

## Supporting Information

### X-ray activated near-infrared persistent luminescence nanoparticles for trimodality in vivo imaging

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### Supporting Figures

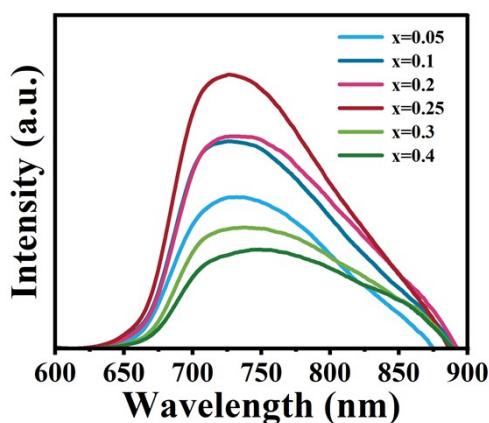


Figure S1 PerL emission spectra of  $\text{Gd}_2\text{GaTaO}_7: x\text{Cr}^{3+}$  after X-ray excitation.

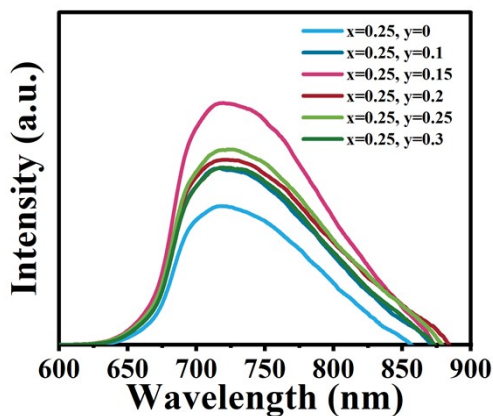
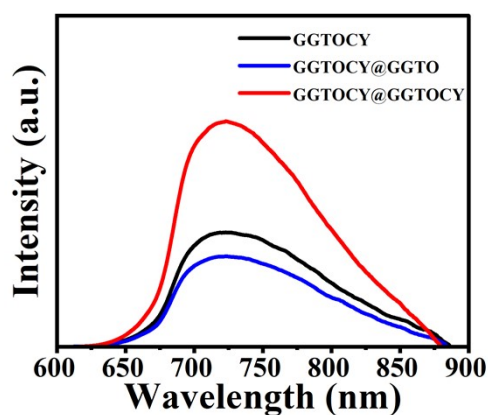
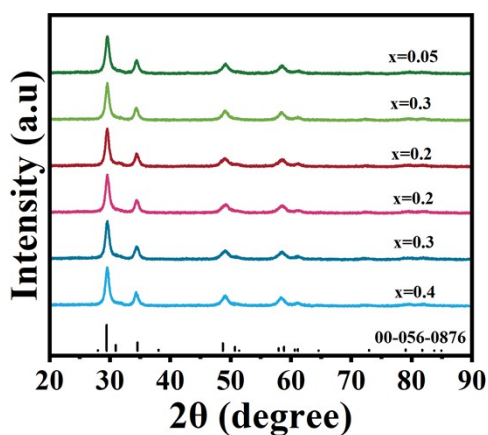


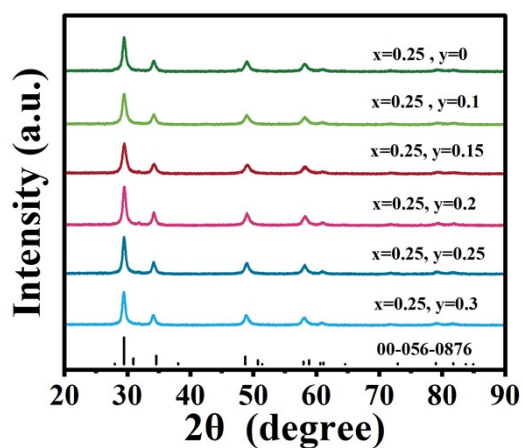
Figure S2 PerL emission spectra of  $\text{Gd}_2\text{GaTaO}_7: x\text{Cr}^{3+}, y\text{Yb}^{3+}$  after X-ray excitation.



