

## Supplementary Information for

### Tailoring the electrocaloric effect of $\text{Pb}_{0.78}\text{Ba}_{0.2}\text{La}_{0.02}\text{ZrO}_3$ relaxor thin film by GaN substrates

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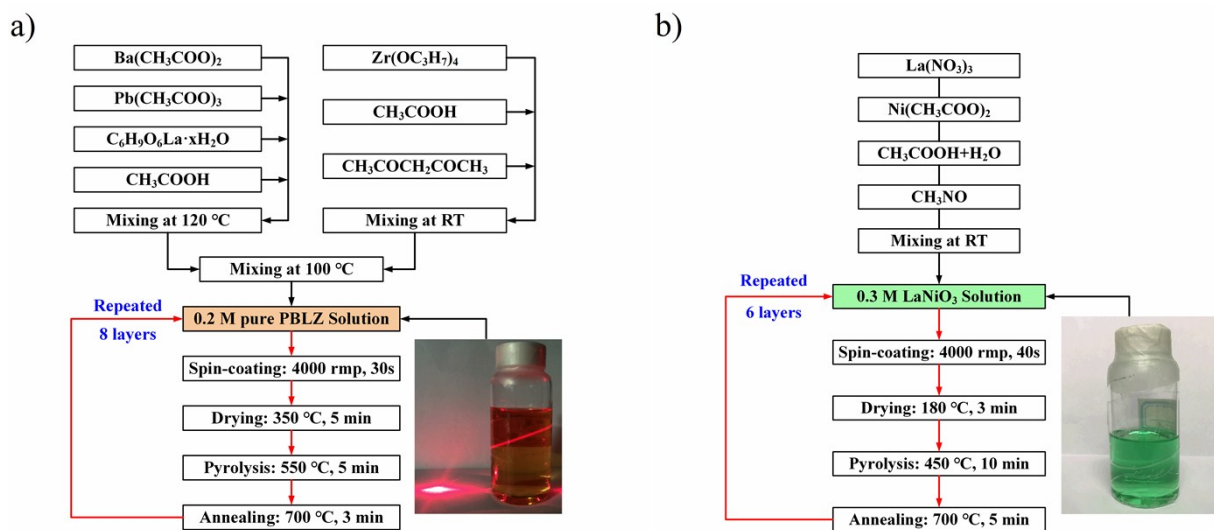
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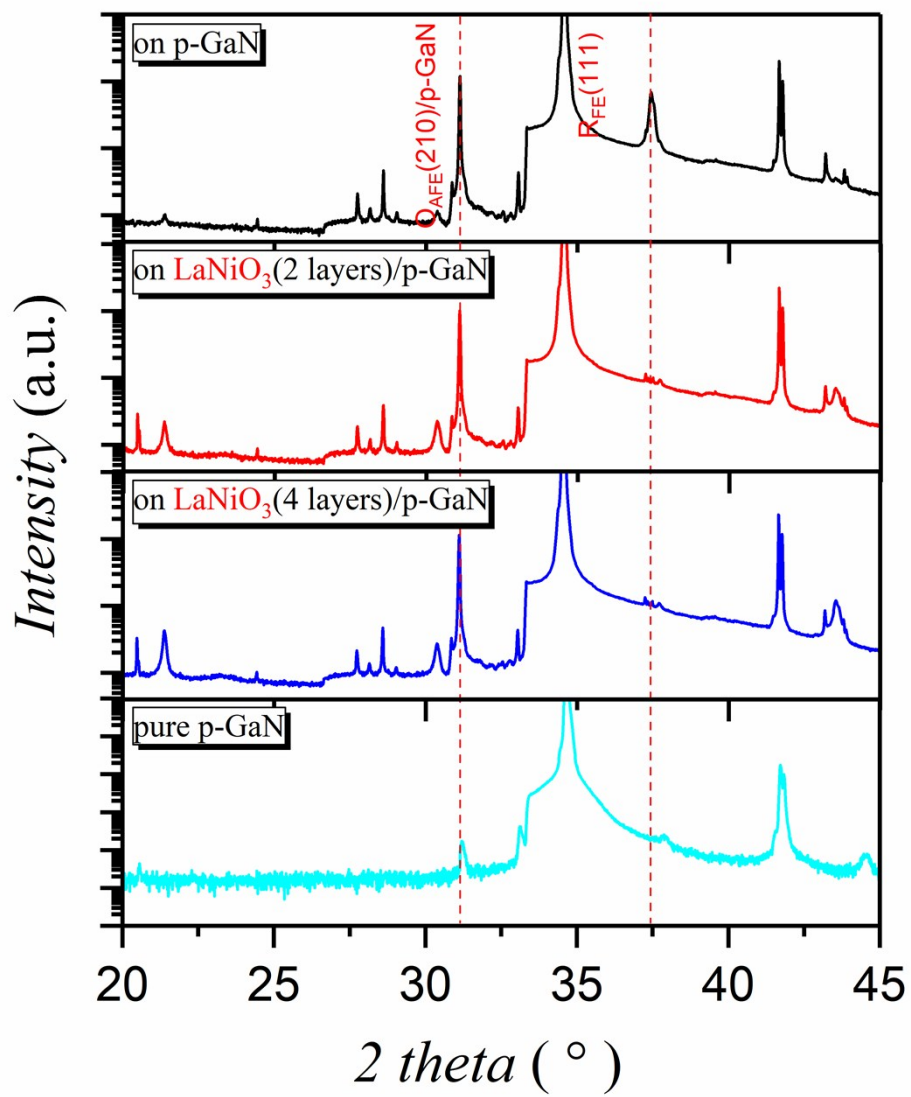
