

## Supporting Information

### Carbon based dots capped gold nanoparticles hybridizing manganese dioxide for enhanced photodynamic therapy of cancer

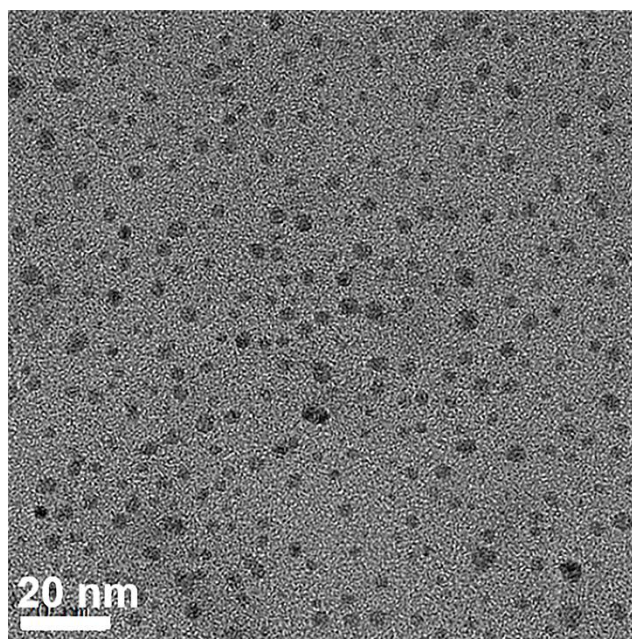
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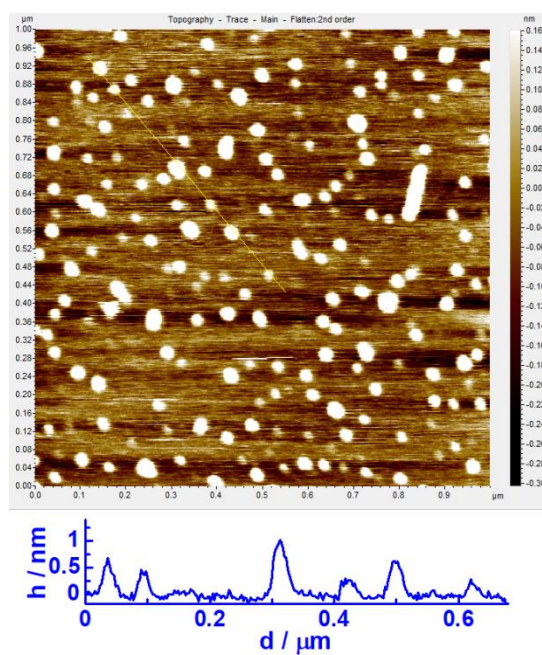
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**Fig. S1** TEM image of CDs.



**Fig. S2** AFM image of CDs. The inset shows the height profile along the yellow line.

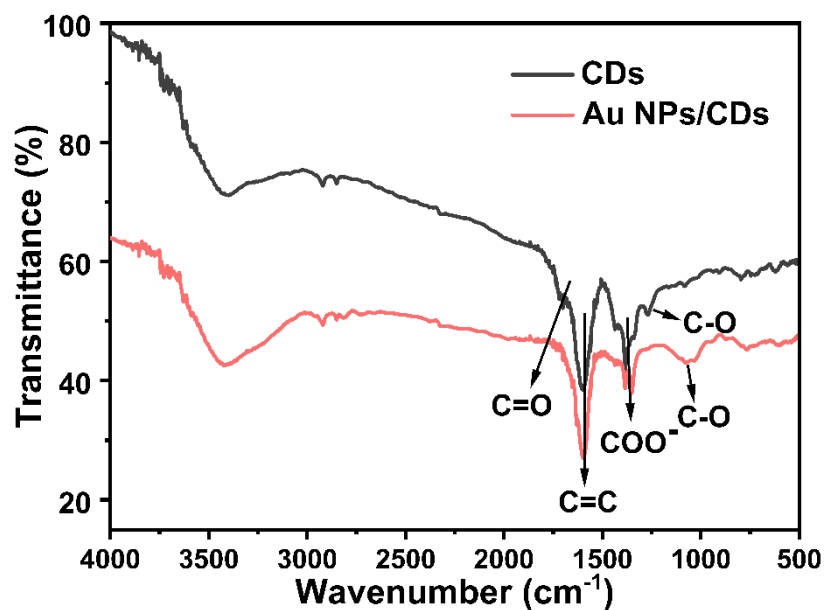


Fig. S3 FT-IR spectra of CDs and 10 nm sized AuNPs/CDs.

