Supplementary Information (SI) for Inorganic Chemistry Frontiers.

Supporting information

Dual-functional Applications of Photochromic $BiNbO_4$: Er^{3+} Ceramics Based on Reversible Upconversion Luminescence Modulation

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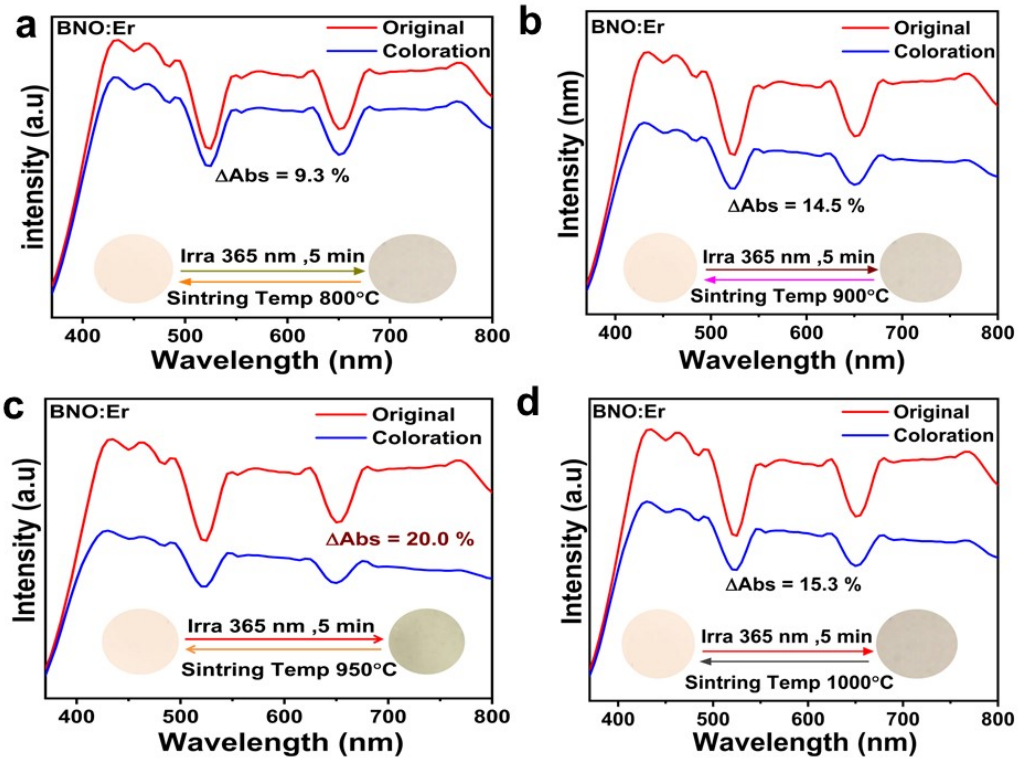

Fig. S1 The diffuse reflection spectra and corresponding photos of the original and photochromic BNO: Er at sintering temperatures of 800°C (a), 900°C (b), 950°C (c), and 1000 °C (d).