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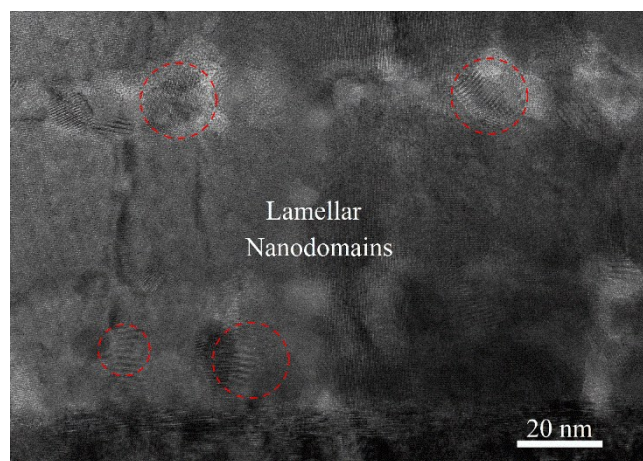
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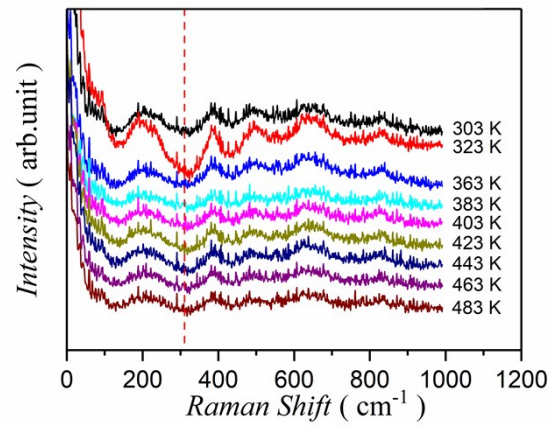
**Fig.S1.** Flow charts of the preparation of (a)  $\text{Pb}_{0.78}\text{Ba}_{0.2}\text{La}_{0.02}\text{ZrO}_3$  (PBLZ) thin films and (b)  $\text{LaNiO}_3$  bottom electrode.