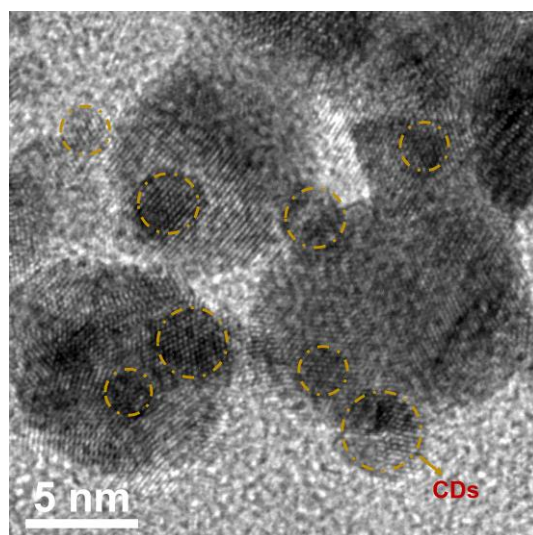


Fig. S4 HR-TEM image of AuNPs/CDs.

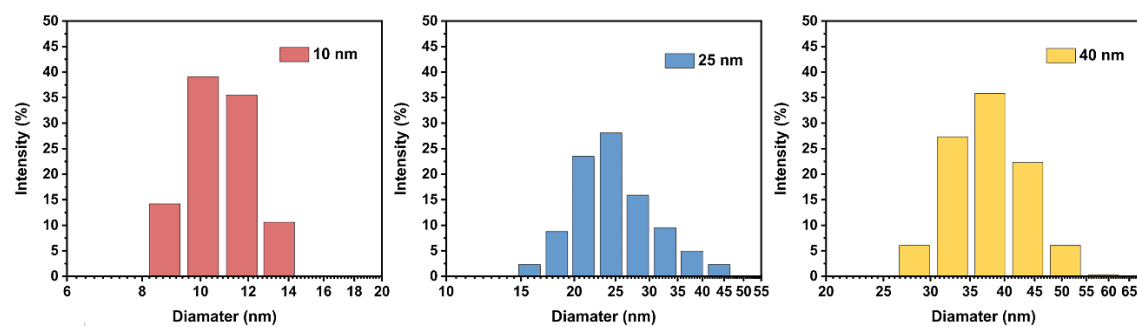
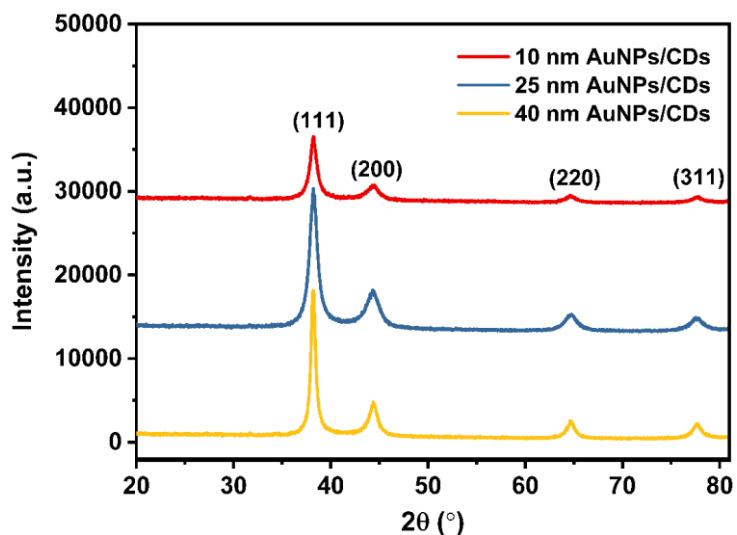
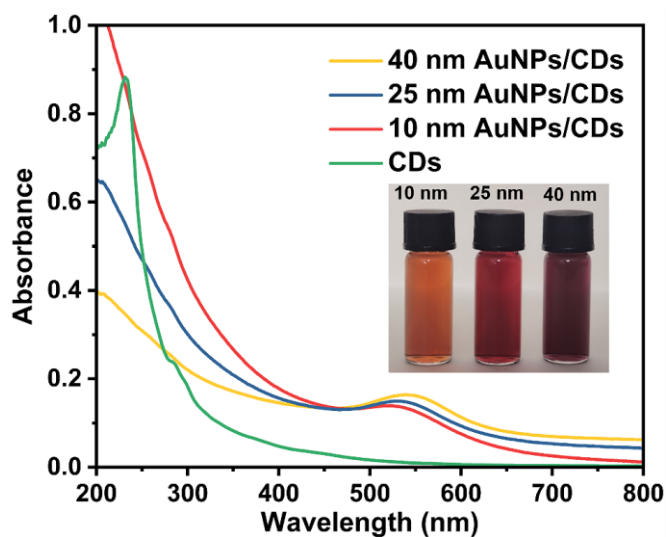


