Electronic Supplementary Material (ESI) for Nanoscale.

Electronic Supplementary Information

Geometrical confined ultrasmall gadolinium oxide nanoparticles boost the T_1 contrast ability

Kaiyuan Ni,[a] Zhenghuan Zhao,[a] Zongjun Zhang,[a] Zijian Zhou,[a] Li Yang,[b] Lirong Wang,[a] Hua Ai,[b] and Jinhao Gao[a]*

[a] State Key Laboratory of Physical Chemistry of Solid Surfaces, The MOE Key Laboratory of Spectrochemical Analysis & Instrumentation,The Key Laboratory for Chemical Biology of Fujian Province, and Department of Chemical Biology, College of Chemistry and Chemical Engineering, Xiamen University, Xiamen 361005, China.

[b] National Engineering Research Center for Biomaterials, and Department of Radiology, West China Hospital, Sichuan University, Chengdu 610064, China.

Email: jhgao@xmu.edu.cn

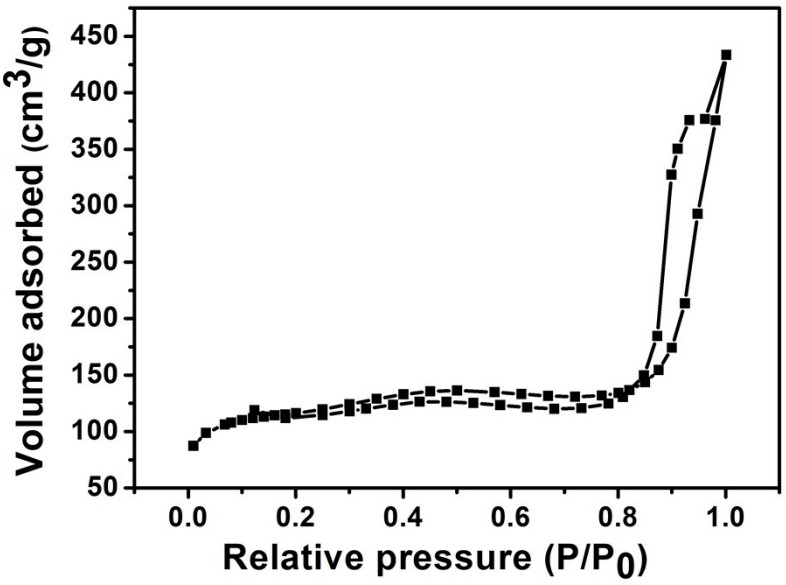

Figure S1. Nitrogen adsorption-desorption isotherms of MSN. The value of specific surface area is 396.5 m^2/g.

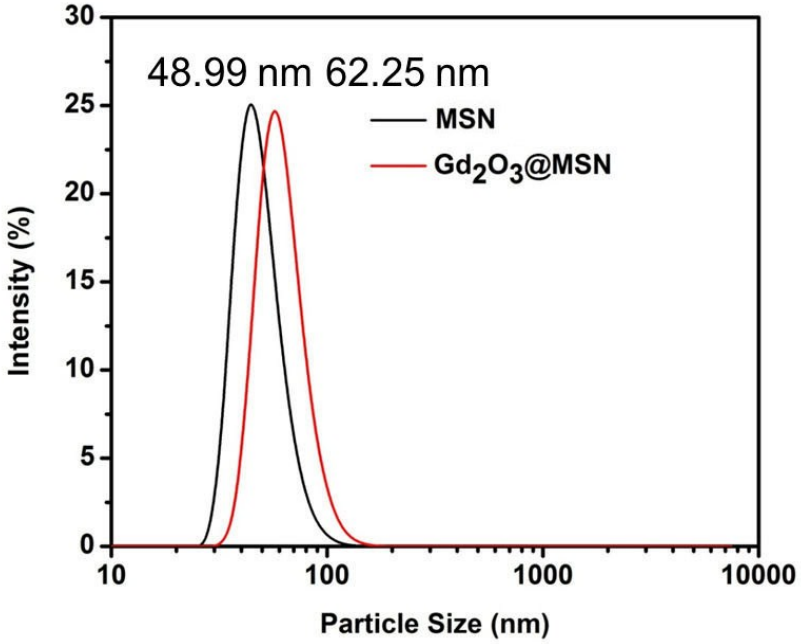

Figure S2. Dynamic light scattering (DLS) analysis of water-dispersible MSN and Gd_2O_3@MSN nanocomposites.

