Supporting Information

Facile preparation of Double Rare Earth-Doped Carbon Dots for MRI/CT/FI Multimodal Imaging

Yanzhi Zhao[a,c], Xiaoting Hao[b], Wei Lu[b,c], Ruoming Wang[b], Xueru Shan[b], Qian Chen[b], Guoying Sun[b,c,] and Jianhua Liu[d,]**

[a] *School of Chemical Engineering, Changchun University of Technology, 2055 Yanan Street, Changchun 130012, P. R. China.*

[b] *Jilin Province Key Laboratory of Carbon Fiber Development and Application, School of Chemistry and Life Science, Changchun University of Technology, 2055 Yanan Street, Changchun 130012, P. R. China *E-mail: sunguoying@ccut.edu.cn*

[c] *Advanced Institute of Materials Science, Changchun University of Technology, 2055 Yanan Street, Changchun 130012, P. R. China*

[d] *Department of Radiology, Second Hospital of Jilin University, Changchun, 130041, P. R. China *E-mail: drliujh@yahoo.com*

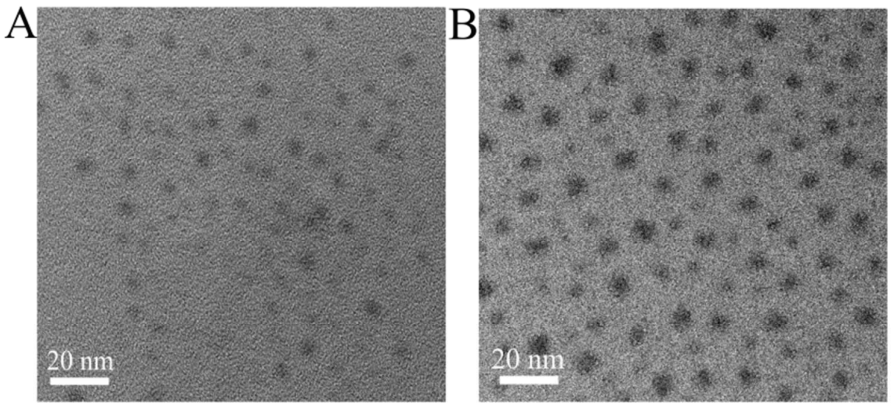

Figure S1. TEM images of (A) Gd/Yb@CDs and (B) CDs.

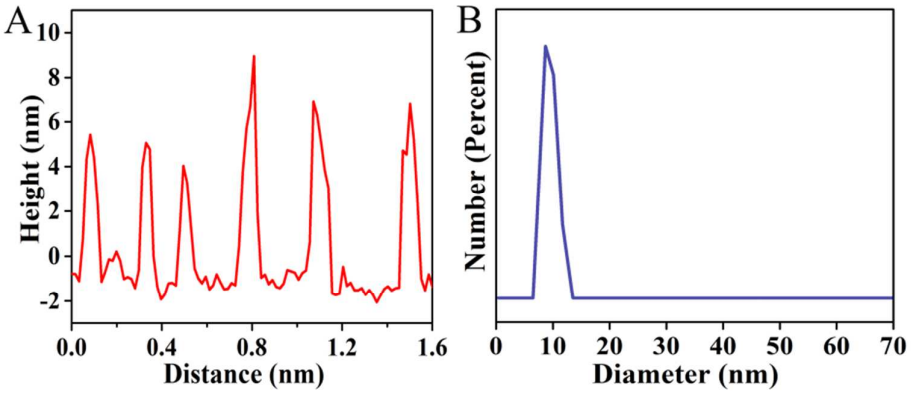

Figure S2. (A) The height profile along the line marked in the AFM image, (B) Hydrodynamic size of Gd/Yb@CDs.

