Supporting information

Multifunctionalities of near-infrared upconversion luminescence, optical temperature sensing and long persistent luminescence in \text{La}_3\text{Ga}_5\text{GeO}_{14}: \text{Cr}^{3+}, \text{Yb}^{3+}, \text{Er}^{3+} \text{and their potential coupling}

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To verify thermal stability of this system, UC luminescence spectra of other samples with different Cr$^{3+}$ contents at various temperatures were carried out. The results are shown in Fig. S1.

The recovery of UC emission of a typical sample in the heating and cooling process is demonstrated in Fig. S2.

**Fig. S1** UC Luminescence spectra and integrated intensity of LGG: $x$Cr$^{3+}$, 0.12Yb$^{3+}$, 0.06Er$^{3+}$ (for a and b, $x=0.04$; for c and d, $x=0.1$; for e and f, $x=0.3$)
Fig. S2 Temperature dependent UC emission spectra of LGG: 0.06Cr$^{3+}$, 0.12Yb$^{3+}$, 0.06Er$^{3+}$ during heating (a) and cooling (c); (b) and (d) represent the corresponding integrated UC emission intensity of LGG: 0.06Cr$^{3+}$, 0.12Yb$^{3+}$, 0.06Er$^{3+}$ at different temperatures during heating and cooling, respectively.