

Supplementary Information

Graphene quantum dots modified upconversion nanoparticles for photodynamic therapy

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1. Characterization of UCNPs@GQDs

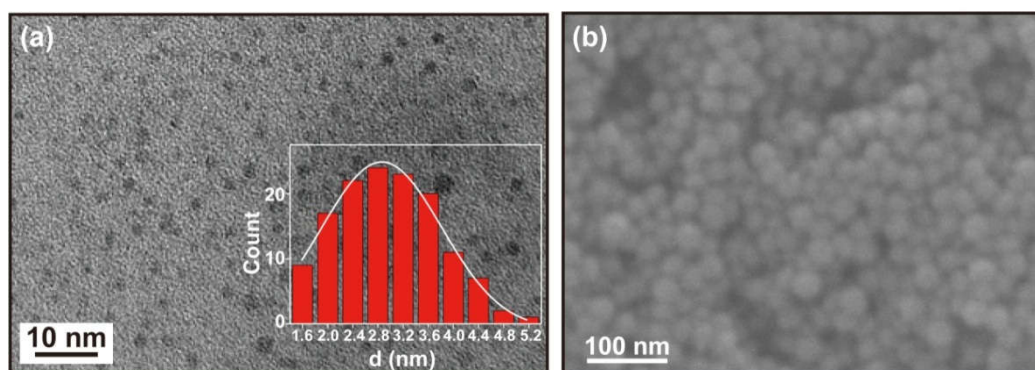


Figure S1. Characterization of GQDs and UCNPs@GQDs. (a) TEM image and size distribution of GQDs. (b) SEM image of UCNPs@GQDs.

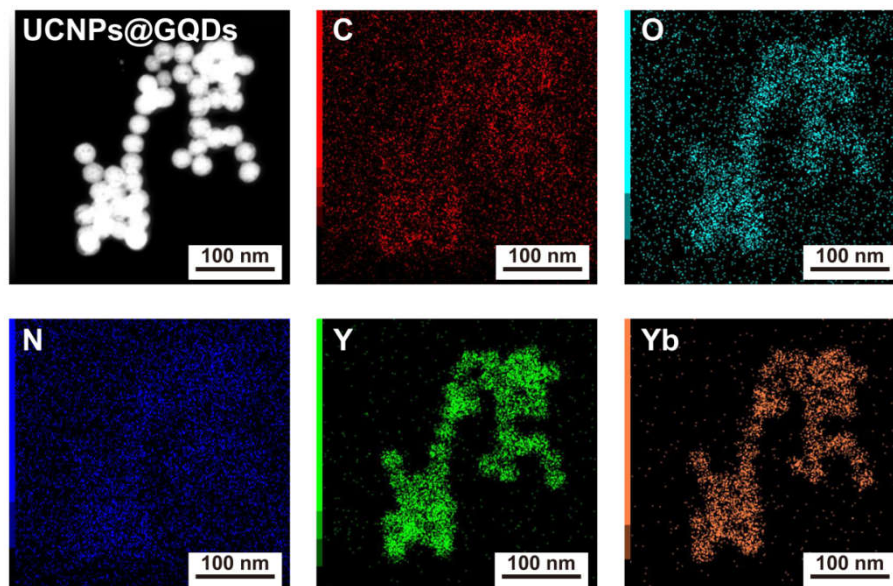


Figure S2. Elemental mapping of UCNPs@GQDs.

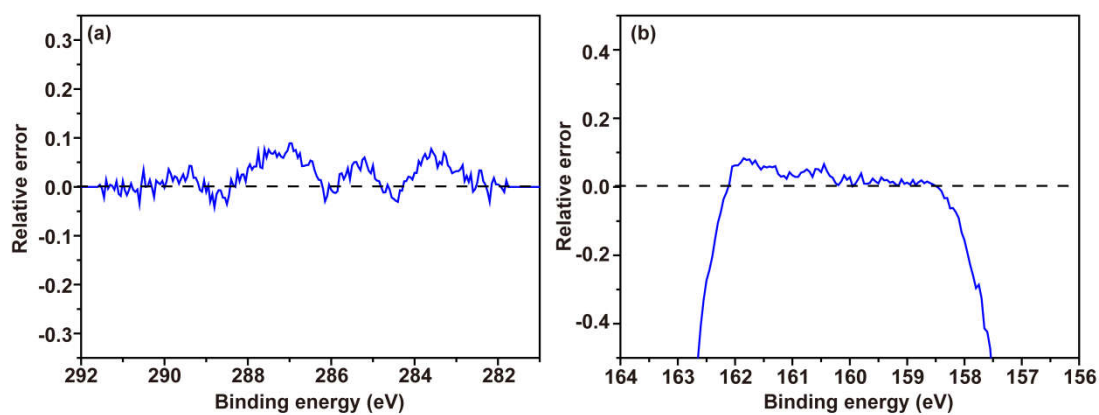


Figure S3. The convergence of XPS profiles. (a) The convergence of C1s XPS profiles of UCNPs@GQDs. (b) The convergence of Y 3d XPS profiles of UCNPs@GQDs.