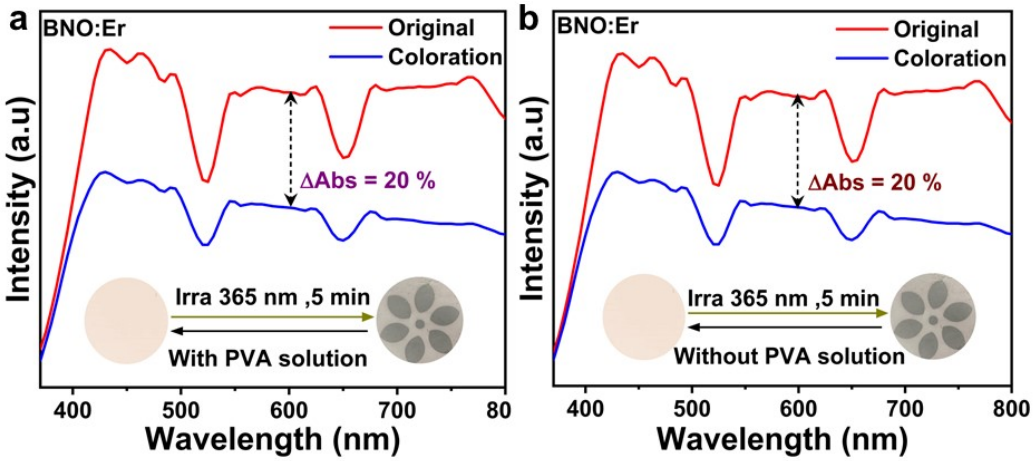

Fig. S2 The diffuse reflection spectra and corresponding digital photos of BNO: Er ceramics with (a) and without (b) PVA solution.

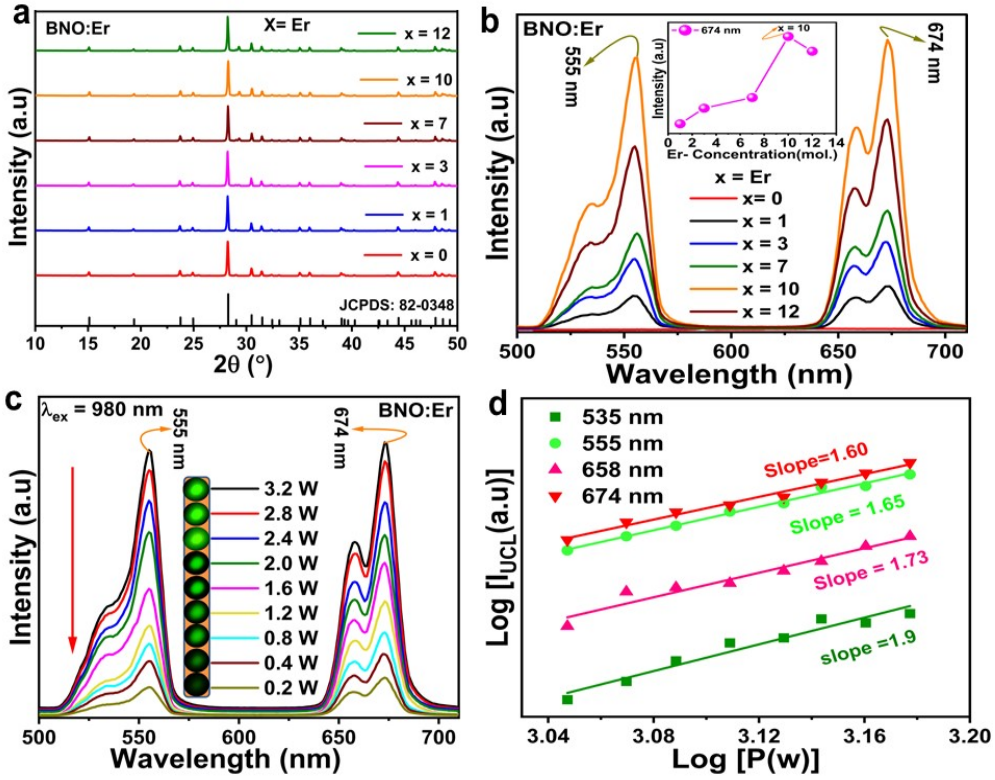

Fig. S3 (a) XRD patterns of BNO doping with different concentrations of Er^{3+} ions. (b) Under 980 nm excitation, the Er^{3+} concentration-dependent UCL spectra. (c) The UCL spectra of BNO: Er ceramic as a function of 980 nm laser power. (d) The plot of logarithmic I_{UCL} at 535, 555, 658, and 674 nm against logarithmic 980 nm laser power.

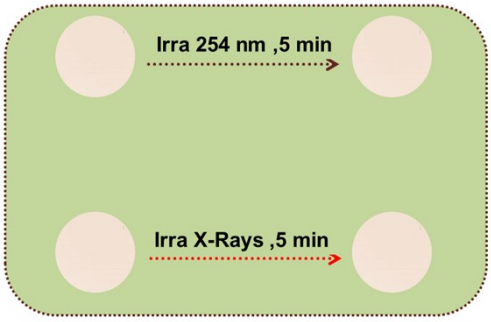

Fig. S4 The digital photos of the BNO: Er ceramics before and after 254 nm laser (top) and X-ray (bottom) irradiation for 5 min.