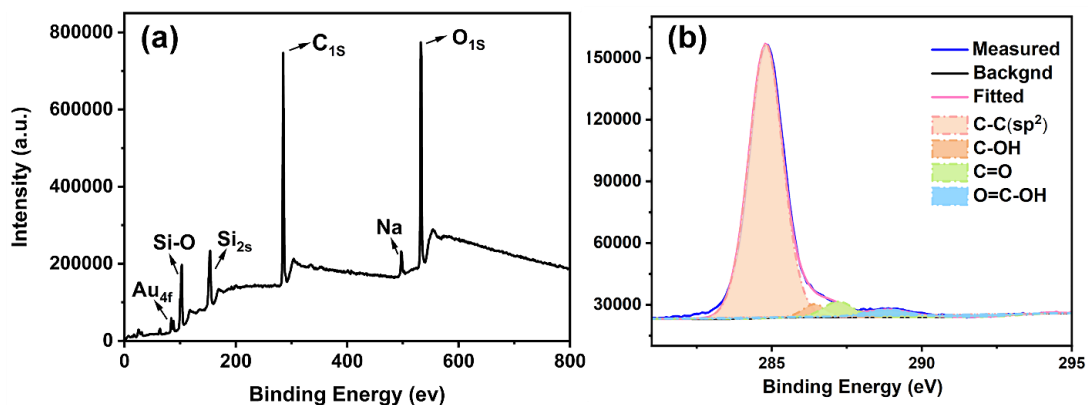
Fig. S5 DLS spectra of different sized AuNPs/CDs.



