

Supporting information

Near-infrared long persistent luminescence of Er^{3+} in garnet for the third bio-imaging window

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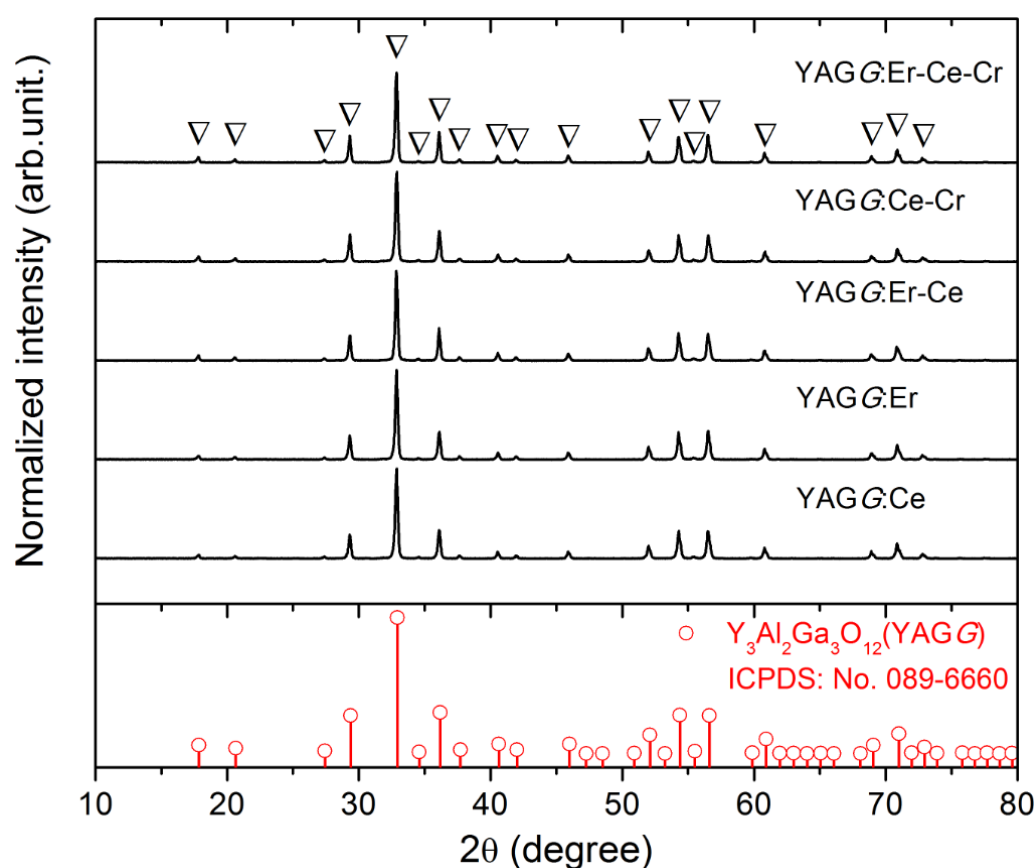


Fig. S1 X-ray diffraction (XRD) patterns of the YAGG:Ce, YAGG:Er, YAGG:Er-Ce, YAGG:Ce-Cr and YAGG:Er-Ce-Cr ceramic samples

The phase compositions of the YAGG:Ce, YAGG:Er, YAGG:Er-Ce, YAGG:Ce-Cr and YAGG:Er-Ce-Cr ceramic samples were measured by X-ray diffraction (XRD) measurements (Ultima IV, Rigaku), utilizing nickel filtered Cu K-alpha radiation (1.5406 Å). All of the as-prepared samples are confirmed to be single phase matching well with the standard card (ICPDS: No. 089-6660) of $\text{Y}_3\text{Al}_2\text{Ga}_3\text{O}_{12}$ (YAGG).

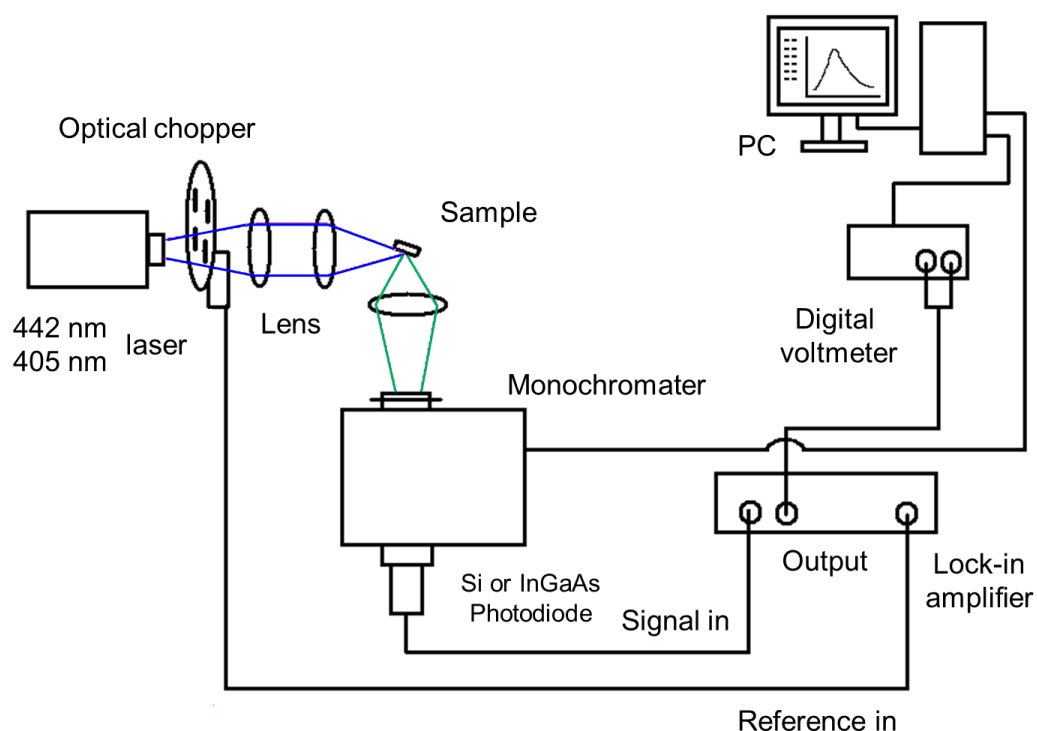


Fig. S2 The measurement setup of photoluminescence (PL)

