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

Giant and reversible photoluminescence modulation based on *in situ* electric-field-controlled antiferroelectric-ferroelectric phase transition

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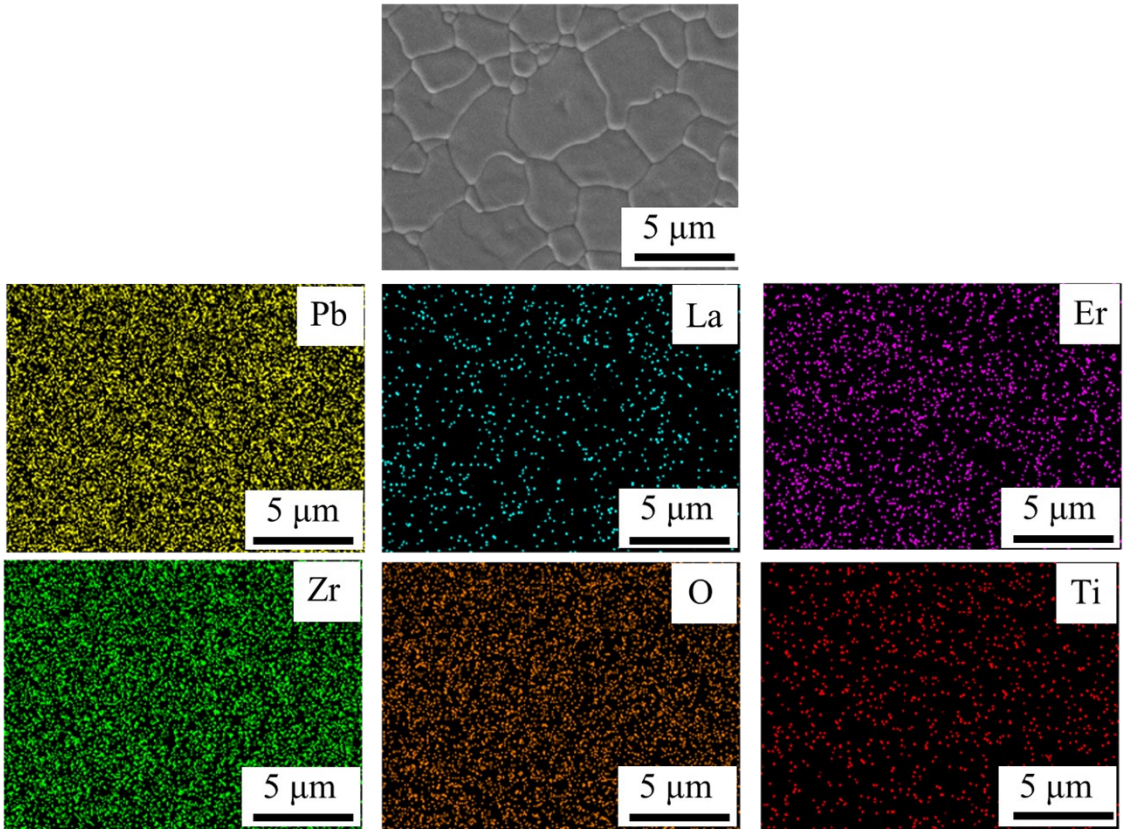

Figure S1. Scanning electron microscopy (SEM) image of the 0.5 mol% Er^{3+} doped $Pb_{0.96}La_{0.04}Zr_{0.9}Ti_{0.1}O_3$ (PLZT-Er) ceramic, and corresponding energy-dispersive X-ray spectroscopy (EDS) images that demonstrate the homogeneity of the elemental distribution.