**Figure S3** PerL emission spectra of  $\text{Gd}_2\text{GaTaO}_7: 0.25\%\text{Cr}^{3+}, 0.15\%\text{Yb}^{3+}$  (GGTOCY);  $\text{Gd}_2\text{GaTaO}_7: 0.25\%\text{Cr}^{3+}, 0.15\%\text{Yb}^{3+} @ \text{Gd}_2\text{GaTaO}_7$  (GGTOCY@GGTO);  $\text{Gd}_2\text{GaTaO}_7: 0.25\%\text{Cr}^{3+}, 0.15\%\text{Yb}^{3+} @ \text{Gd}_2\text{GaTaO}_7: 0.25\%\text{Cr}^{3+}, 0.15\%\text{Yb}^{3+}$  (GGTOCY@GGTOCY) after X-ray excitation.



**Figure S4** XRD pattern of  $\text{Gd}_2\text{GaTaO}_7: x\text{Cr}^{3+}$ .



**Figure S5** XRD pattern of  $\text{Gd}_2\text{GaTaO}_7: x\text{Cr}^{3+}, y\text{Yb}^{3+}$ .

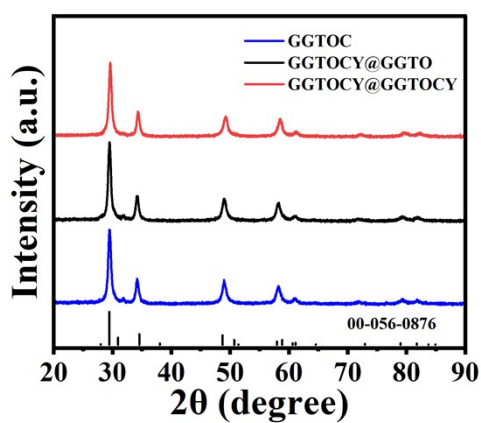


Figure S6 XRD pattern of GGTOCY; GGTOCY@GGTO; GGTOCY@GGTOCY.

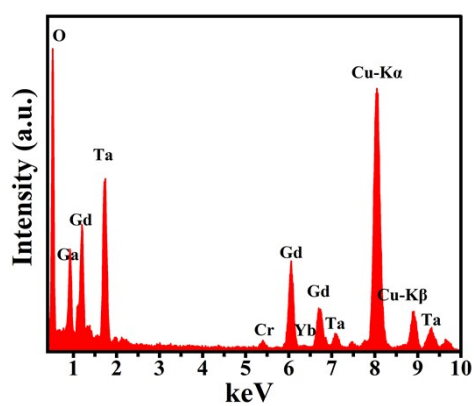


Figure S7 EDS of GGTO NPs.

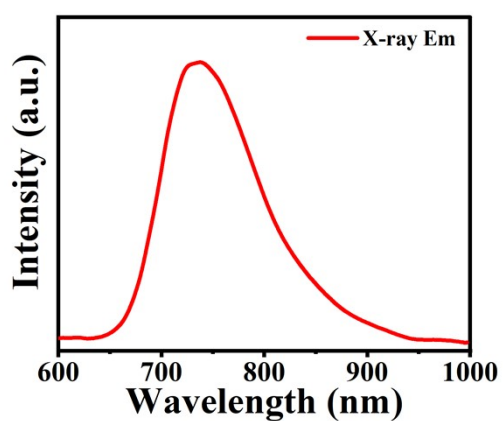
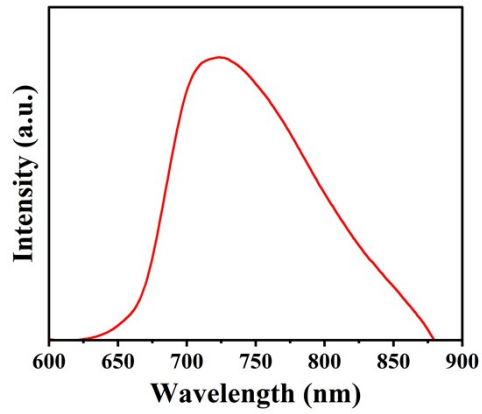
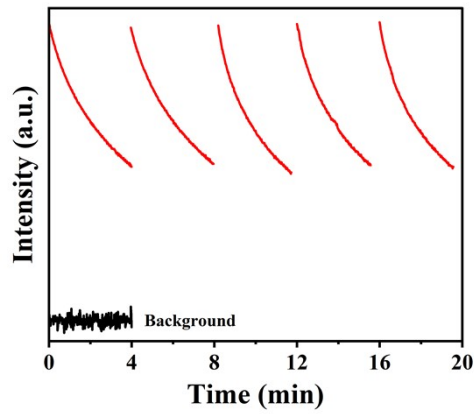