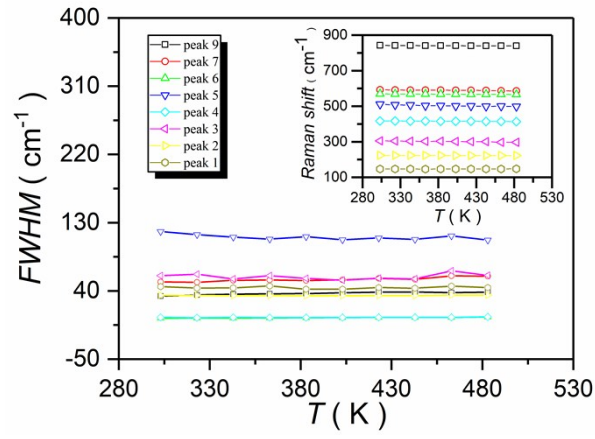
**Fig. S2.** XRD patterns of the pure p-GaN and PBLZ thin films on p-GaN substrate,  $\text{LaNiO}_3$  (2 layers)/p-GaN substrate and  $\text{LaNiO}_3$  (2 layers)/p-GaN substrate.



**Fig. S3.** TEM image of the PBLZ thin film on LaNiO<sub>3</sub>/n-GaN substrate.

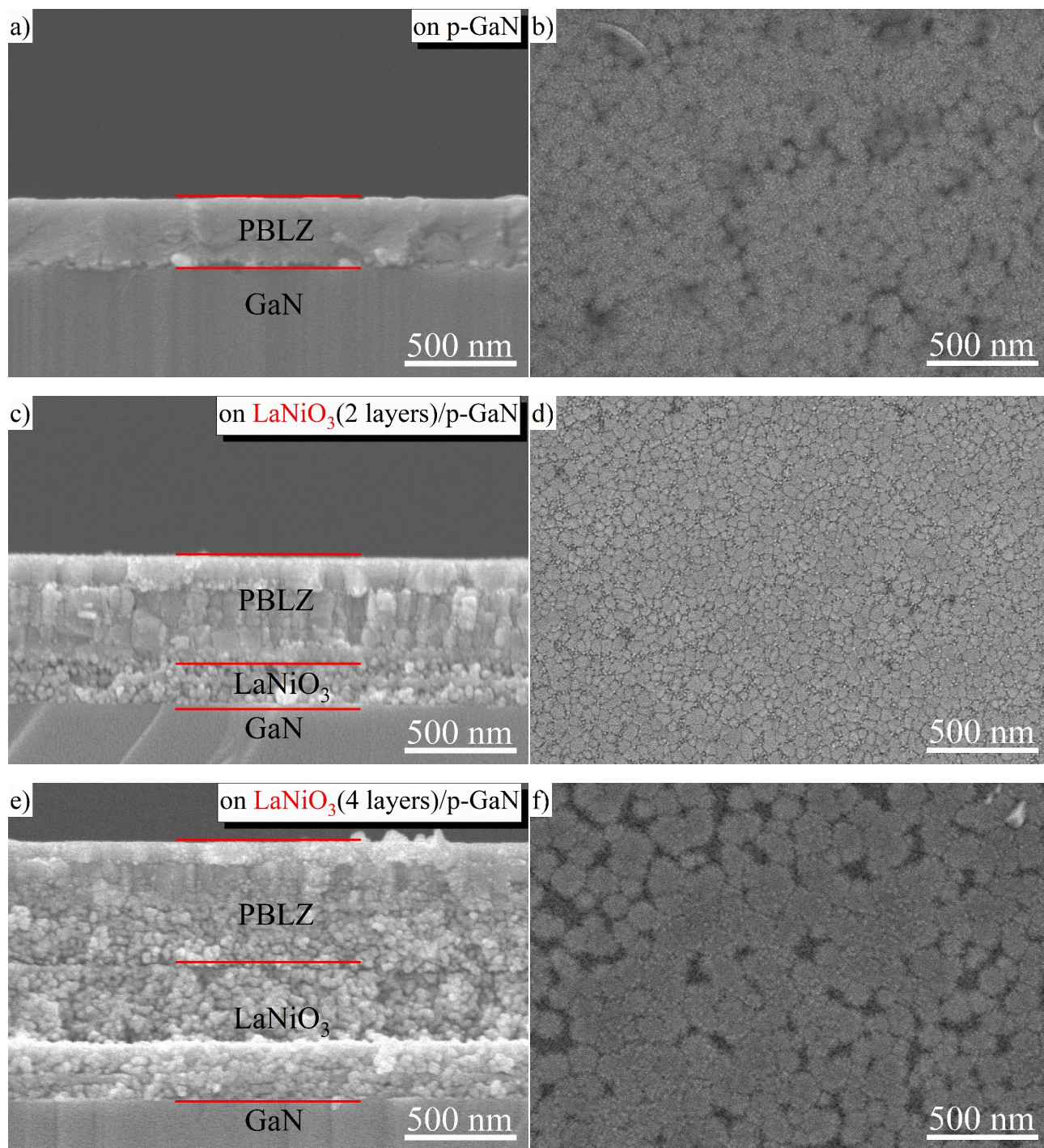


**Fig. S4.** Raman scattering spectra of the PBLZ thin film on Pt/LaNiO<sub>3</sub> substrate at selected temperature.

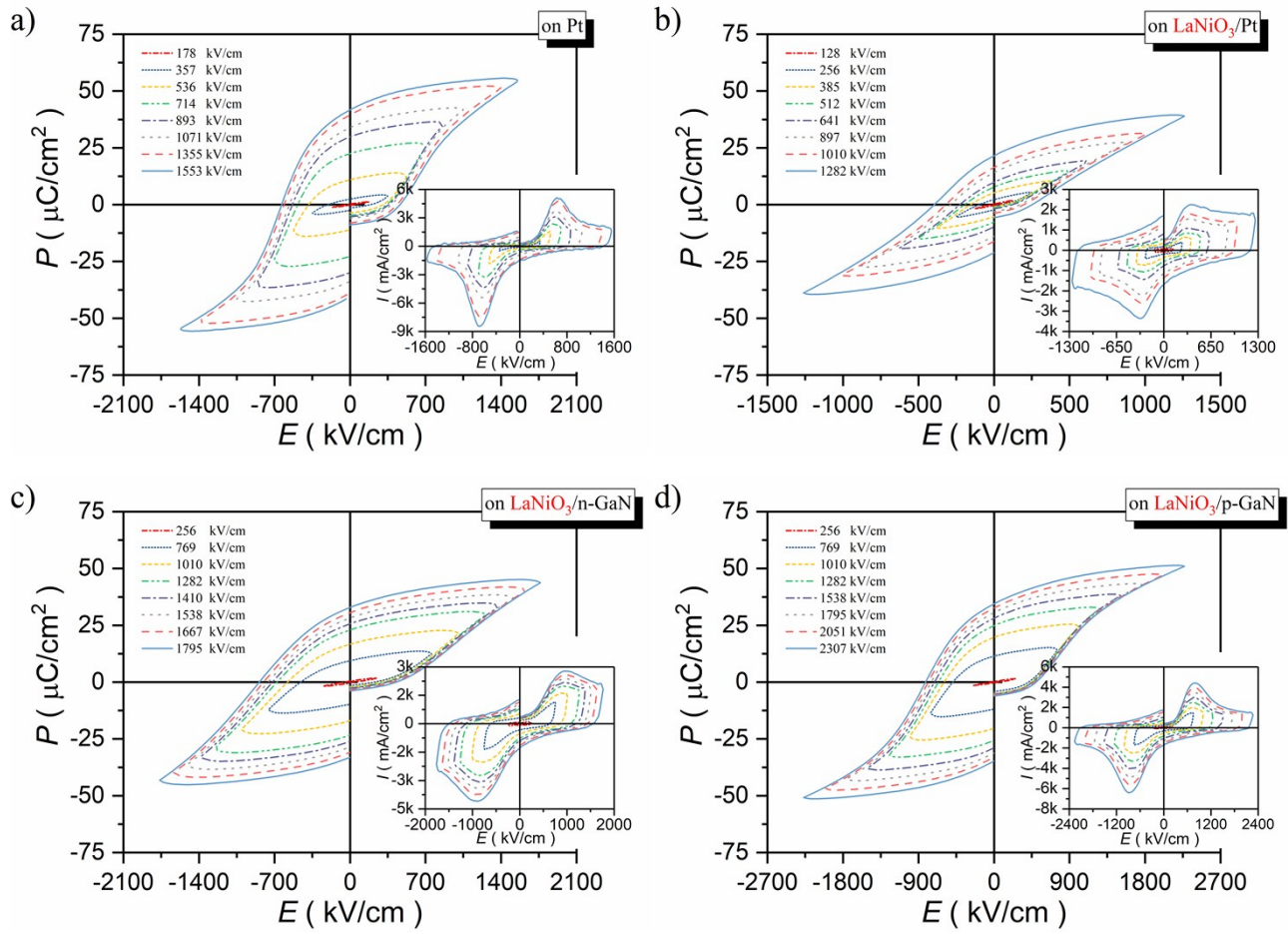


**Fig. S5.** FWHM of Raman scattering spectra of the PBLZ thin film on p-GaN substrate as a function of temperature of peak 1,2,3,4,5,6,7 and 9. Inset: Raman shift as a function of temperature of peak 1,2,3,4,5,6,7 and 9.





**Fig. S6.** Cross-sectional and the corresponding surface SEM images of the PBLZ thin films. a), b) on pure p-GaN. c), d) on LaNiO<sub>3</sub>(2 layers)/p-GaN substrate. e), f) on LaNiO<sub>3</sub>(4 layers)/p-GaN substrate.



**Fig. S7.**  $P$ - $E$  loops of the PBLZ thin films at selected electric fields at 10 kHz (a) on Pt substrate. (b) on LaNiO<sub>3</sub>/Pt substrate. (c) on LaNiO<sub>3</sub>/n-GaN substrate. (d) on LaNiO<sub>3</sub>/p-GaN substrate. Insets in (a), (b), (c) and (d):  $I$ - $E$  curves at selected electric fields.