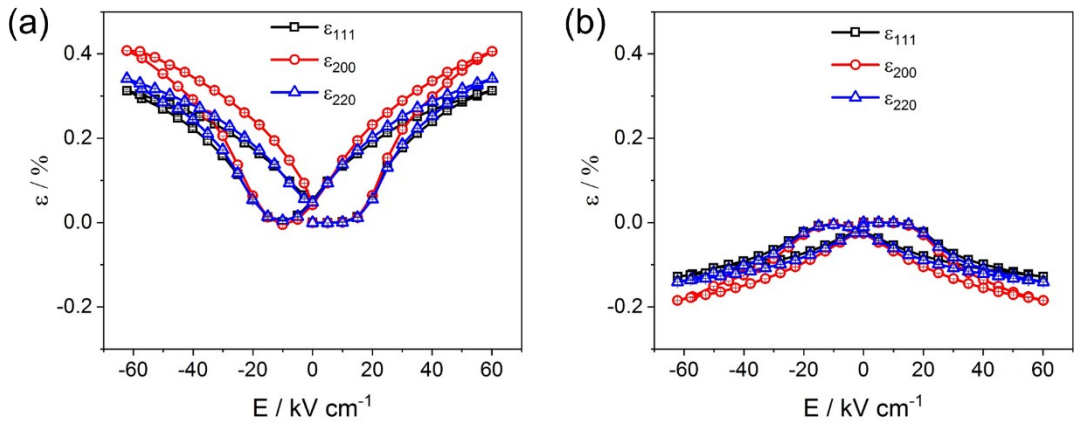

Figure S8 Effective lattice strains calculated from representative peaks with grain orientations of (a) β = 0° and (b) β = 90°, obtained from the *in-situ* XRD experiment for 5%$BiMg_{2/3}Nb_{1/3}O_3$ doped BF-BT ceramics, with two cycles of electric field poling under ± 60 kV cm^{-1}