

Supporting Information for

**Self-Assembled Ru Nanozyme with H<sub>2</sub>O<sub>2</sub>-Activated Oxygenation for  
NIR-II Photoacoustic Imaging-Guided Photothermal/Photodynamic  
Therapy**

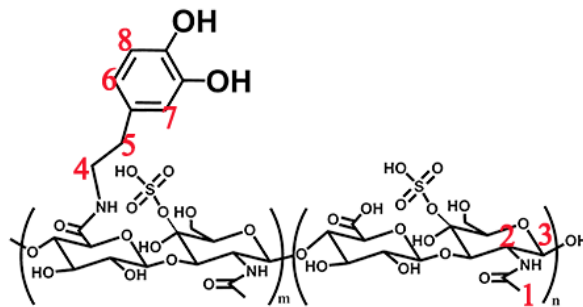
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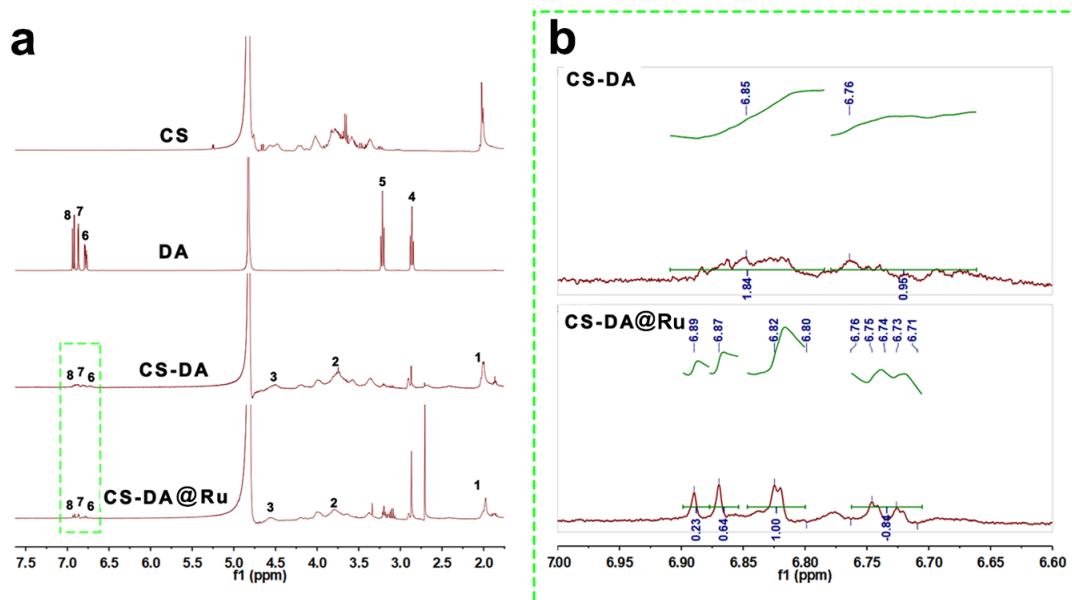
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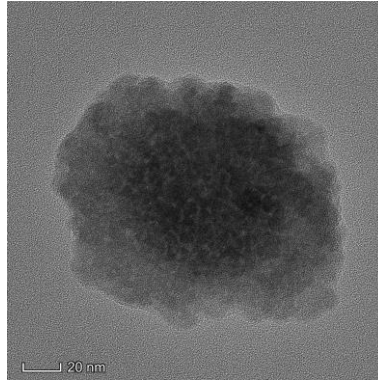
<sup>+</sup> Guang Liu, Zhilang Li, and Zirong Lv contributed equally to this work.