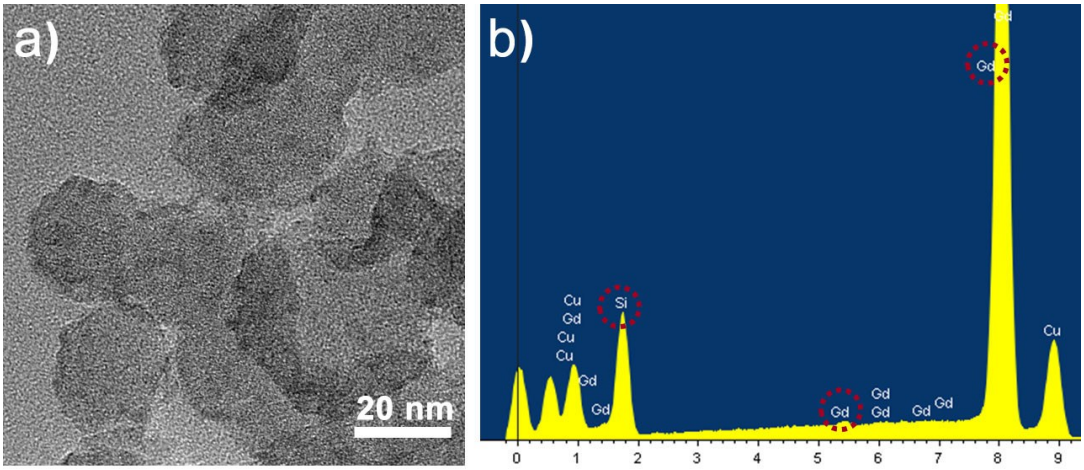

Figure S3. Structural characterization on Gd_2O_3@MSN. (a) TEM image and (b) energy dispersive X-ray (EDX) analysis of Gd_2O_3@MSN in (a) in the copper mesh. The red circles show the existence of silicon and gadolinium.

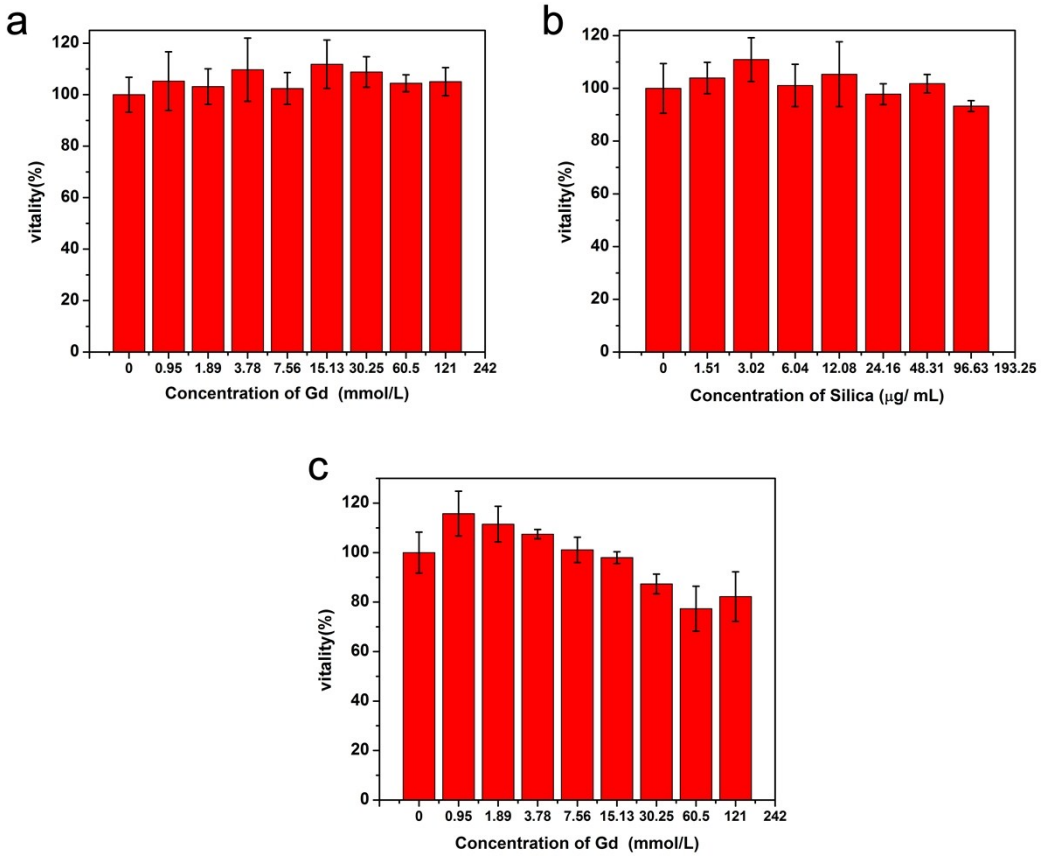

Figure S4. *In vitro* cytotoxicity analysis. The MTT assay of HepG2 cells incubated with (a) Gd_2O_3, (b) MSN, (c) Gd_2O_3@MSN for 24 h (n = 5/group).