**Fig. S6** XRD patterns of different sized AuNPs/CDs.

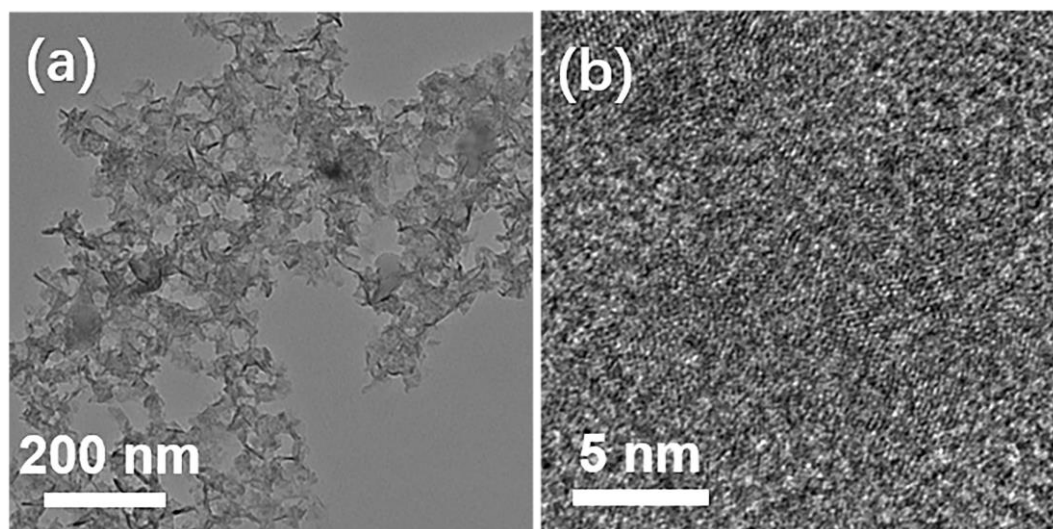


**Fig. S7** UV-vis spectra of three sized AuNPs/CDs and CDs (inset: pictures of the three sized AuNPs/CDs)

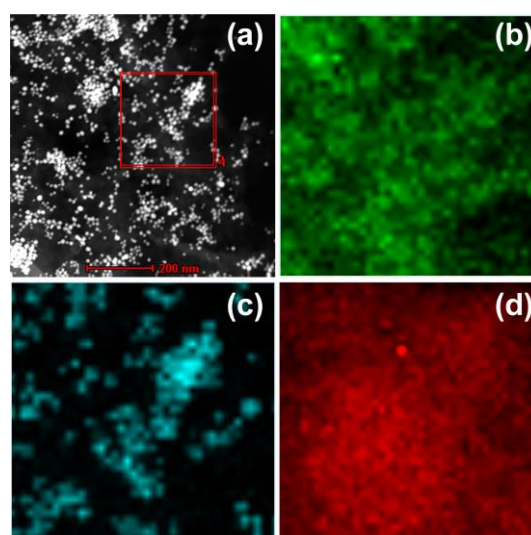


**Fig. S8** XPS spectrum (a) and high-resolution XPS spectrum of C1s (b) of 10 nm sized

AuNPs/CDs.



**Fig. S9** TEM (a) and HRTEM (b) image of FA/MnO<sub>2</sub>/CDs.



**Fig. S10** The corresponding (the area framed in a) EDX elemental maps of Mn(b) Au (c) and C(d). (A colour version of this figure can be viewed online.)

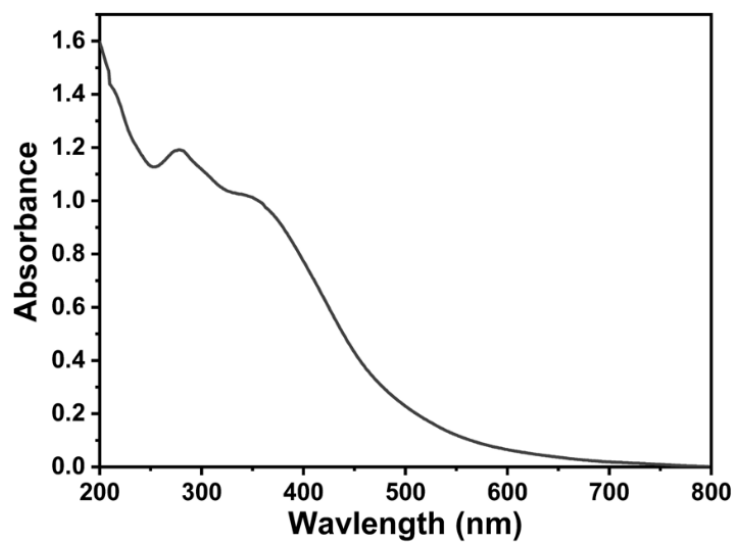


Fig. S11 UV-vis spectrum of FA/MnO<sub>2</sub>/CDs.