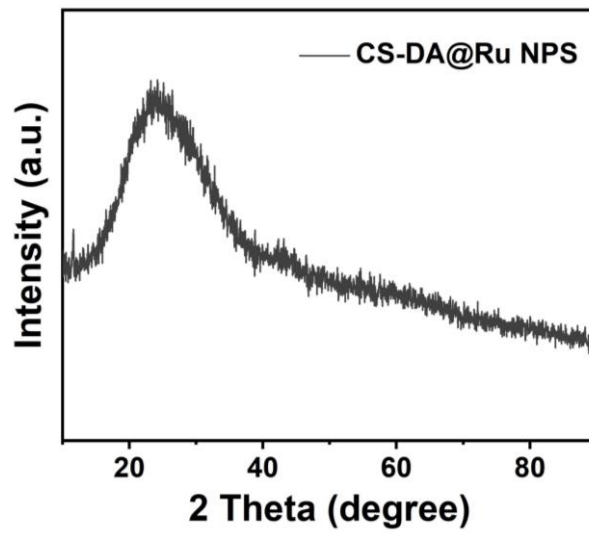
**Fig. S1.** The structure of CSA-DA.



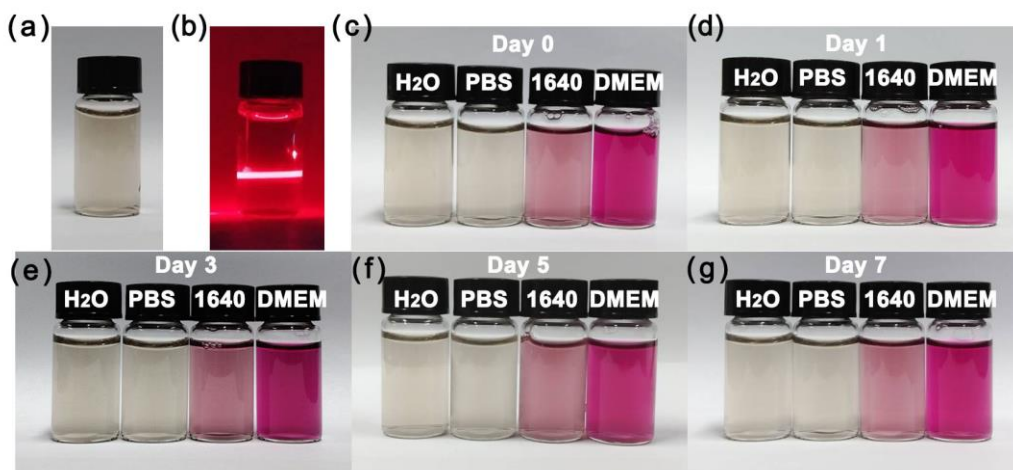
**Fig. S2.**  $^1\text{H}$  NMR of CS, DA, CS-DA, and CSA-DA@Ru NPs.



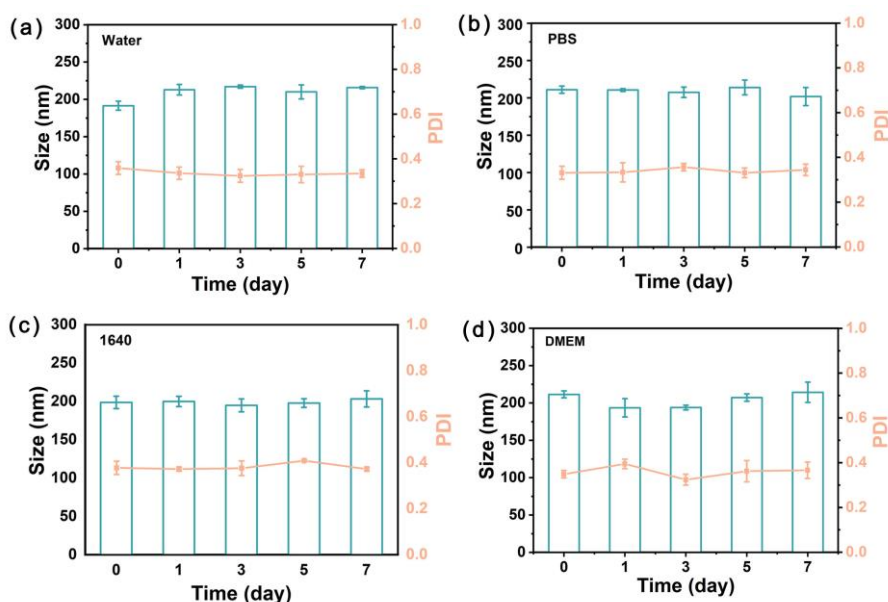
**Fig. S3.** TEM of CS-DA@Ru NPs.



