

Supporting Information for

**Splendid cryogenic optical thermometry and rewritable photomemory based on  
up-conversion luminescence of  $K_{0.5}Bi_{0.5}TiO_3$ : Er/In ceramic**

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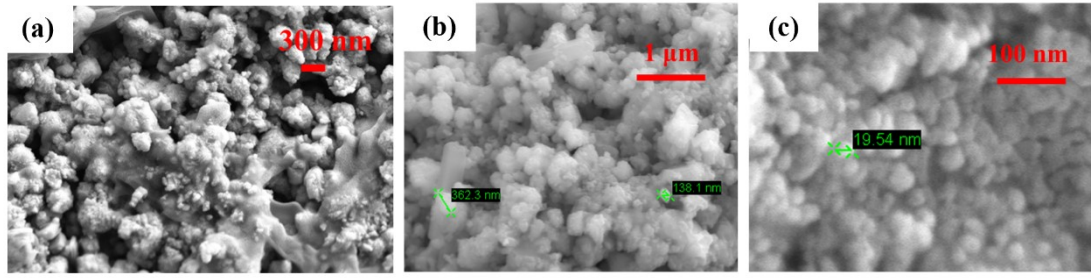


Figure S1. FE-SEM of (a) KBT: 0.5mol% Er, (b) KBT: 0.5mol% Er and (c) KBT: 0.5mol% Er /0.5 mol% In ceramic.

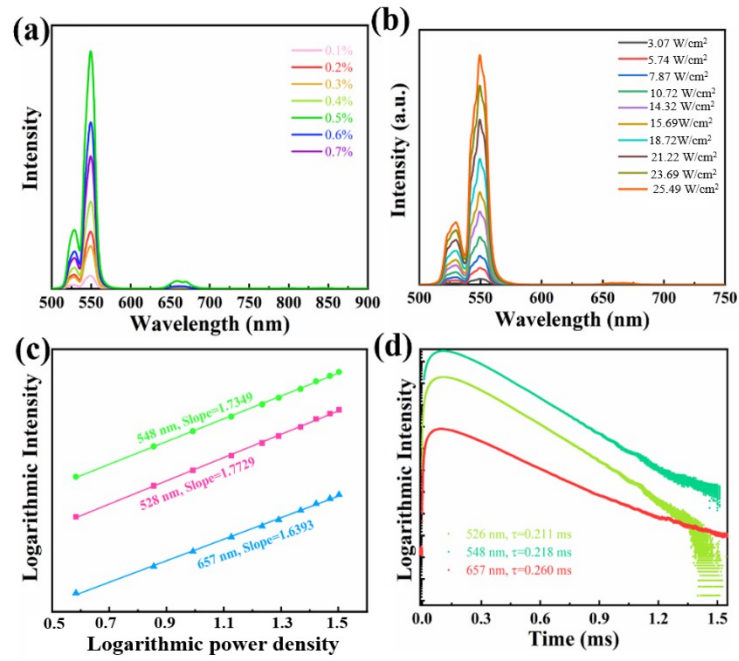


Figure S2. UCPL properties of KBT: Er ceramics. UCPL spectra excited by 980 nm laser at (a) various  $\text{Er}^{3+}$  ions concentration and (b) different pumping power density. (c) Log-log plot of pumping power density vs UC intensity under 980 nm irradiation. (d) Decay curves of  $\text{Er}^{3+}$  ions at 528, 548 and 657 nm.

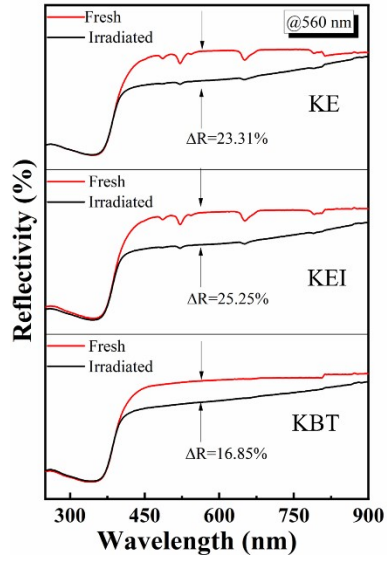


Figure S3. The UV-Vis reflectance of KBT host, KBT: 0.5mol% Er and KBT: 0.5mol% Er /0.5 mol% In ceramics before (black line) and after (red line) irradiated by 365 nm for 120 s. The  $\Delta R$  is calculated by the difference value of reflectivity at 560 nm of before and after irradiation.

