

Supplementary Data

In-situ reversibly tuning photoluminescence of epitaxial thin film via piezoelectric strain induced by $\text{Pb}(\text{Mg}_{1/3}\text{Nb}_{2/3})\text{O}_3$ - PbTiO_3 single crystal

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Fig. S1 shows the schematic PFM set-up and the local PFM hysteresis loops measured under 25 V dc bias field and an ac voltage of 1 V was applied. The phase angle exhibited a 180° change under the reversal of the dc bias field, confirming a polarization switching process.

Fig. S2 shows the macroscopic P - E loops of the BTO(Yb/Er) thin film, it can

been found that the maximum polarization P_m , remnant polarization P_r , and coercive field E_c is $\sim 30 \mu\text{C}/\text{cm}^2$, $\sim 10 \mu\text{C}/\text{cm}^2$ and $3 \text{ kV}/\text{mm}$, respectively. The well-defined hysteresis loops verified the macroscopic ferroelectric response of the epitaxial BTO(Yb/Er) thin film.

Fig. S3 shows the cross-sectional HRTEM image of the SRO/BTO(Yb/Er) interface, which indicated the BTO(Yb/Er) thin film was epitaxially grown on the SRO bottom electrode.

Fig. S4 shows the PL spectra measured under $0.3 \text{ kV}/\text{mm}$ during the increasing and decreasing process. It can be found that in the repeated process the intensity of the green emission peak was reversibly changed.

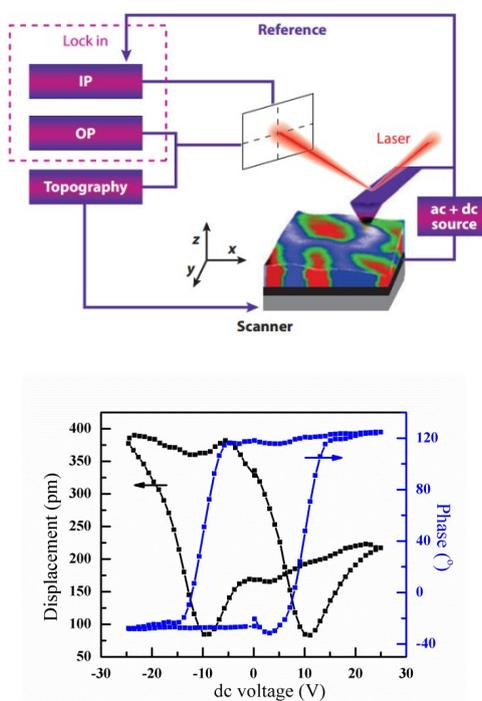


Fig. S1. The PFM set-up and local piezoelectric hysteresis loop of the BTO(Yb/Er) thin film.

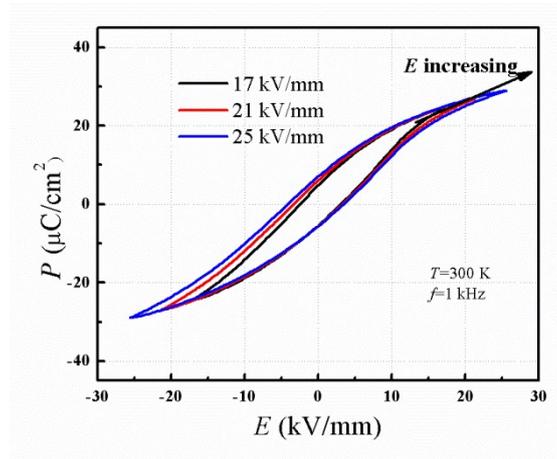


Fig. S2. The macroscopic P - E loops of the BTO(Yb/Er) thin film measured under 1 kHz at room temperature.

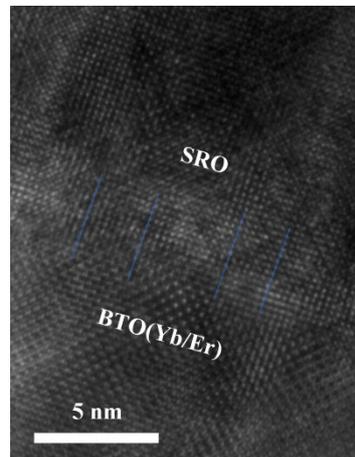


Fig. S3. The cross-sectional HRTEM image of the SRO/BTO(Yb/Er) interface.

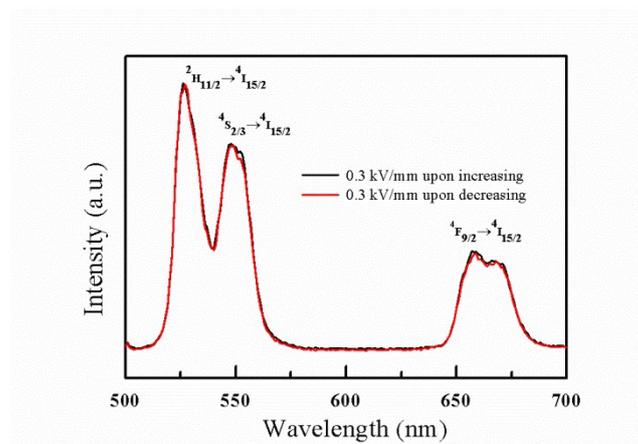


Fig. S4. The PL spectra measured under 0.3 kV/mm during the increasing and decreasing process