

Photo-Cleavable Polycations Wrapped Upconversion Nanoparticles for Efficient siRNA Delivery and Cancer Therapy

Yuling He ^{1,2*}, Shuwen Guo ³, Huangxian Ju ² and Ying Liu ^{2*}

¹Shaanxi Key Laboratory of Brain Disorders, Institute of Basic and Translational Medicine, Xi'an Medical University, No. 1 Xinwang Road, Xi'an 710021, China. E-mail: heyuling0925@163.com

²State Key Laboratory of Analytical Chemistry for Life Science, School of Chemistry and Chemical Engineering, Nanjing University, Nanjing 210023, China. E-mail: yingliu@n ju.edu.cn

³Key Laboratory of Analytical Chemistry for Life Science of Shaanxi Province, School of Chemistry and Chemical Engineering, Shaanxi Normal University, Xi'an 710100, China.

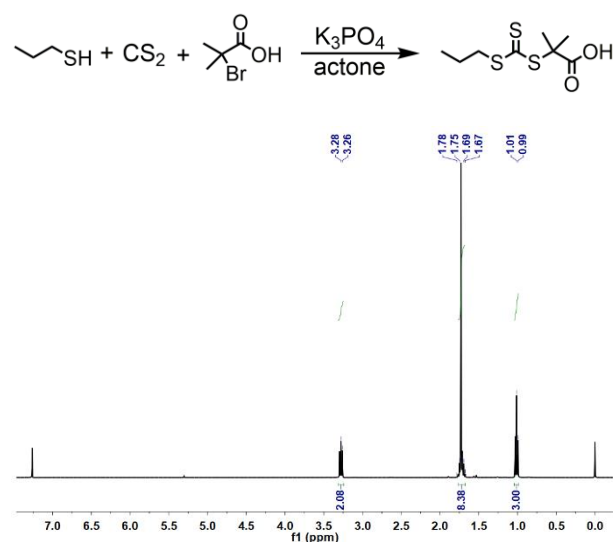


Figure S1. Synthetic route and ¹H NMR spectrum (in CDCl₃) of chain transfer agent CTA.

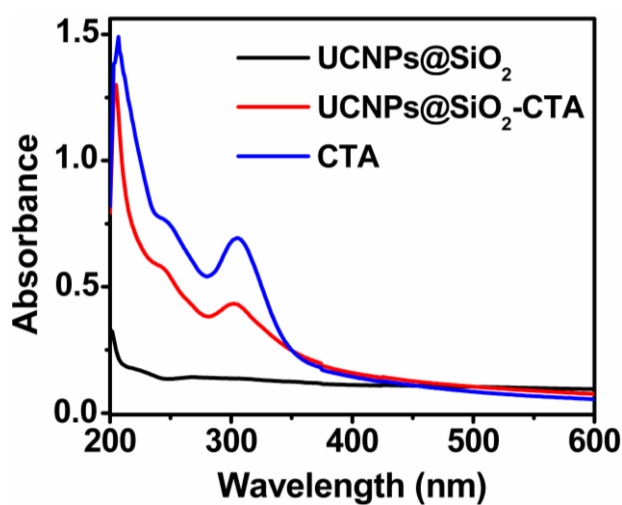


Figure S2. UV-Vis spectra of UCNPs@SiO₂, UCNPs@SiO₂-CTA and CTA.

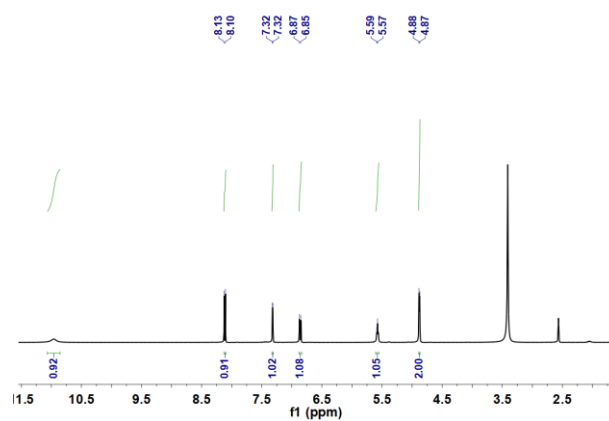


Figure S3. Synthetic route and ¹H NMR spectrum (in DMSO-*d*₆) of 5-hydroxy-2-nitrobenzyl alcohol (Compound 1).