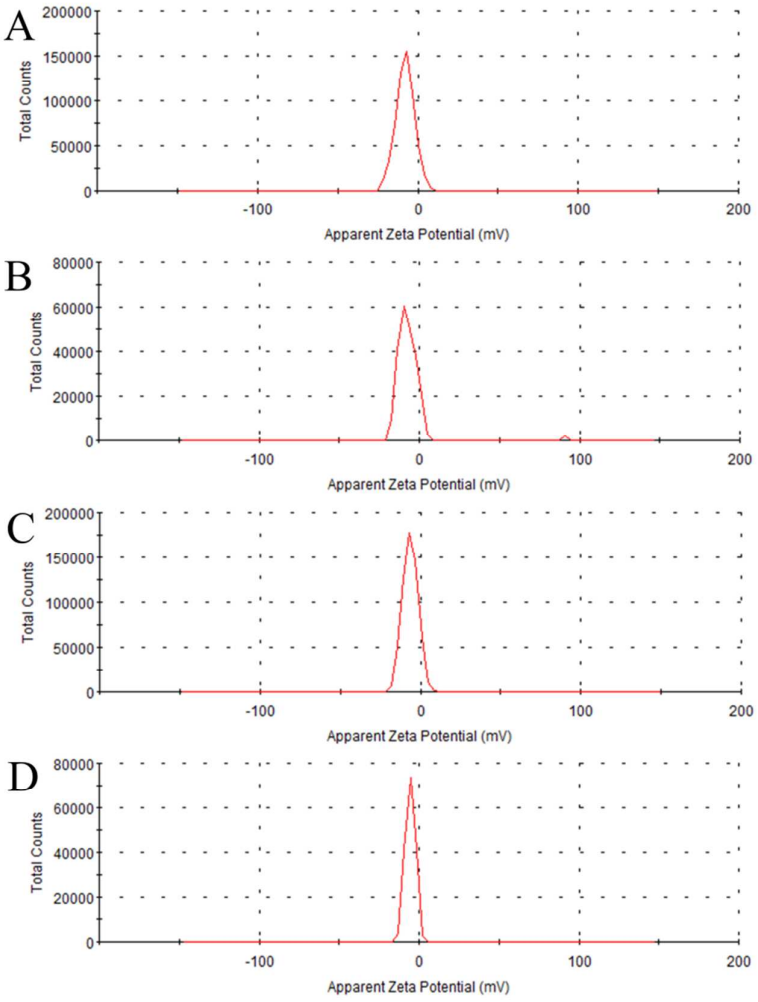

Figure S3. Zeta potential of (A) CDs, (B) Gd@CDs, (C) Yb@CDs and (D) Gd/Yb@CDs in water.

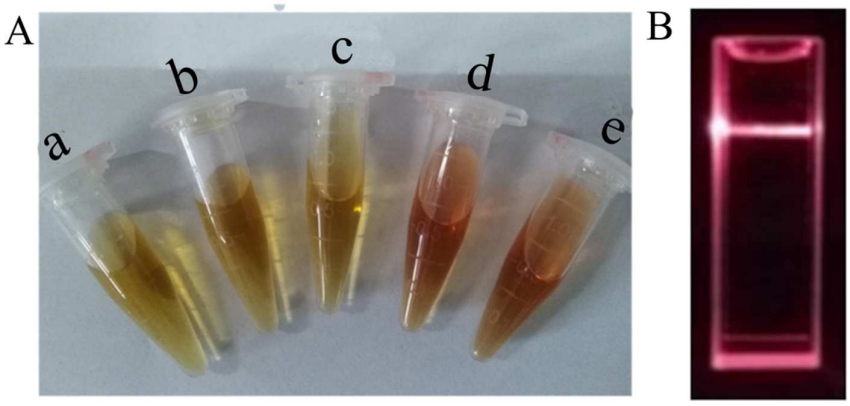

Figure S4. (A) The stability of Gd/Yb@CDs in water for 30 days (a), PBS for 0 day (b) and 30 days (c) and DMEM cell medium for 0 day (d) and 30 days (e), (B) The Tyndall effect exhibited by Gd/Yb@CDs in aqueous solution.

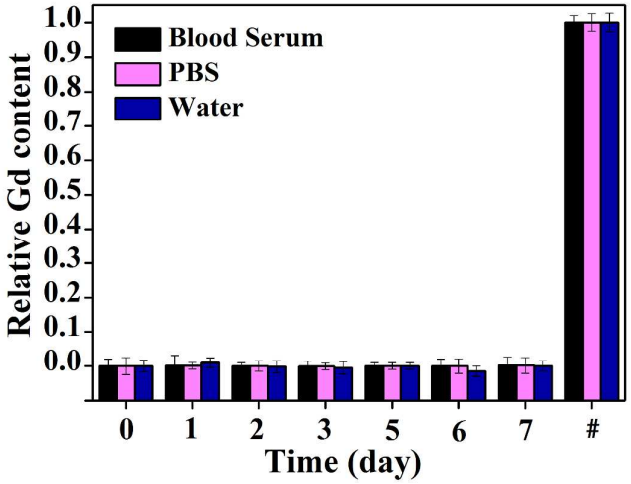

Figure S5. The Gd^{3+} leakage test of Gd/Yb@CDs in blood serum, PBS and water. # represents the overall Gd content in Gd/Yb@CDs.

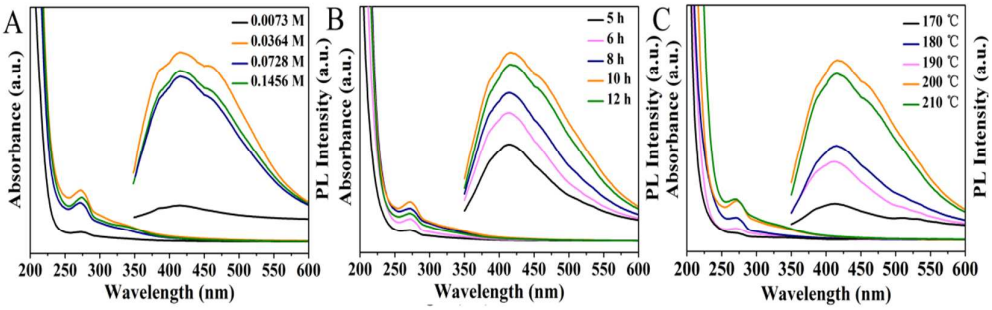

Figure S6. The UV-Vis absorption and fluorescence spectra (λ_{ex} = 340 nm) of Gd/Yb@CDs (A) with various L-arginine concentrations prepared (B) for 5 ~ 12 h (C) at 170 ~ 210 ℃.

