

## Supporting Information

### Large, thermally stabilized and fatigue-resisted piezoelectric strain in textured relaxor- PbTiO<sub>3</sub> ferroelectric ceramics

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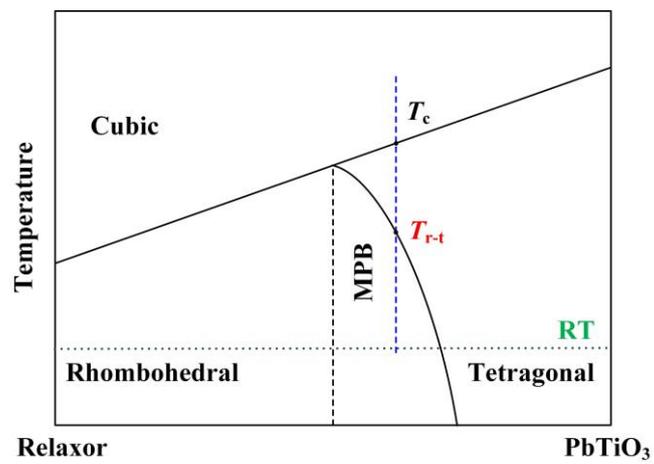


Fig.S1 Schematic phase diagram for relaxor-PbTiO<sub>3</sub> based ferroelectrics.

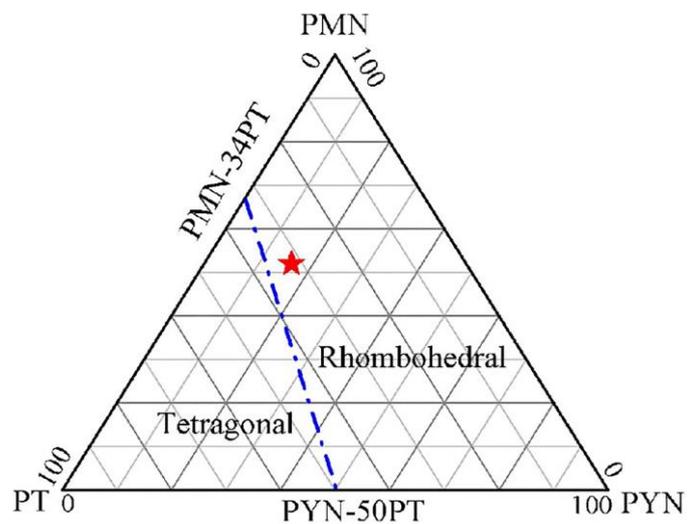


Fig.S2 Phase diagram showing the location of 0.16PYN-0.52PMN-0.32PT studied here.

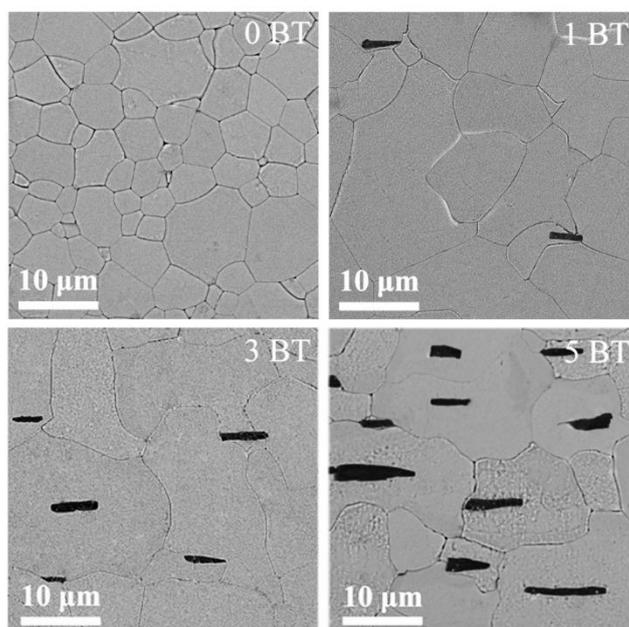


Fig.S3 SEM images of the PYN-PMN-PT ceramics with 0 vol.% (0BT), 1 vol.% (1BT), 3 vol.% (3BT) and 5 vol.% (5BT) BT templates.

