Electronic Supplementary Material (ESI) for Dalton Transactions

## **Supporting information**

## Au@mSiO<sub>2</sub> core-shell nanoparticles loaded with fluorescent dyes: synthesis and application for

## imaging performance

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Fig. S1 DLS (a) and zeta potential (b) of Au@mSiO<sub>2</sub> in water.



Fig. S2 DLS and zeta potential of Au@mSiO<sub>2</sub>-TTA (a, a<sub>1</sub>) and Au@mSiO<sub>2</sub>-OTA (b, b<sub>1</sub>) in water.



Fig. S3 Zeta potential of Au@mSiO<sub>2</sub>, Au@mSiO<sub>2</sub>-OTA, and Au@mSiO<sub>2</sub>-TTA in water, respectively.



**Fig. S4** UV curve of IR820 with different concentrations (a) and standard linear  $(a_1)$ ; the UV absorption spectrum of Au@mSiO<sub>2</sub>-OTA (black line) and Au@mSiO<sub>2</sub>-OTA-IR820 (orange line) (b).



**Fig. S5** The fluorescence spectrum of 6-TAMRA (purple line), Au@mSiO<sub>2</sub>-OTA-6-TAMRA (orange line), Au@SiO<sub>2</sub>@mSiO<sub>2</sub>-OTA-6-TAMRA (green line) and Au@mSiO<sub>2</sub>-OTA (black line), the excitation wavelength was at 540 nm (5 nm /5 nm /500 V) (a); the UV absorption spectrum of Au@mSiO<sub>2</sub>-OTA (black line) and Au@mSiO<sub>2</sub>-OTA-6-TAMRA (green line) c). Au@SiO<sub>2</sub>@mSiO<sub>2</sub>-OTA (black line) and Au@SiO<sub>2</sub>-OTA-6-TAMRA (green line) (c).



**Fig. S6** The UV spectrum of  $Au@SiO_2@mSiO_2-OTA$  (black line) and  $Au@SiO_2@mSiO_2-OTA-IR820$  (green line) (a); the fluorescence spectrum of IR820 (purple line),  $Au@mSiO_2-OTA-IR820$  (orange line) and  $Au@SiO_2@mSiO_2-OTA-IR820$  (green line), the excitation wavelength was at 800 nm (10 nm /10 nm /800 V) (b); lifetimes of IR820,  $Au@mSiO_2-OTA-IR820$  and  $Au@SiO_2@mSiO_2-OTA-IR820$  (c), the excitation wavelength was at 656 nm.



**Fig. S7** The lifetimes of 6-TAMRA (a), Au@mSiO<sub>2</sub>-OTA-6-TAMRA (b) and Au@SiO<sub>2</sub>@mSiO<sub>2</sub>-OTA-6-TAMRA, the excitation wavelength was at 507 nm (c).



**Fig. S8** The fluorescence intensity of composite nanoparticles at different times in culture medium and supernatant (a) and DLS of composite nanoparticles change in culture medium (b).



Fig. S9 Fluorescent images of Hell cells incubated with  $Au@mSiO_2$ -OTA-IR820 (0.2 mg/mL) at different periods. From left to right as follows: composite nanoparticle fluorescence, nuclei fluorescence stained with DAPI, and merged images.



Fig. S10 Fluorescent images of Hell cells incubated with different concentrations of IR820 (16  $\mu$ M) in cell culture medium for different periods. From left to right as follows: IR820 fluorescence, nuclei fluorescence stained with DAPI, and merged images.