2. $^1\text{O}_2$ detection

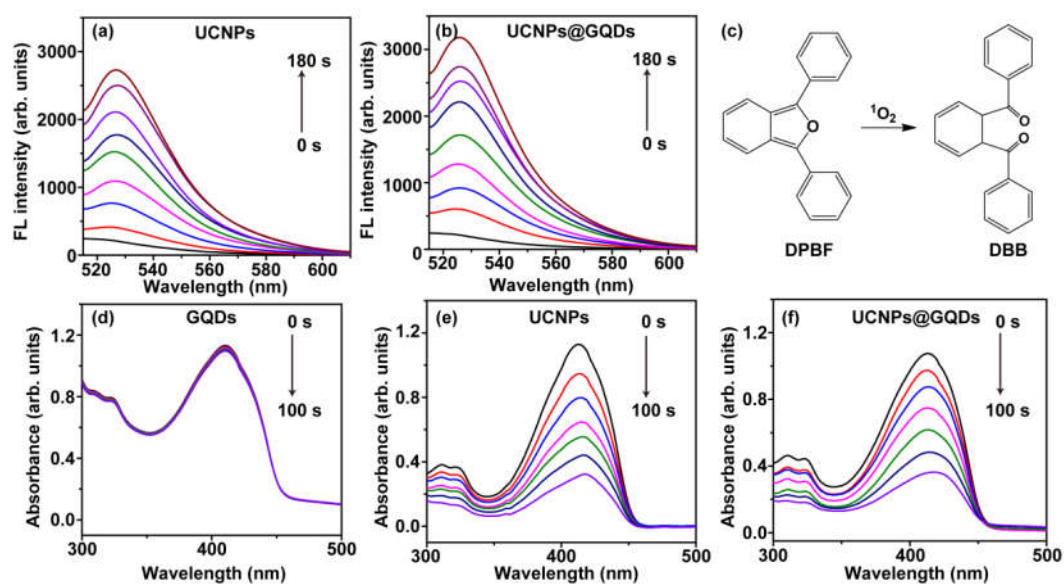


Figure S4. $^1\text{O}_2$ detection by SOSG and DPBF. (a and b) FL intensity curves of SOSG were detected at 525 nm upon treating by UCNP and UCNP@GQDs and subsequent 980 nm laser irradiation in different time duration. (c) The reaction between DPBF and $^1\text{O}_2$. (d-f) Absorption decay curves of DPBF were detected at 420 nm upon treating by UCNP@GQDs and subsequent 980 nm laser irradiation in different time duration.

3. PDT assessment

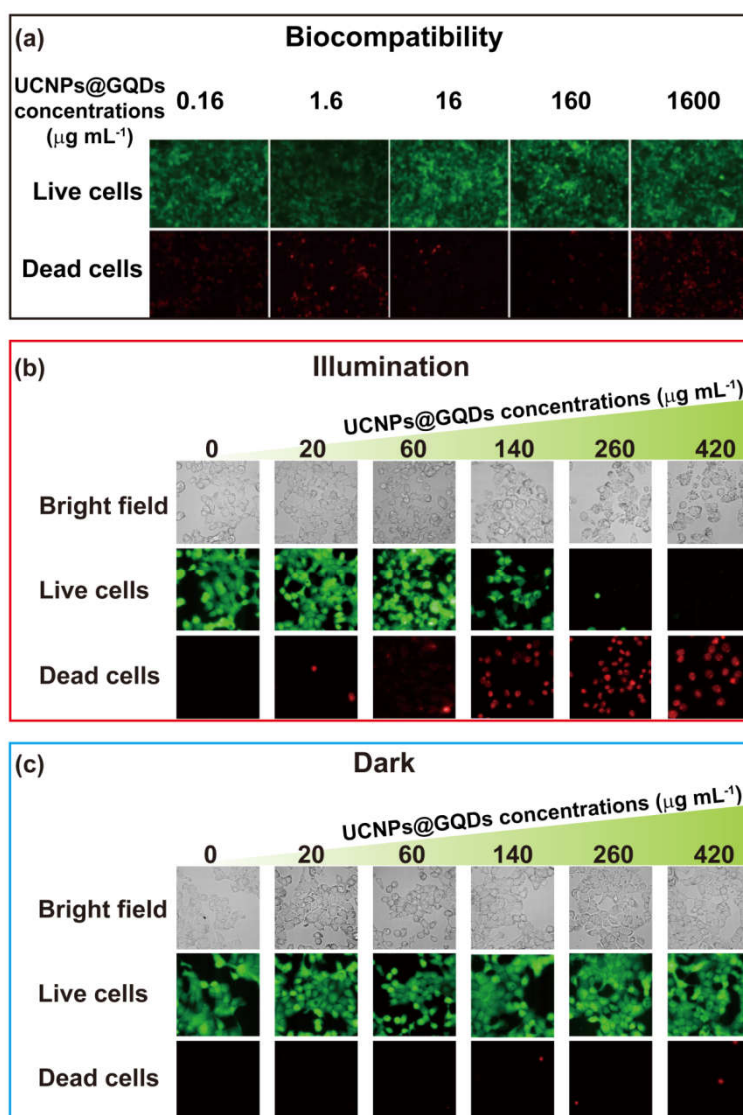


Figure S5. PDT assessment for UCNPs@GQDs. (a) Fluorescent images of HeLa cells treated by live/dead assay kit were taken after UCNPs@GQDs treatment without 980 nm laser irradiation in order to assess the biocompatible of UCNPs@GQDs. (b) Fluorescent images of HeLa cells treated by live/dead assay kit were taken after UCNPs@GQDs treatment with 980 nm laser irradiation in order to assess the PDT effect of UCNPs@GQDs. (c) Fluorescent images of HeLa cells treated by live/dead assay kit were taken after UCNPs@GQDs treatment without 980 nm laser irradiation for comparison.