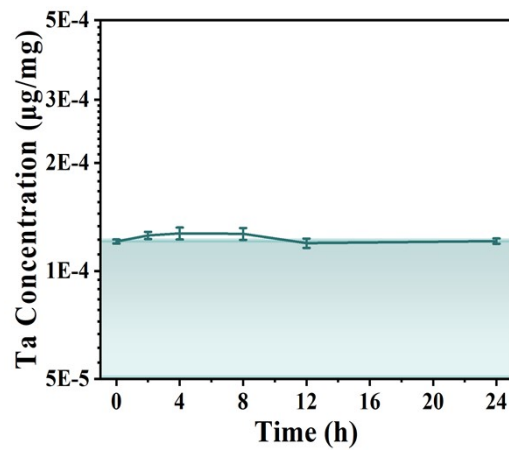
Figure S8 Emission spectrum of GGTO NPs under 4w X-ray excitation for 3 min.



**Figure S9** PersL emission spectrum of GGTO NPs after 4w X-ray excitation for 3 min.



**Figure S10** PersL decay curve of GGTO NPs monitored at 725 nm after X-ray excitation.



**Figure S11** Ta<sup>5+</sup> ionic spillover of GGTO in simulated body fluids (SBF) over 24 h. The light green area is the Ta<sup>5+</sup> concentration of the control (SBF).

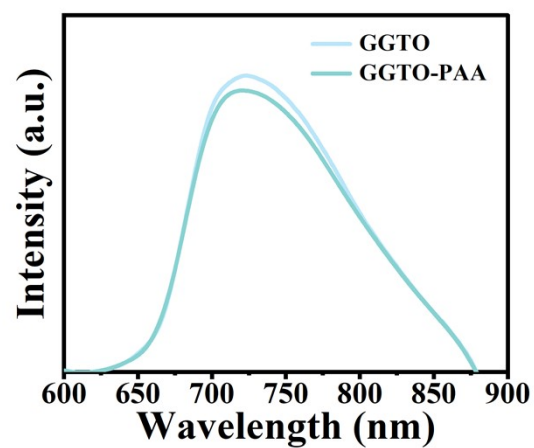


Figure S12 PersL emission spectrum of GGTO and GGTO-PAA after 4w X-ray excitation for 3 min.

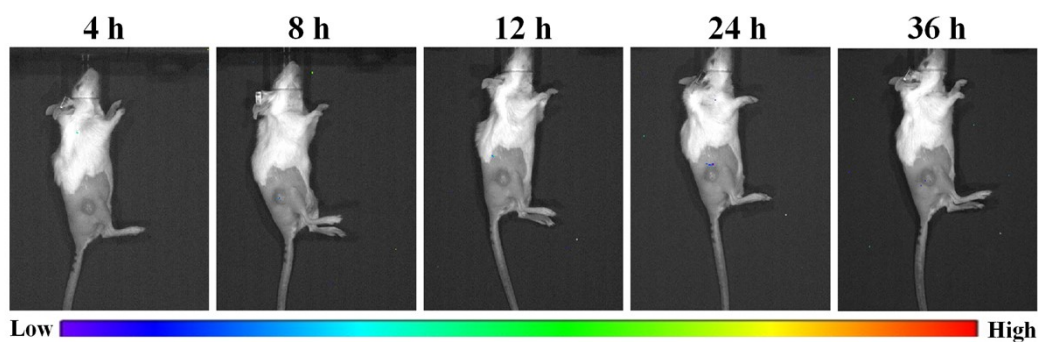


Figure S13 In vivo PersL imaging of GGTO-OH in mice.

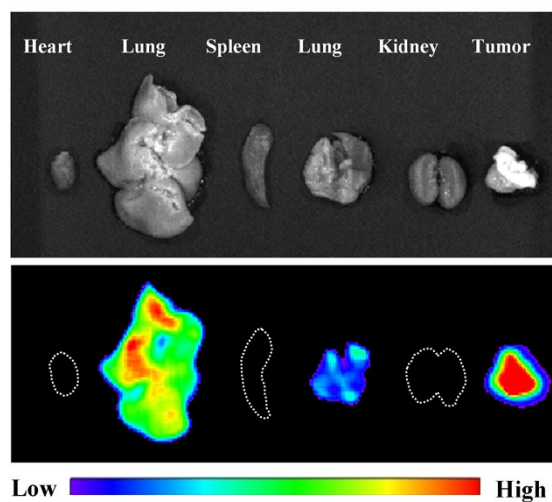


Figure S14 Ex vivo PersL imaging of main organs and tumor.