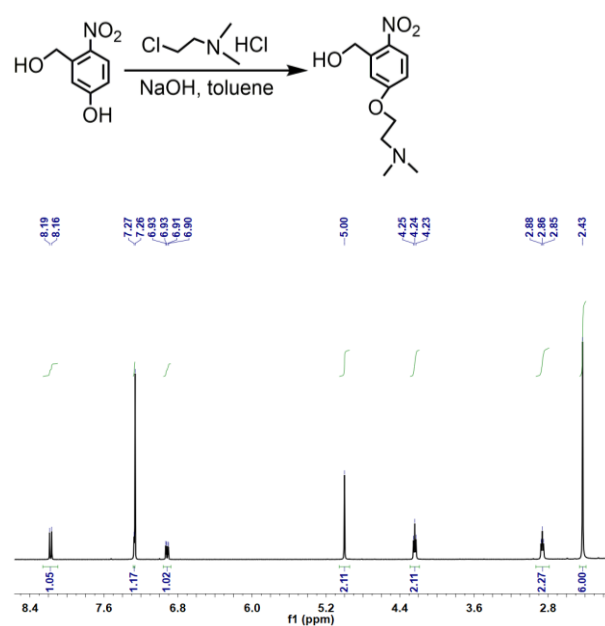


Figure S4. Synthetic route and ¹H NMR spectrum (in CDCl₃) of 5-(2-(dimethylamino)ethoxy)-2-nitrobenzyl alcohol (Compound 2).

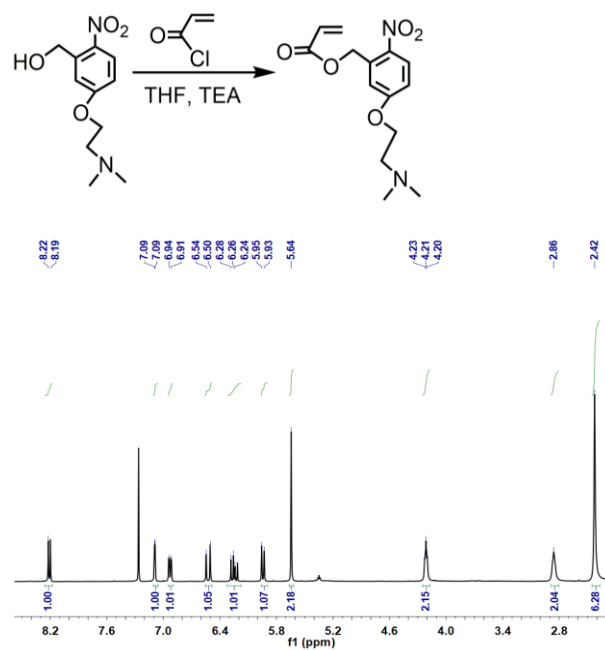


Figure S5. Synthetic route and ^1H NMR spectrum (in CDCl_3) of 5-(2-(dimethylamino)ethoxy)-2-nitrobenzyl acrylate (DMNA).

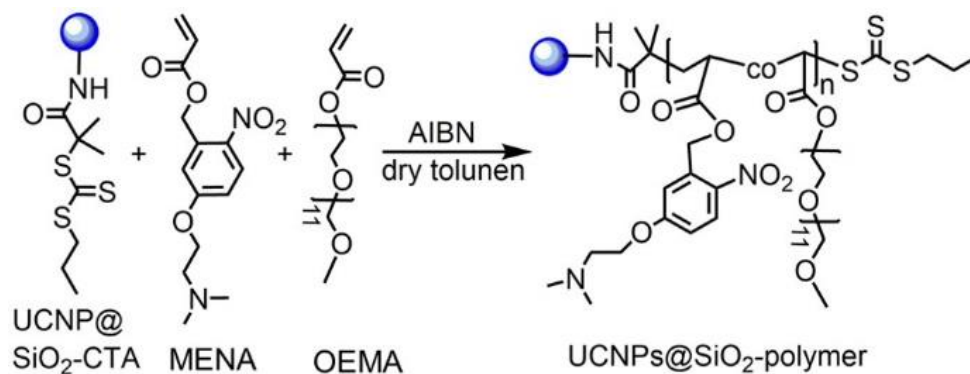


Figure S6. Synthetic route of UCNP@SiO₂-polymer via RAFT polymerization.

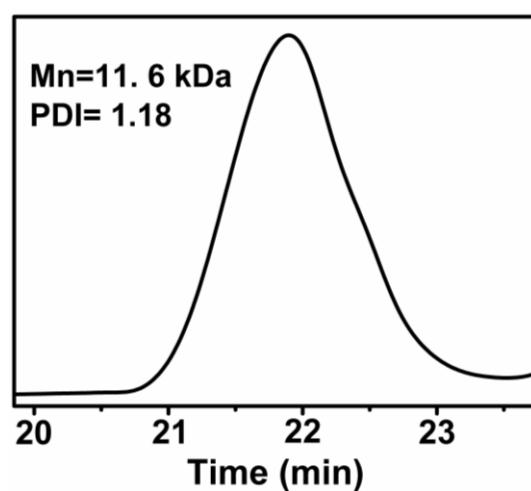


Figure S7. Gel permeation chromatographic (GPC) analysis of P(OEOA-co-DMNA) from the surface of UCNP@SiO₂-polymer using THF as eluent.