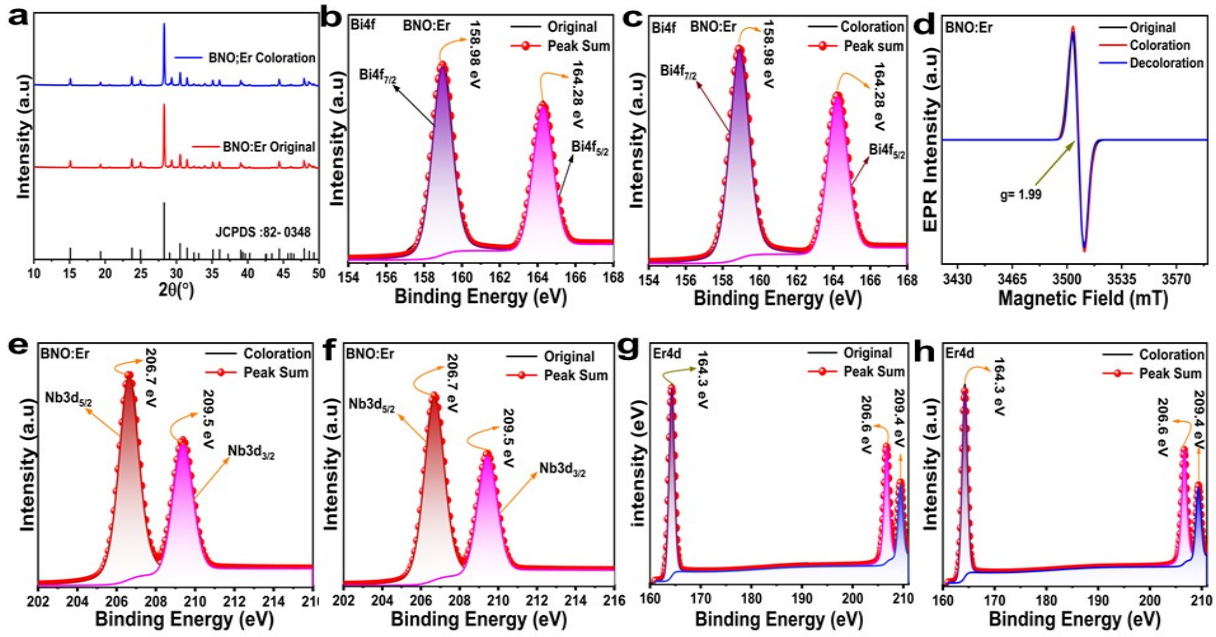

Fig. S5 (a) The XRD patterns of the original and photochromic BNO: Er ceramic. The Bi 4f high-resolution XPS spectra of the BNO: Er ceramic before (b) and after (c) 365 nm light irradiation for 5 min. (d) EPR signal of the initial and coloration samples. The Nb 3d high-resolution spectra of the original (e) and photochromic (f) BNO: Er ceramic. The Er 4d high-resolution XPS spectra of the BNO: Er before (g) and after (h) 365 nm UV light (12 W) exposure for 5 min.

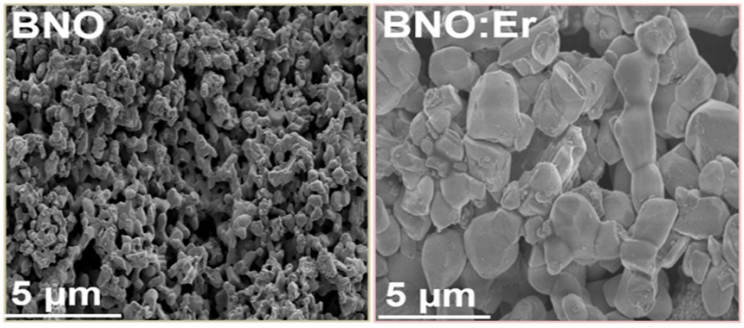

Fig. S6 SEM images of BNO and BNO:Er ceramics.