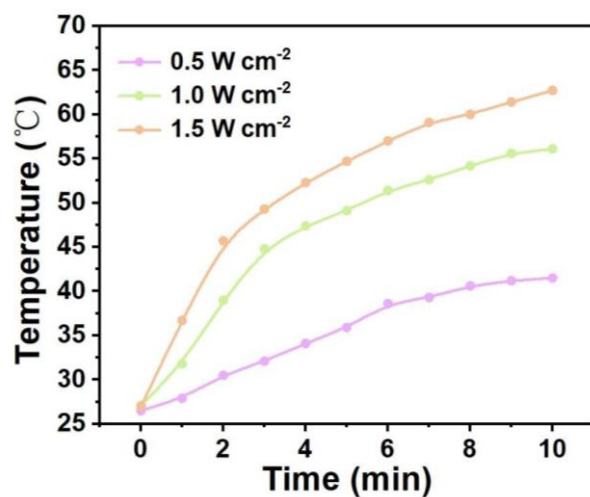
**Fig. S4.** XRD pattern of CS-DA@Ru NPs.



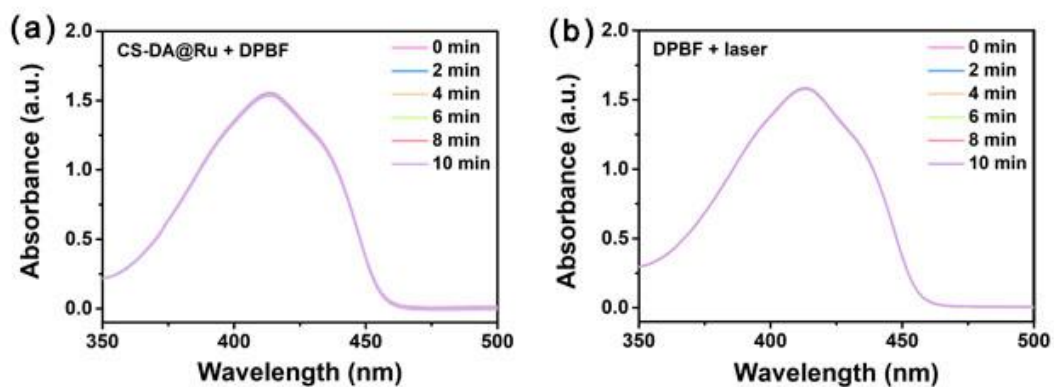
**Fig. S5.** (a) Picture of CS-DA@Ru NPs aqueous solution. (b) CS-DA@Ru NPs aqueous solution under near-infrared light irradiation. (c-d) Pictures of CS-DA@Ru NPs dispersed in H<sub>2</sub>O, PBS, 1640, 1640 + serum, DMEM, and DMEM + serum media for 0, 1, 3, 5, and 7 days, respectively.



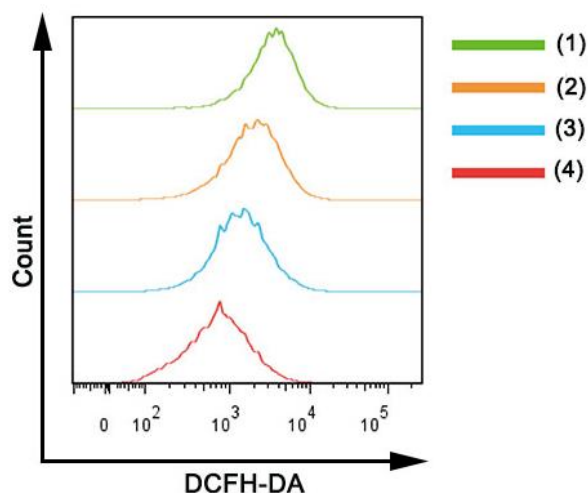
**Fig. S6.** Particle dispersion index values and hydrodynamic particle size of CS-DA@Ru NPs dispersed in water, PBS, 1640 and DMEM media for different times.