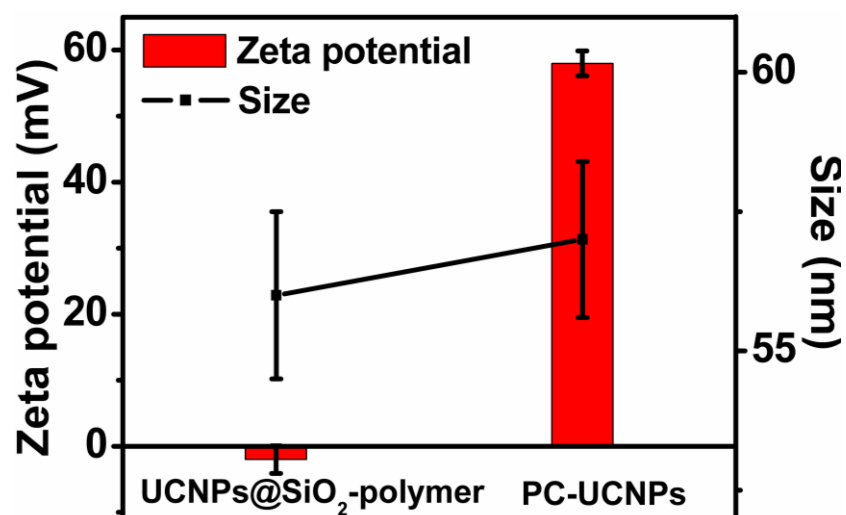


Figure S8. Zeta potential and DLS analysis of UCNP@SiO₂-polymer and PC-UCNPs.

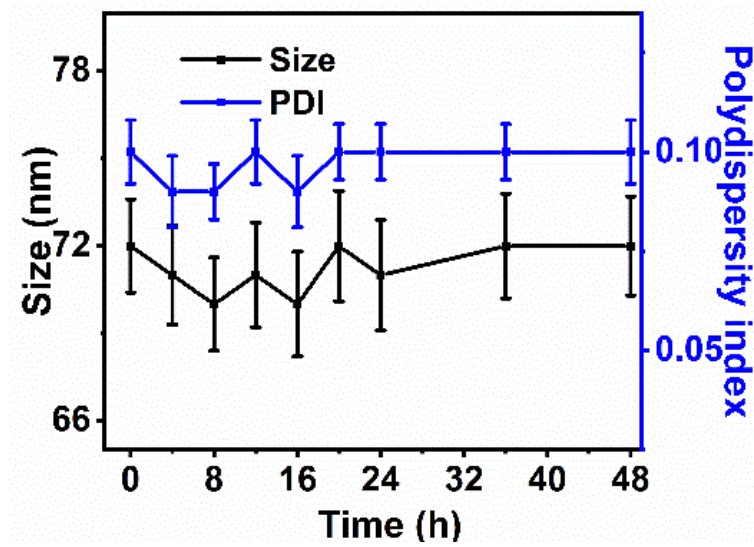


Figure S9. DLS analysis and polydispersity index (PDI) of PC-UCNPs/siRNA/HA incubated with DMEM containing 10% fetal bovine serum for different times.

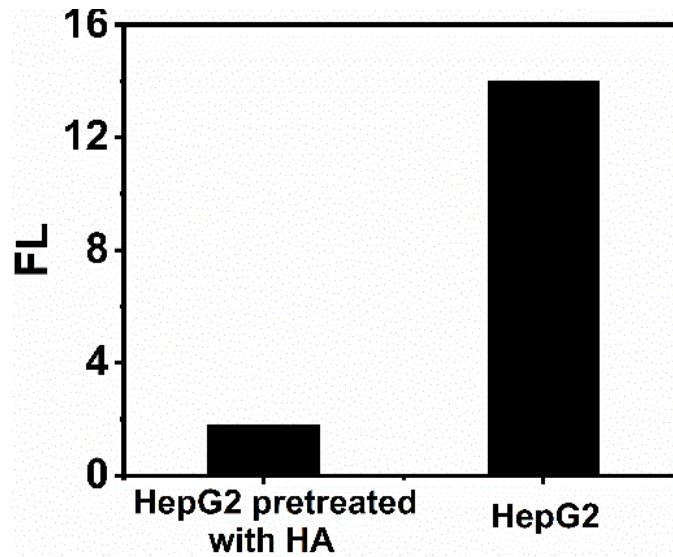


Figure S10. Semiquantitative analysis of intracellular FAM fluorescence intensity for PC-UCNPs/siRNA/HA incubated HepG2 cells and HA pre-treated HepG2 cells.