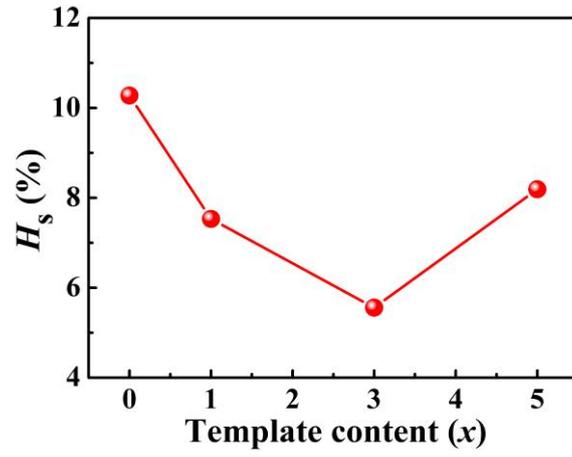


Fig.S4 Strain hysteresis  $H_s$  of the PYN-PMN-PT ceramics as a function of BT template concentration ( $x$  vol.%).

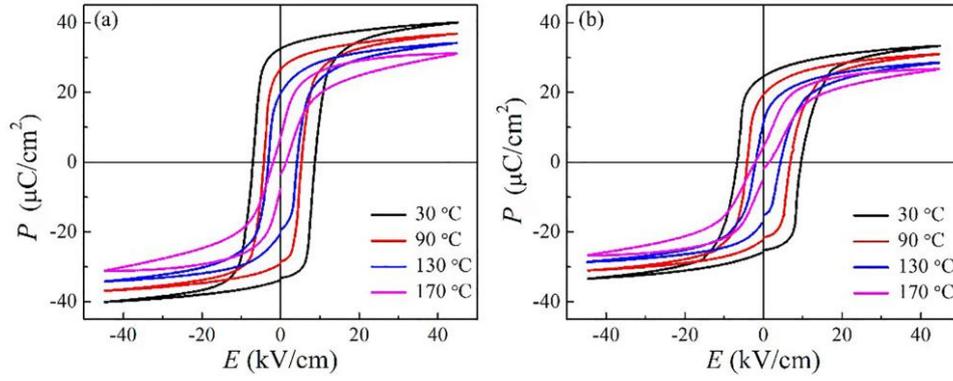


Fig.S5 Polarization vs. electric field ( $P$ - $E$ ) hysteresis loops of (a) the randomly oriented and (b) 3 vol.% BT textured PYN-PMN-PT ceramics measured at selected temperatures.

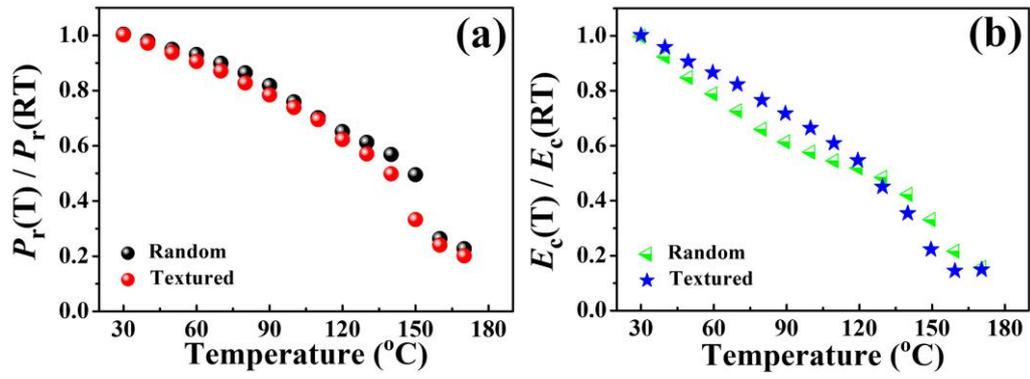


Fig.S6 Temperature dependence of normalized (a)  $P_r$  (i.e.,  $P_r = (P_r^+ - P_r^-) / 2$ ) and (b)  $E_c$  for randomly oriented and 3 vol.% BT textured PYN-PMN-PT ceramics.

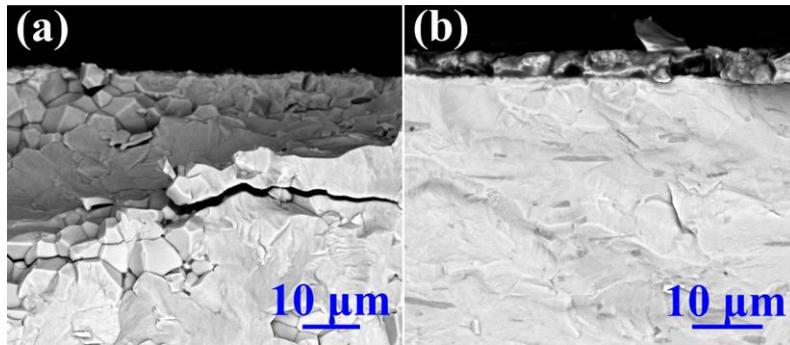


Fig. S7 SEM images of fracture surfaces of (a) randomly oriented and (b) 3 vol.% BT textured PYN-PMN-PT ceramics after  $10^6$  bipolar cycles.