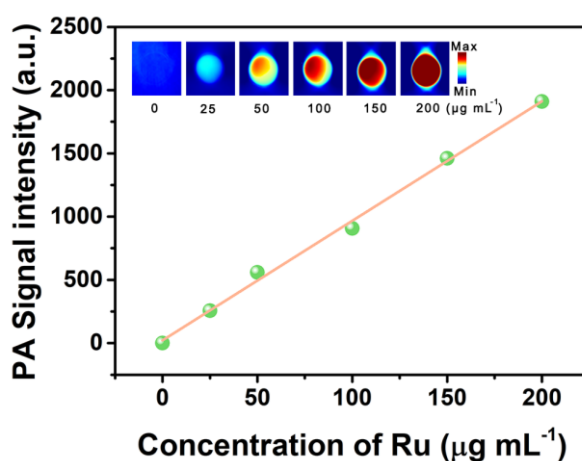
**Figure S7.** Temperature elevation profiles of CS-DA@Ru NPs irradiated with a 1064 nm laser at different power densities (0.5, 1.0, 1.5 W cm<sup>-2</sup>).



**Fig. S8.** (a) UV-vis absorbance spectra of DPBF solution treated with CS-DA@Ru NPs for different times. (b) UV-vis absorbance spectra of DPBF solution under 1064 nm light irradiation for different times.