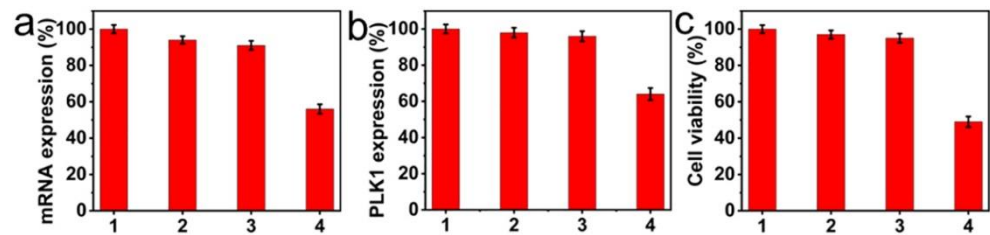


Figure S11. Gene silencing and cell viability. Expression levels of (a) PLK1 mRNA expression via qRT-PCR, (b) PLK1 protein expression via ELISA and (c) relative HeLa cell viability via MTT. (1) Untreated HeLa cells, (2) PC-UCNPs/siPLK1/HA treated HeLa cells without NIR irradiation, (3) PC-UCNPs/siRNA/HA treated HeLa cells with NIR irradiation, (4) PC-UCNPs/siPLK1/HA treated HeLa cells with NIR irradiation. The error bars indicate means \pm S.D. (n = 5).

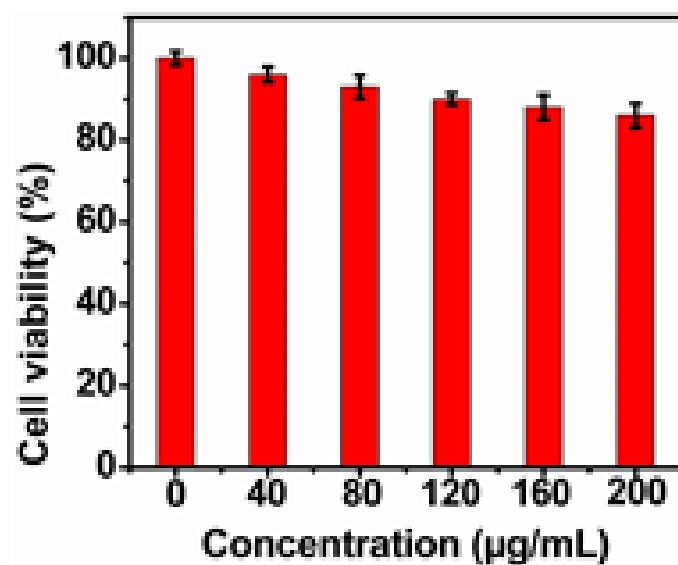


Fig. S12 Relative cell viabilities of HepG2 cells treated with PC-UCNPs/siRNA/HA at the series concentrations.

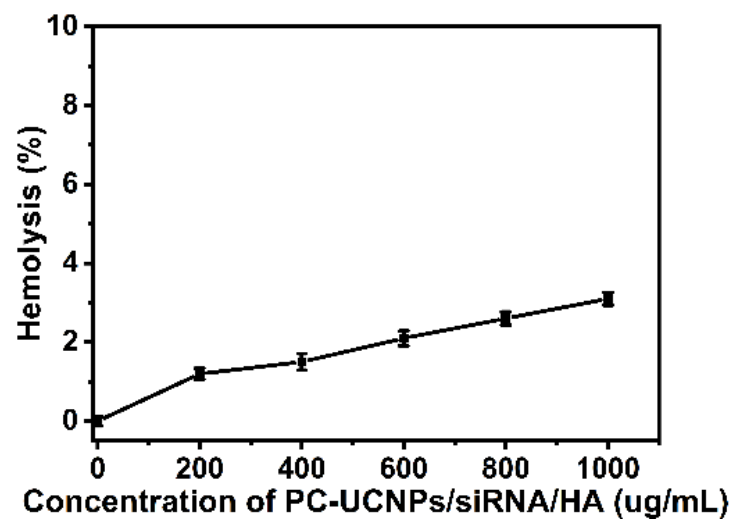


Figure S13. Hemolysis percentages of red blood cells (RBCs) incubated with 0, 200, 400, 600, 800, 1000 µg/mL PC-UCNPs/siRNA/HA. The data error bars indicate means \pm SD (n=4).