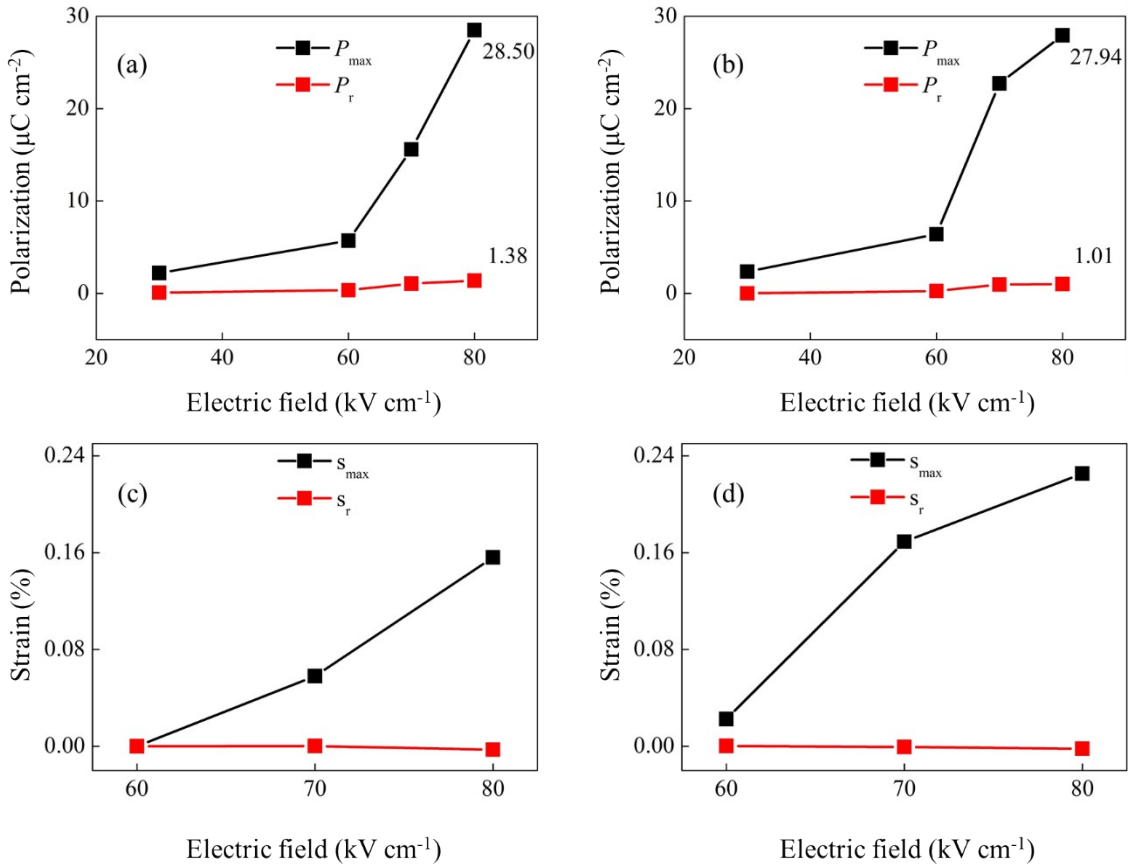

Figure S2. (a) (b) Maximum polarization (P_{max}) and remnant polarization (P_r) of PLZT and PLZT-Er under various maximum electric fields (E). (c) (d) Maximum strain (s_{max}) and remnant strain (s_r) of PLZT and PLZT-Er under various maximum electric fields (E). (a) (c) Pure PLZT, and (b) (d) PLZT-Er.