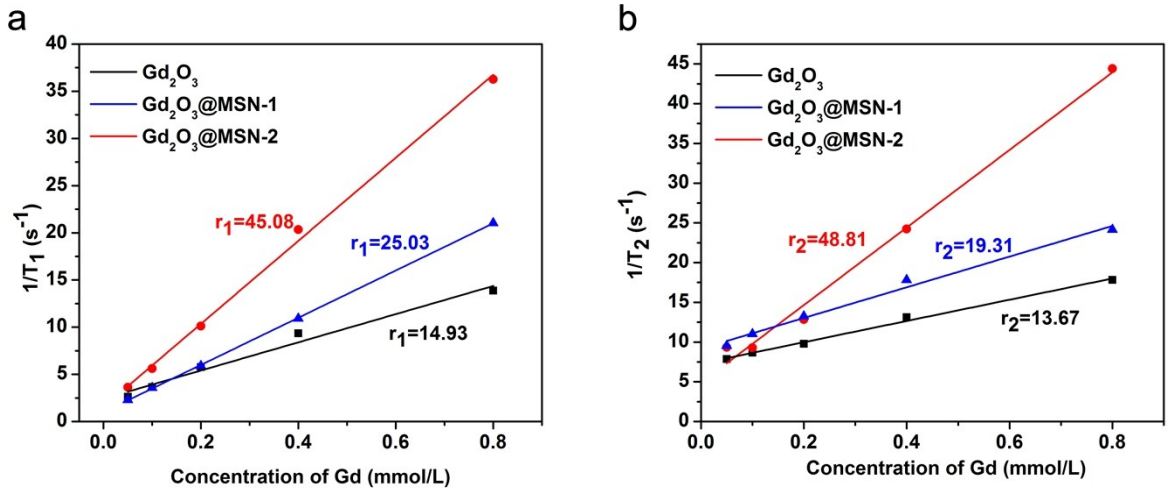

Figure S5. MR relaxivity at 0.5 T. The analysis of relaxation rate (a) R_1 ($1/T_1$) (b) R_2 ($1/T_2$) *vs.* gadolinium ion concentration for Gd_2O_3 and as-prepared Gd_2O_3@MSN using a 0.5 T NMI20-Analyst NMR system. Gd_2O_3@MSN-1 and Gd_2O_3@MSN-2 are two samples with Si: Gd=100:1 and 25: 1, respectively. These results indicated that the MRI contrast effect can be enhanced with the increase of Si/Gd ratio, in other words, the amount of ultrasmall Gd_2O_3 loaded in MSN.

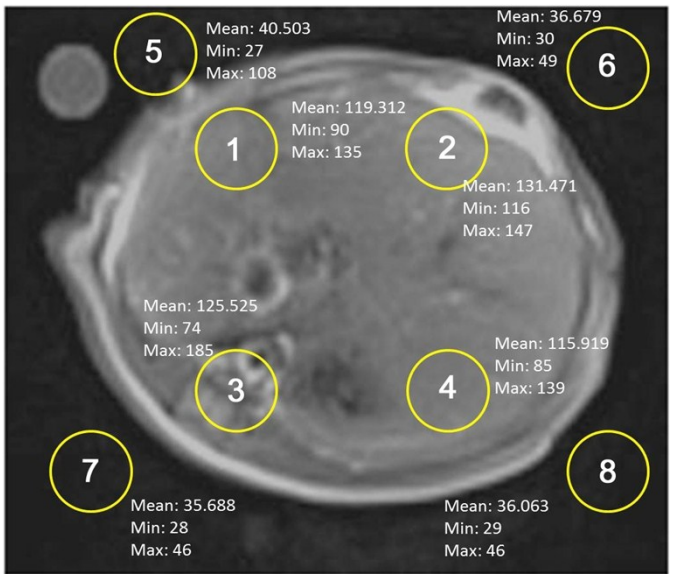

Figure S6. Examples of regions of interest (ROIs) selected on the *in vivo* MR image: circles 1-4 represent liver regions, circles 5-8 for background.