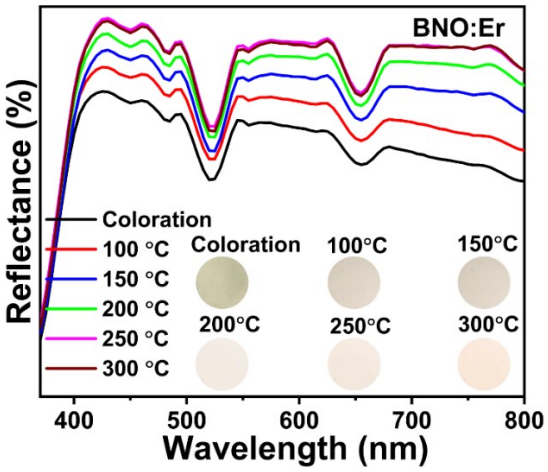

Fig. S7 The diffuse reflection spectra and corresponding digital photos of the photochromic-saturated BNO: Er ceramic by re-heating at various temperatures for 4 min.

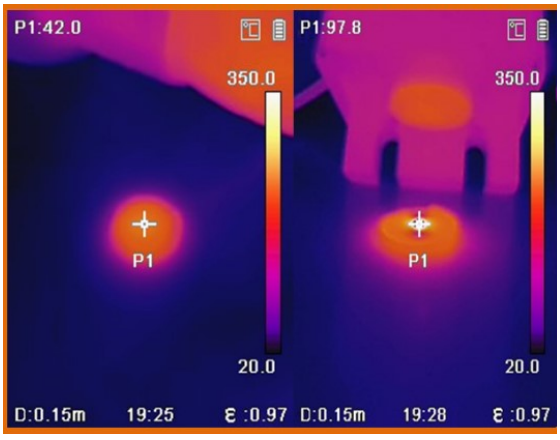

Fig. S8 Digital photographs of the surface temperature of BNO: Er ceramics during bleaching with an 808 nm laser (3W) for 2 min. The left and right respectively correspond to the laser off and on.

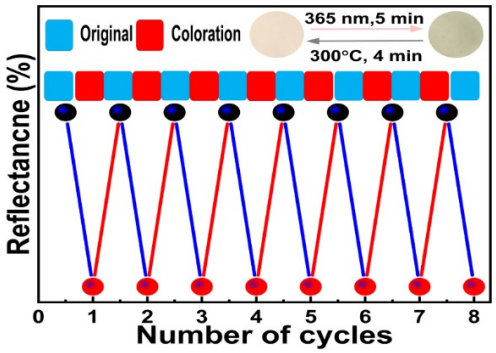

Fig. S9 Alternating stimulation between 365 nm UV for 5 min and thermal treatment at 300 ℃ for 4 min, the plot of reflectivity of BNO: Er at 600 nm versus cycle numbers.

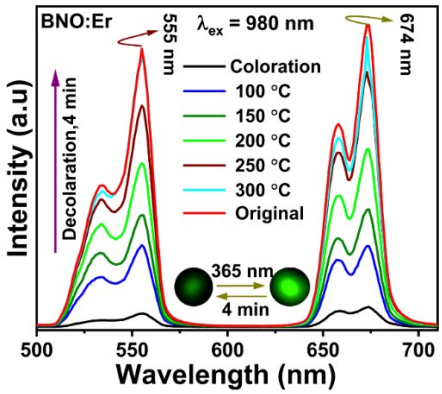

Fig. S10 Under 980 nm excitation, the UCL spectra of the photochromic-saturated BNO: Er with various temperatures thermal treatment for 4 min.