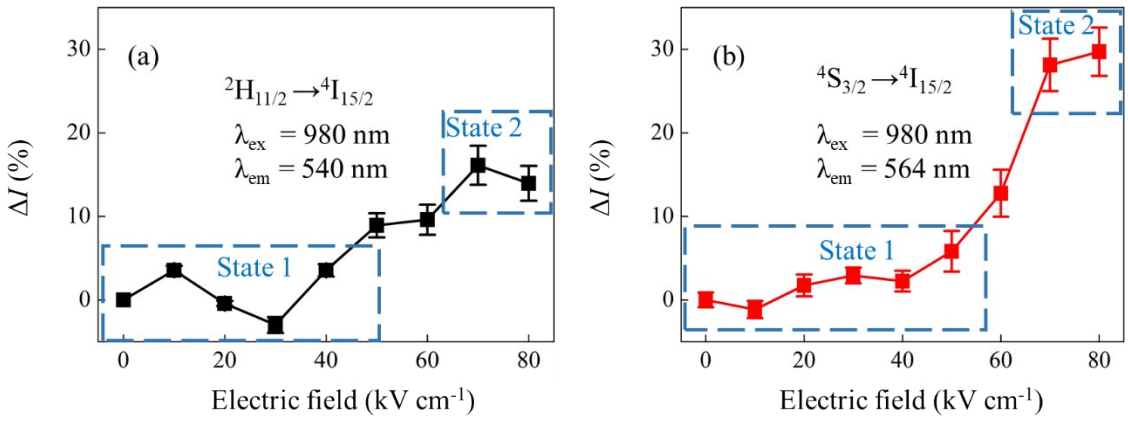

Figure S3. Photoluminescence (PL) enhancement ratio as a function of applying *E* from 0 to 80 kV cm^{-1}: (a) 540 nm, and (b) 564 nm. Two distinguishable states are marked.

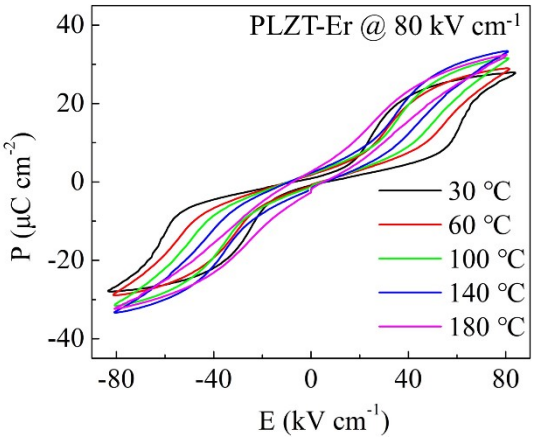

Figure S4. Temperature dependent *P*-*E* curves of PLZT-Er sample at E = 80 kV cm^{-1}.

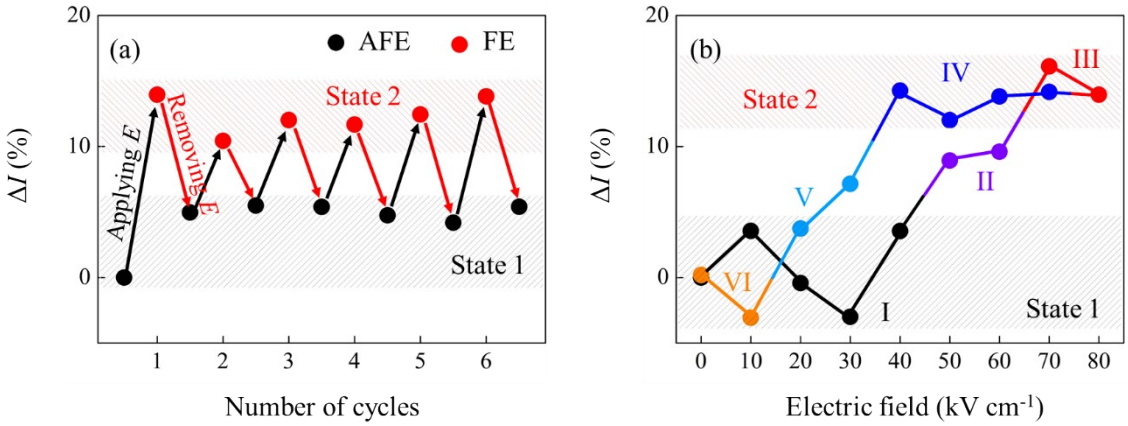

Figure S5. (a) PL enhancement ratio of PLZT-Er under an alternate *E* between 0 and 80 kV cm^{-1}. (b) PL enhancement ratio of the PLZT-Er ceramic under a cycle of *in situ E* between 0 and 80 kV cm^{-1}. Six nonlinear change sections (I to VI) and two distinguishable PL states are marked in (b). The PL band is at 540 nm.