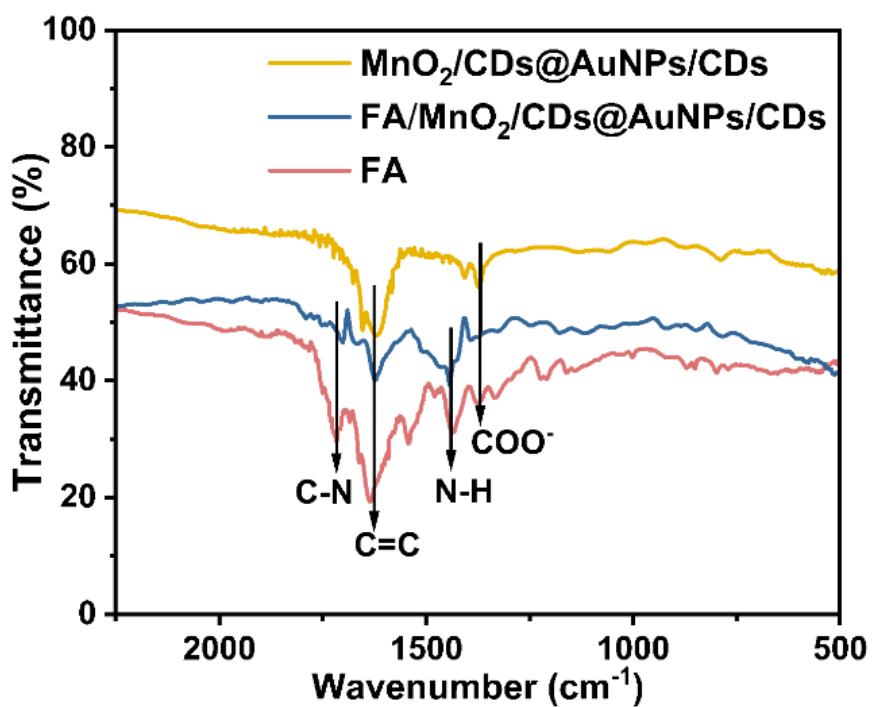
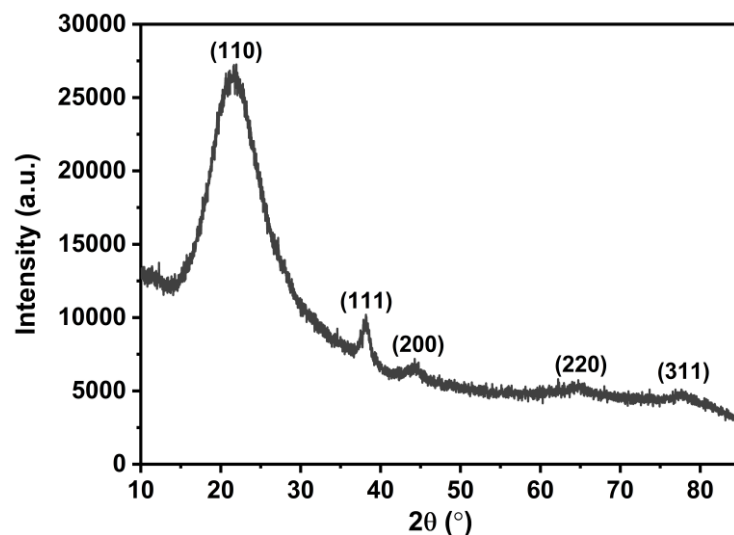
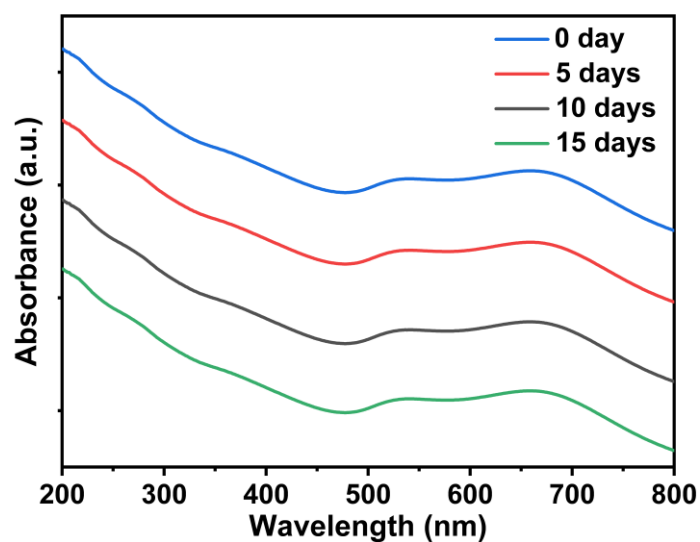