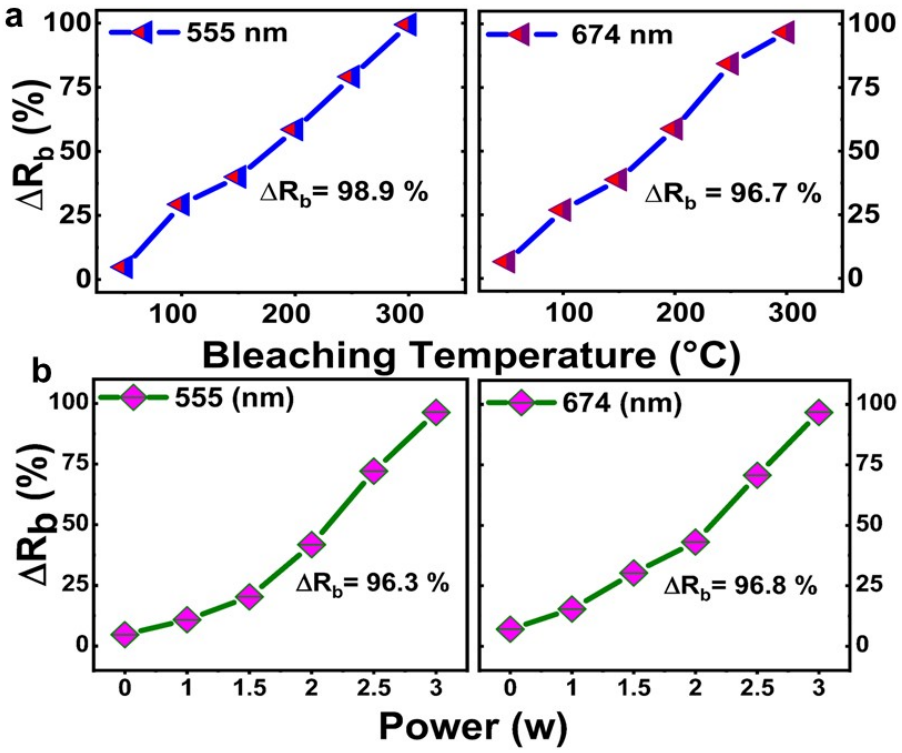

Fig. S11 The calculated UCL recovery rate with different temperatures (a) and different intensities (b) of 808 nm laser light at 555 nm (left) and 674 nm (right) based on the UCL spectra.