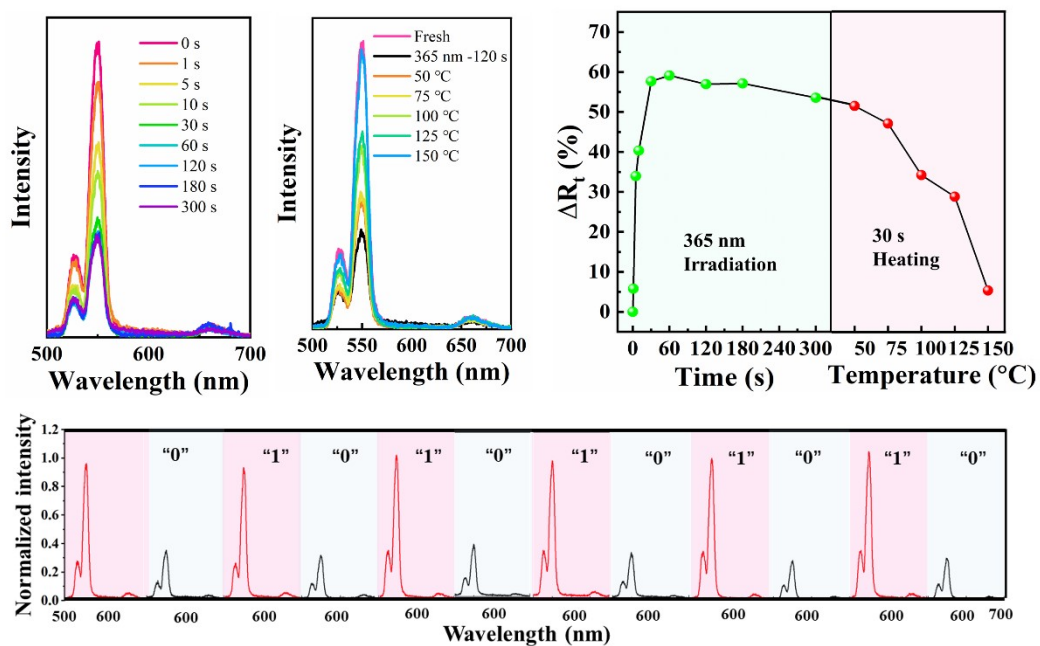


Figure S4. PC performance and UCPL modulation by 365 nm irradiation and thermal stimulation of KBT: 0.5 mol% Er ceramics. UV-vis reflectance spectra of irradiated by 365 nm with various times, the bleaching by operations of heating, dependence of  $\Delta R_t$  values on the irradiation time and heating temperature and UCPL modulation under alternate cycles between 365 nm irradiation for 240 s and thermal stimulation at 150 °C for 30 s.

Table S1. The Bi-O bond lengths of KBT: 0.5mol% Er and KBT: 0.5mol% Er /0.5 mol% In samples according to Rietveld refinements.

	<b>KE</b>	<b>KEI</b>
Bi-O1 (Å)	2.7844	2.7857
Bi-O1 (Å)	2.7844	2.7857
Bi-O1 (Å)	2.7844	2.7857
Bi-O1 (Å)	2.7844	2.7857
Bi-O2 (Å)	2.8487	2.9593
Bi-O2 (Å)	2.8487	2.9593
Bi-O2 (Å)	2.8487	2.9593
Bi-O2 (Å)	2.8487	2.9593
Bi-O2 (Å)	2.7422	2.6405
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