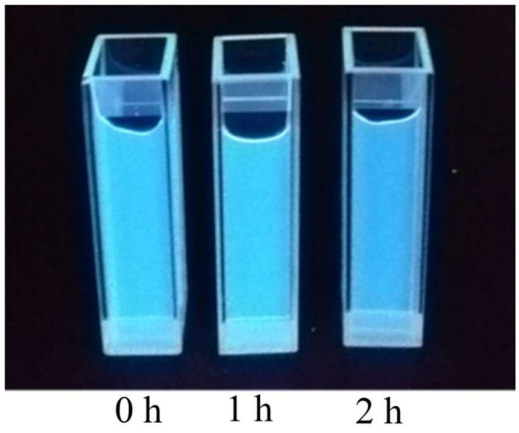

Figure S7. Photostability analysis of Gd/Yb@CDs under 365 nm UV light.

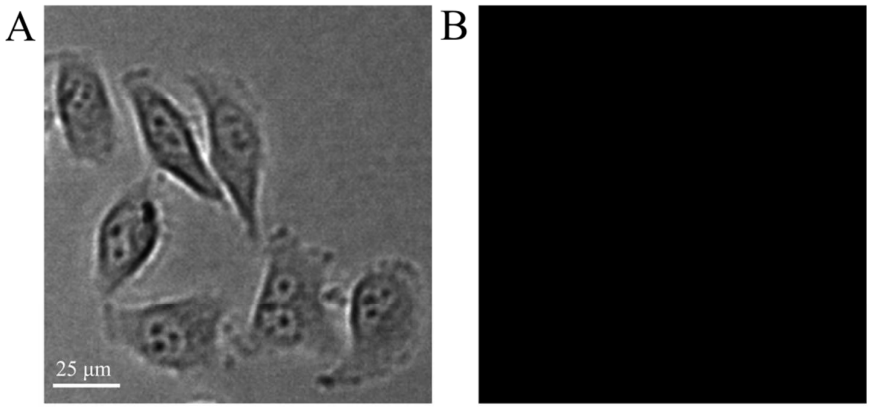

Figure S8. Cell images without the treatment of Gd/Yb@CDs: (A) bright-fied microphograph, (B) fluorescence microscope images of HeLa cells.

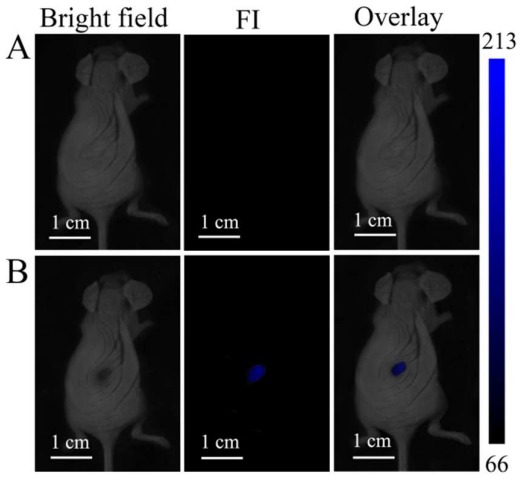

Figure S9. The *in vivo* fluorescence imaging of mice (λ_{ex} = 385 nm; irradiation time, 60 s) after subcutaneous injection (A) without and (B) with Gd/Yb@CDs.

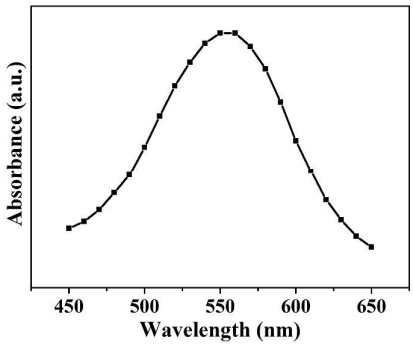

Figure S10. The UV-Vis absorption of the DMSO solution of purple formazan dye.

Since the maximum absorption of the DMSO solution of purple formazan dye was around 570 nm [1,2], we chosed 570 nm as the absorption wavelength instead of 490 nm, which could increase the detection sensitivity. Additionally, many articles also chosed this wavelength in MTT experiments.

REFERENCES

1. Jiang, C. H.; Wang, Y.; Wang, J. W.; Song, W.; Lu, L. H. Achieving Ultrasensitive *in vivo* Detection of Bone Crack with Polydopamine-capsulated Surface-enhanced Raman Nanoparticle. *Biomaterials* **2017,** *114*, 54-61.

2. Li Y. Y.; Jiang, C. H.; Zhang, D. W.; Wang, Y.; Ren, X. Y.; Ai, K. L.; Chen, X. S.; Lu. L. H. Targeted Polydopamine Nanoparticles Enable Photoacoustic Imaging Guided Chemo-photothermal Synergistic Therapy of Tumor. *Acta Biomaterialia* **2017**, *47*, 124-134.