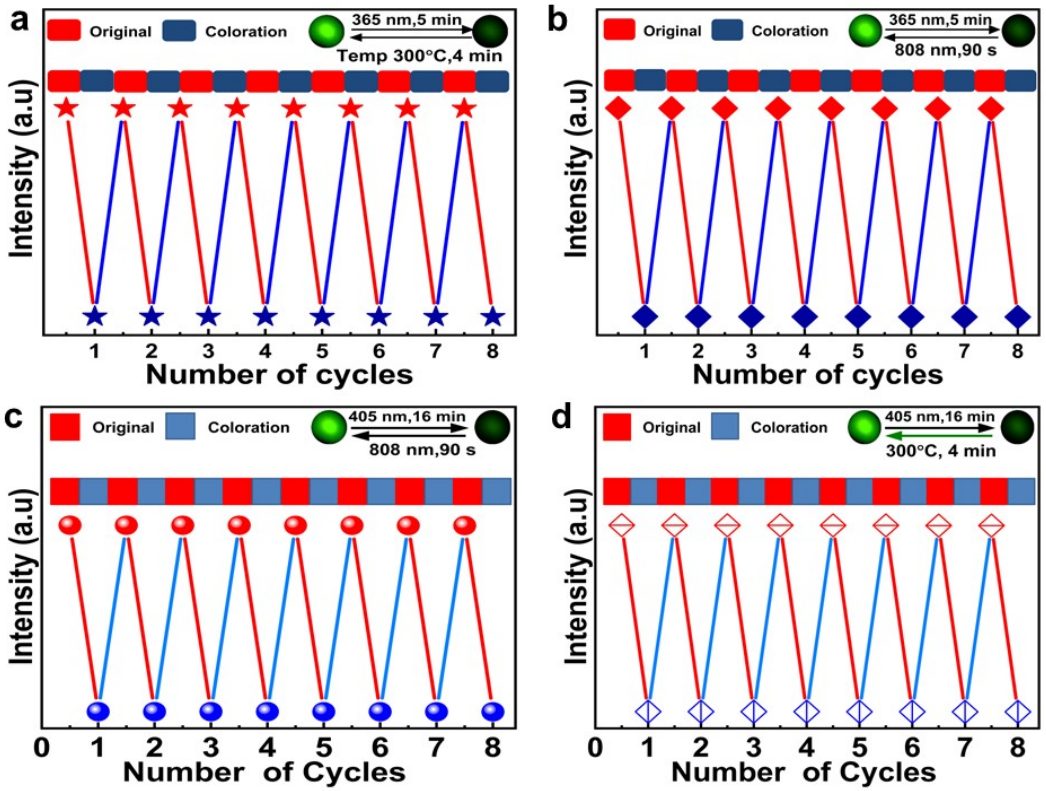

Fig. S12 Alternating stimulation between 365 nm UV for 5 min and thermal treatment at 300 ℃ for 4 min (a) or 808 nm laser for 90 s (b), the plot of UCL intensities of BNO: Er at 674 nm versus cycle numbers. Alternating stimulation between 405 nm LED for 16 min and 808 nm laser for 90 s (c) or thermal treatment at 300 ℃ for 4 min (d), the plot of UCL intensities of BNO: Er at 674 nm versus cycle numbers.

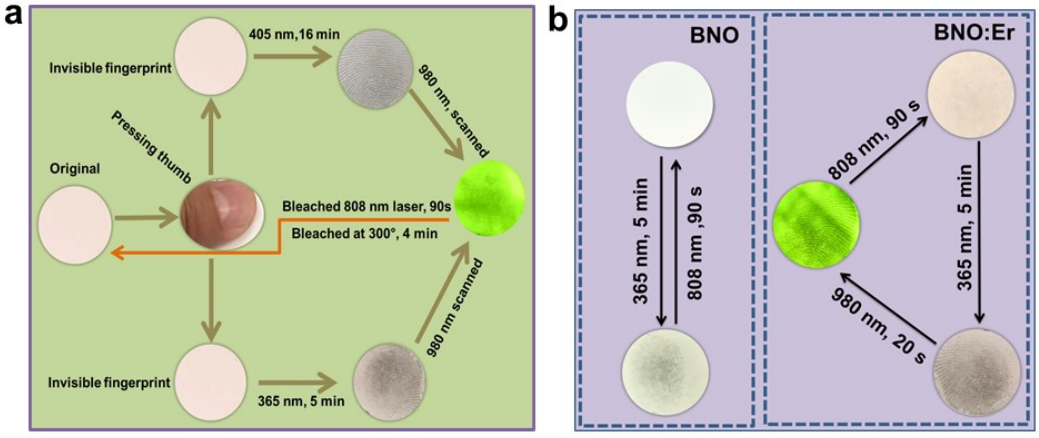

Fig. S13 (a) The schematic diagram of the preparation and erasing of fingerprint patterns. (b) The digital photos of the collection and readout for fingerprint patterns in photochromic and UCL mode

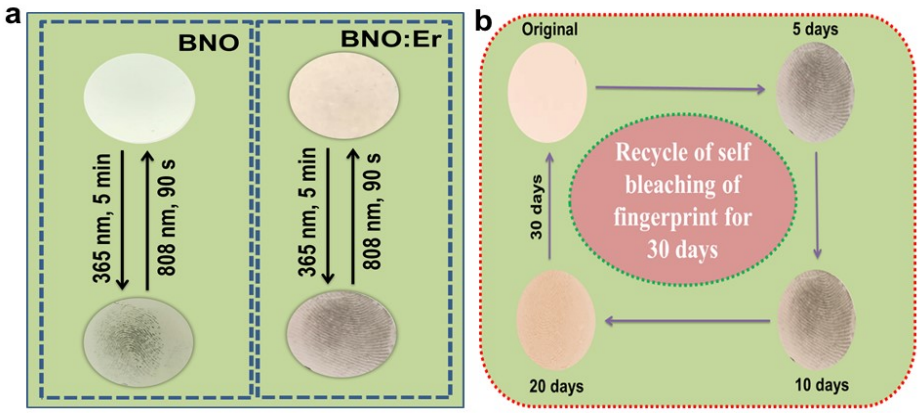

Fig. S14 (a) Reversible fingerprint collection based on pure and Er^{3+}-doped BNO ceramics. (b) The aging experiment for testing fingerprint storage time.