Supporting information

A novel removable template method for preparation of persistent

luminescence nanoparticles with biocompatible size and high intensity

Zichao Yana, Chang Yina, Mengjie Suna, Weibao Yuana, Wei Wanga, Qiang Wua and Zhi Yuana, Weibao Yuana, Wei Wanga, Qiang Wua

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1. Method

1.1 The hydrothermal method to prepare ZGC

In brief, ZGC nanoparticles were synthesized by hydrothermal method and low-temperature sintering in air. 8.94 mmol of gallium ion, 8.97 mmol of zinc ion, and 0.04 mmol of chromium ion were added to 10 mL of water under vigorous stirring. Adjusting the pH to 7.5 with ammonia solution, stirred for 3 hours and transferred into a 25 mL Teflon-lined stainless steel autoclave for 24 h heat at 120°C. Washed with water and ethanol and dry at 60°C. Finally, the white compound was sintered at 750°C for 5 h.

1. Results and Discussion

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Results and discussion



Figure S1. FT-IR of the prepared intermediate ZGTC (red line) and TCPP (blue line).



Figure S2. The EDS, SEM and TEM characterization of the prepared ZGTC. (a) The distribution of O atoms. (b) The distribution of Ga atoms. (c) The distribution of Zn atoms. (d) The distribution of Cr atoms. (e-f) SEM graphs of prepared ZGTC. (g-h) TEM graphs of prepared ZGTC.



Figure S3. The PXRD data (a) and EDS (b) of prepared ZGC.



Figure S4. The change of hydrate particle size in 4 hours



Figure S5. PL decay curve of ZGC PLNPs obtained by adding different ratios of Cr^{3+} ions during the preparation process. The excitation source is 254 nm, and the PL was recorded at 695 nm.



Figure S6. The PL decay curve of ZGC PLNPs powder (red curve) and ZGC PLNPs suspension solution (yellow curve). The excitation source is 254 nm, and the PL was recorded at 695 nm.



Figure S7. The photo-stability of prepared ZGC PLNPs. (a) PL decay curve of ZGC PLNPs which was irradiated by 254 nm UV lamp for 3 cycles (10 min each time). (b) PL decay curve of ZGC PLNPs which was irradiated by LED (5000 lumen) for 4 cycles (5 min each time).



Figure S8. Thermally stimulated luminescence data of prepared ZGC.



Figure S9. The τ_{avg} for different fitted curves of different PL decay curve.



Figure S10. PersL imaging after peritumoral injection



Figure S11. PersL imaging after intravenous injection



Figure S12. The cytotoxicity of ZGC against HepG2 cells.



Figure S13. The spectrogram of the commercial LED lamp used