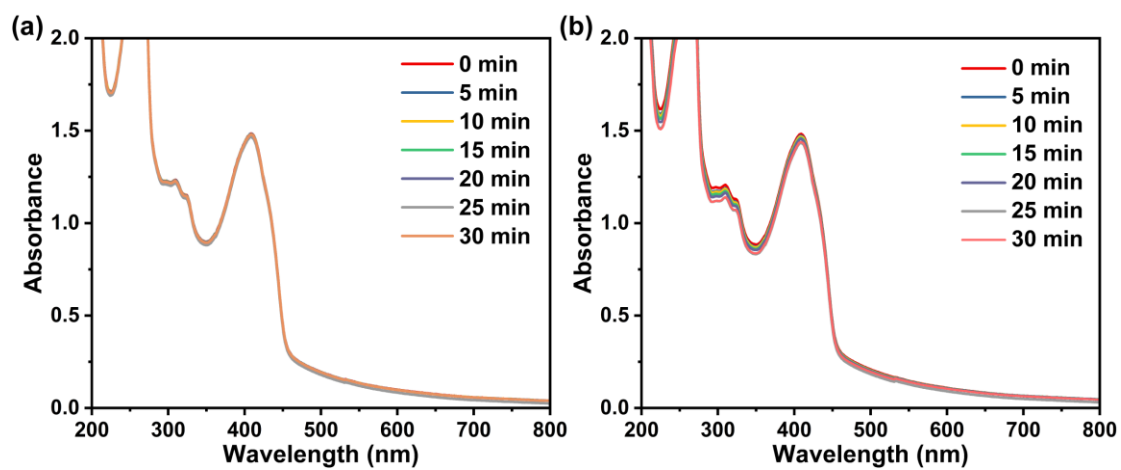
Fig. S12 FT-IR spectra of FA, MnO<sub>2</sub>/AuNPs/CDs and FA/MnO<sub>2</sub>/AuNPs/CDs.



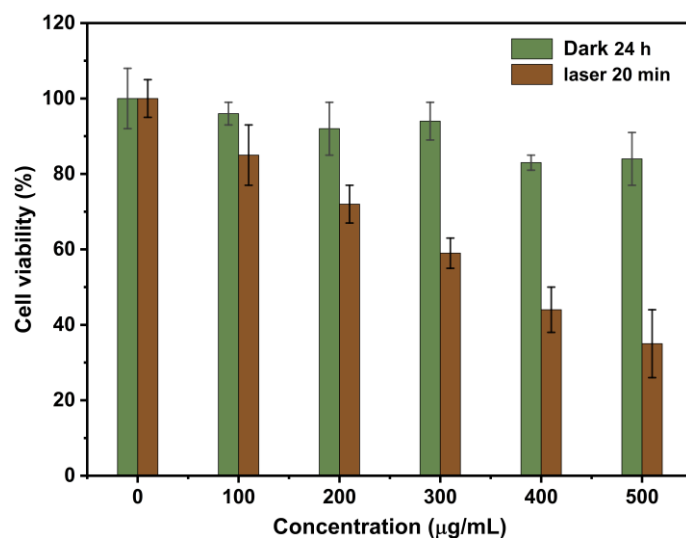
**Fig. S13** XRD patterns of different sized FA/MnO<sub>2</sub>/CDs-AuNPs/CDs.



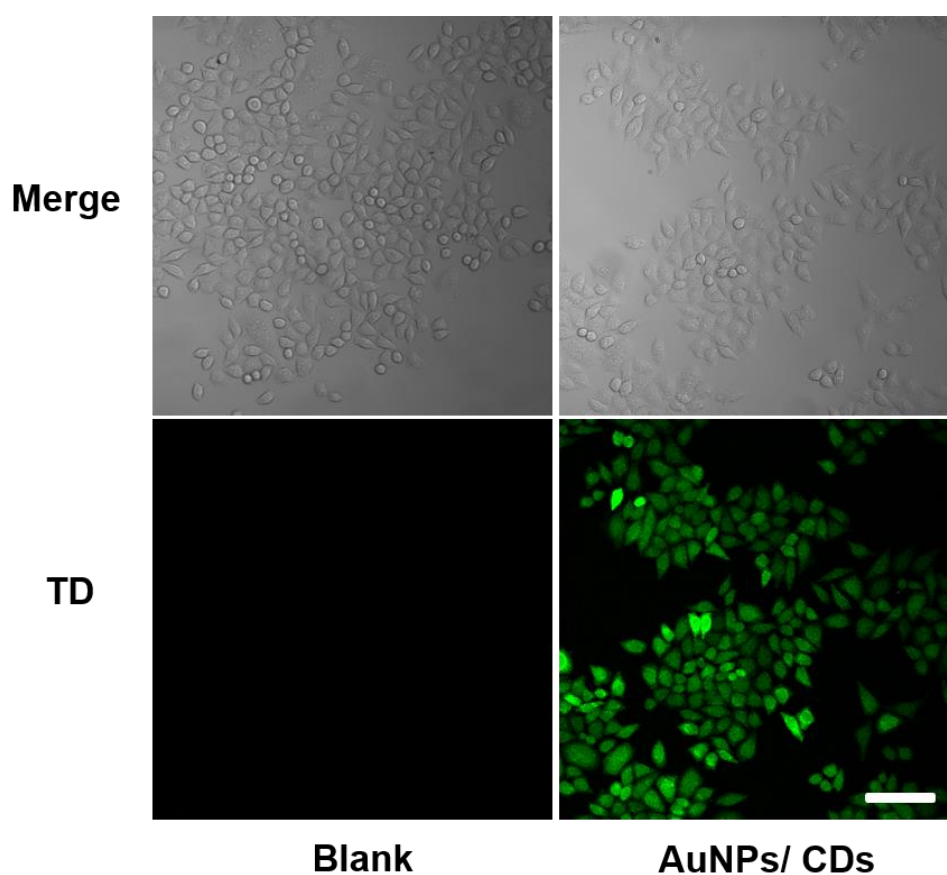
**Fig. S14** UV-vis spectrum of FA/MnO<sub>2</sub>/CDs-AuNPs/CDs for different days.