Photoluminescence (PL) spectra of the YAGG:Ce, YAGG:Er and YAGG:Ce-Er ceramic samples by pumping with a 405 nm laser diode (LD) (SDL-405-LM-100T, Shanghai Dream Lasers Technology Co. Ltd.,) and the YAGG:Ce-Cr and YAGG:Er-Ce-Cr samples by pumping with a 442 nm LD (NDHB510APA-E, Nichia Co. Ltd.,) were recorded in the range of 350-1670 nm. The PL spectra were measured by a monochromator (G250, Nikon), a Si photodiode (PD) detector (S-025-H, Electro-Optical System Inc.,) from 350 to 1100 nm and an InGaAs PD detector (IGA-030-H, Electro-Optical System Inc.,) from 1100 to 1670 nm. All the PL spectra were calibrated by using a standard halogen lamp (SCL-600, Labsphere).

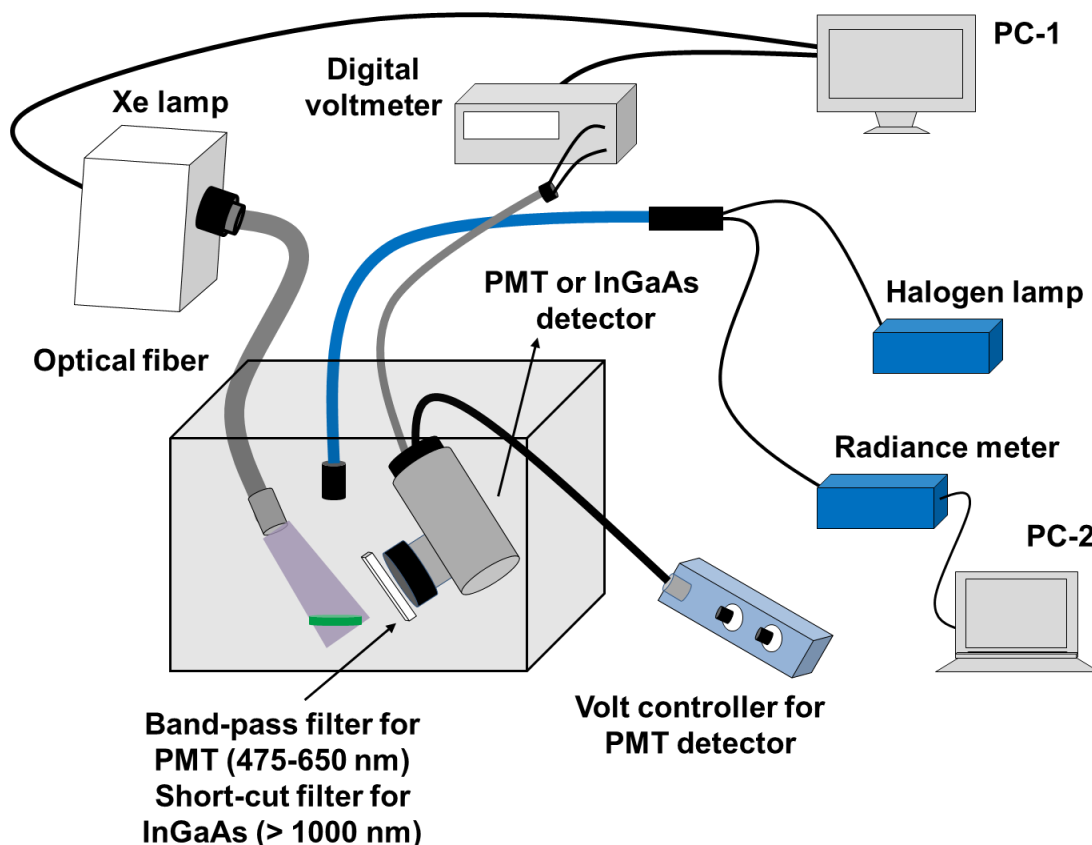


Fig. S3 The measurement setup of persistent luminescent decay curves

All persistent luminescent decay curves of the YAGG:Ce-Cr and YAGG:Er-Ce-Cr samples after being excited for 5 min by a 300 W Xe lamp (MAX-302, Asahi Spectra) with a 460 nm band-pass filter were measured at 25°C using a PMT detector (R11041, Hamamatsu Photonics & Co. Ltd.) or an InGaAs photodiode (PD) detector (IGA-030-H, Electro-Optical System Inc.). In order to monitor the Ce^{3+} emission, the PMT detector was covered with 475 nm short-cut and 650 nm long-cut filters to filter out all but the Ce^{3+} luminescence. Then the decay curves were calibrated to the absolute luminance (in unit of mcd/m^2) using a radiance meter (Glacier X, B&W Tek Inc). In order to monitor the Er^{3+} luminescence, the InGaAs PD was covered with a 1000 nm short-cut filter to filter out all but the Er^{3+} luminescence. Then the decay curves were calibrated to the absolute radiance (in unit of mW/Sr/m^2) using the same radiance meter.