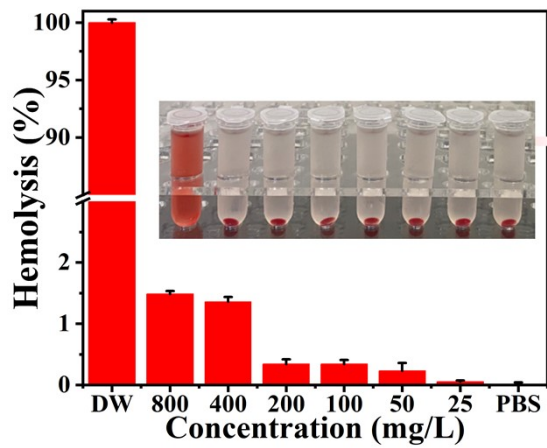


Figure S15 Hemolysis rate of erythrocytes treated with different concentrations of GGTO-AMD.

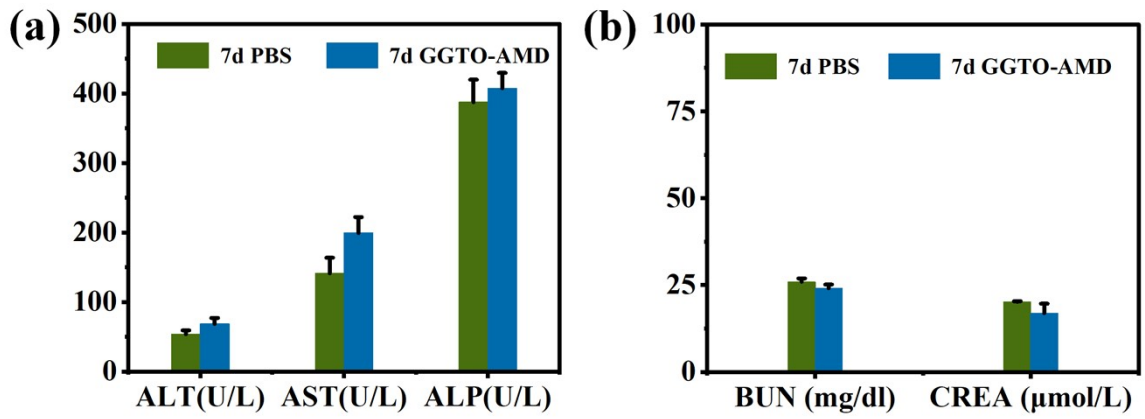


Figure S16 Semi-quantitative analysis of the distribution of GGTO-AMD in main organs of mice.

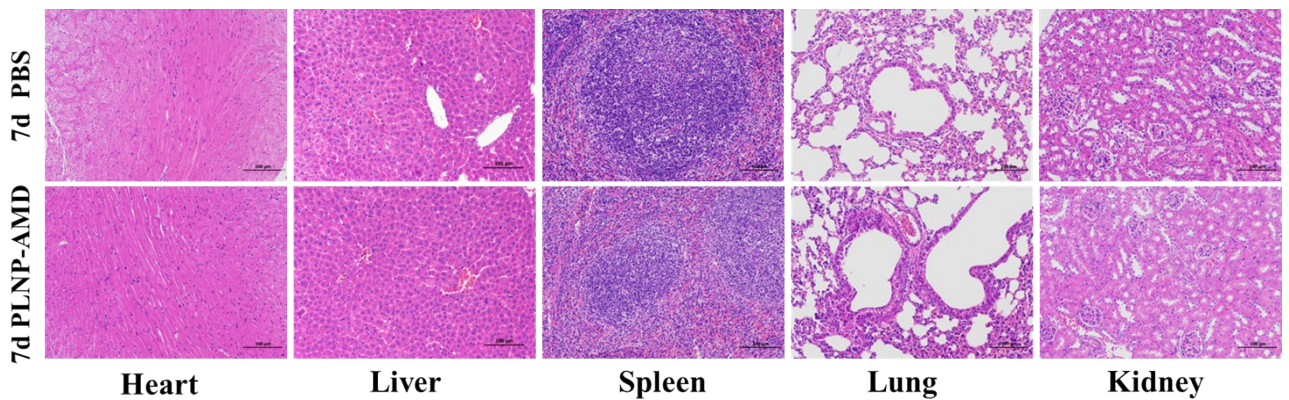


Figure S17 Hematoxylin and eosin (H&E) stained images of major organs of mice injected with GGTO NPs and PBS at 7 days, scale bar=100 μm.