**Fig. S15** UV-vis spectra of DPBF in the presence of FA/MnO<sub>2</sub>/CDs with 1×10<sup>-6</sup> mol/L H<sub>2</sub>O<sub>2</sub> in darkness(a) and under 660 nm light irradiation(b).

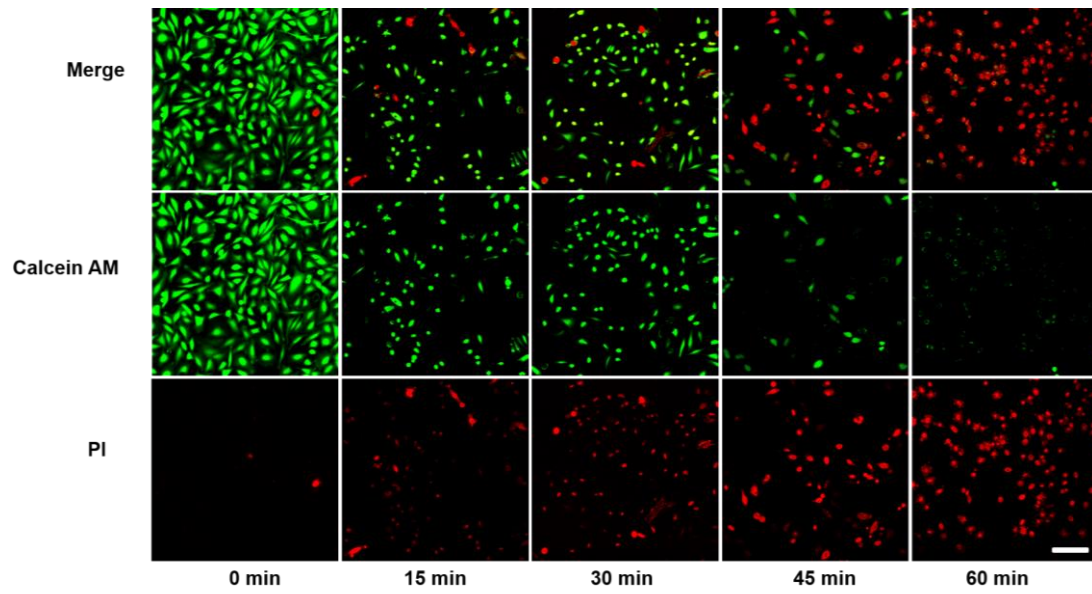


**Fig. S16** Cell viability assay with HeLa cells treated with different concentration of FA/MnO<sub>2</sub>/CDs-AuNPs/CD in dark and with 20 min irradiation of a 532 nm laser.



**Fig. S17** The bright-field and dark field fluorescent images of HeLa cells incubated by 10 nm sized AuNPs/CDs and DCFH-DA active oxygen detector with (laser) and without (blank) 20 min irradiation of a 532 nm (b). The scale bars were 100 µm.





**Fig. S18** Inverted fluorescence microscopy images of 10 nm sized AuNPs/CDs treated HeLa cells after being irradiated with the 532 nm laser for different irradiation times. The cells were all costained with PI and Calcein-AM. The scale bars were 100  $\mu\text{m}$ .