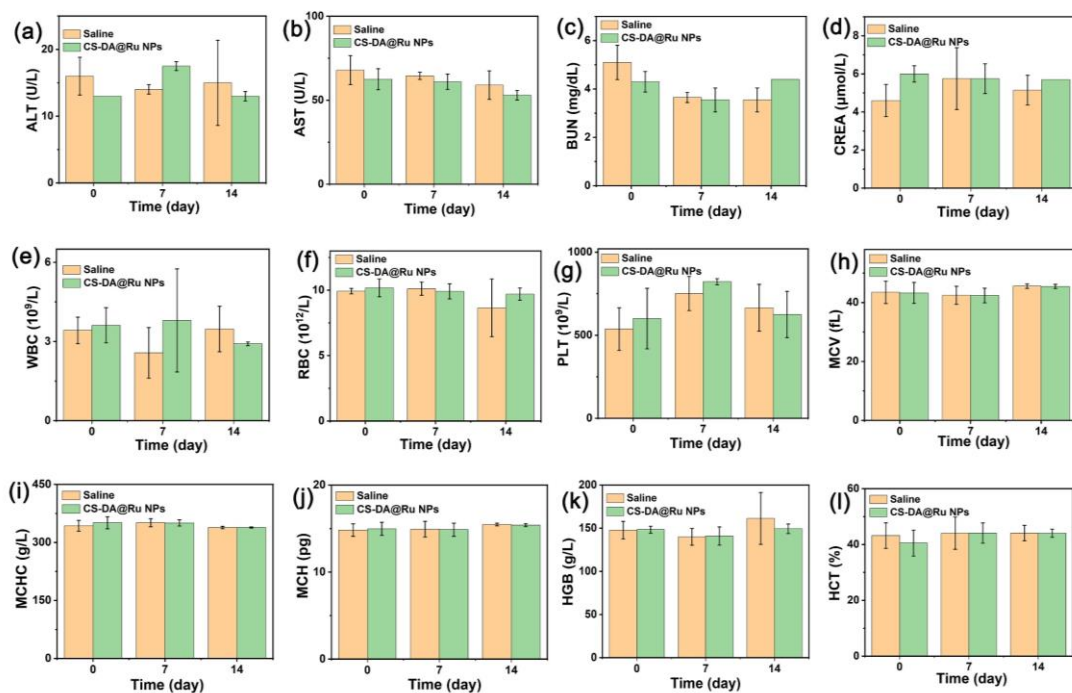


**Fig. S9.** Flow cytometry analysis intracellular ROS of 4T1 cells stained by DCFH-DA after different treatments: (1) control, (2) 1064 nm laser, (3) CS-DA@Ru NPs, (4) CS-DA@Ru NPs + 1064 nm laser.

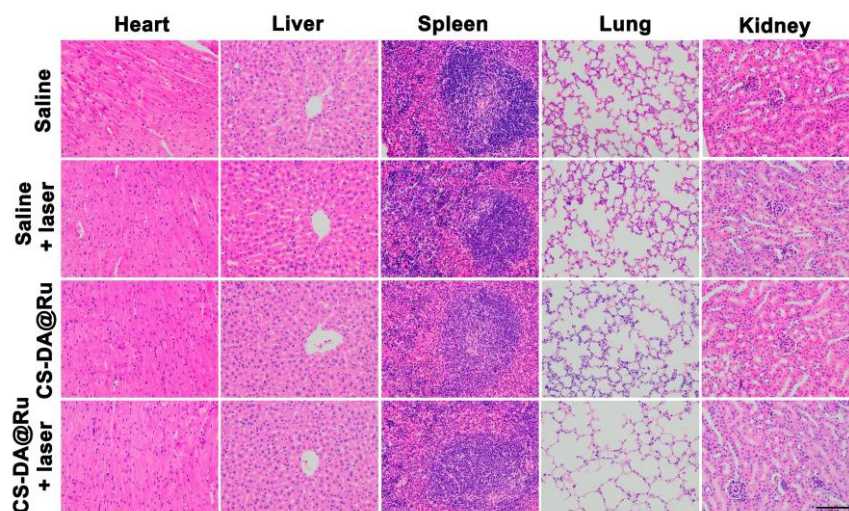


**Fig. S10.** Fitted curve of PA signal intensity versus CS-DA@Ru NPs concentration.

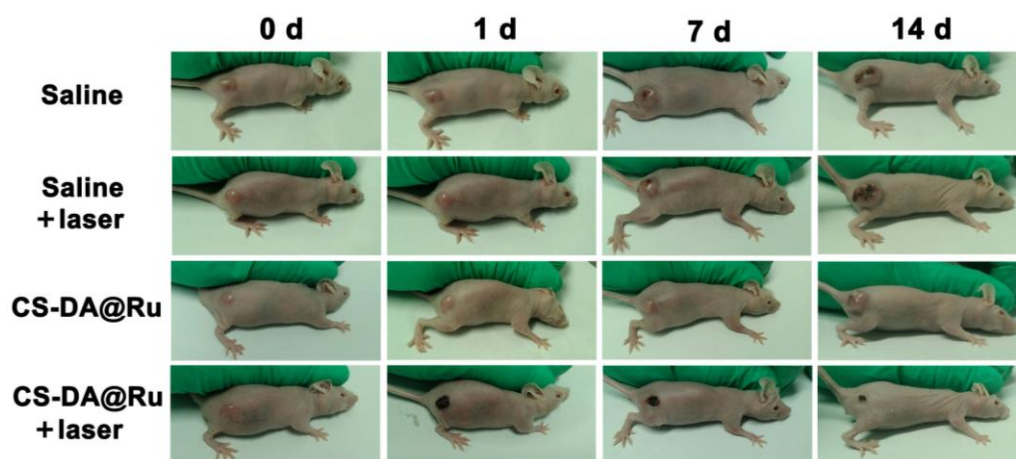
Inset: PA images of CS-DA@Ru NPs at different dosages.



**Fig. S11.** Serum levels of alanine aminotransferase (ALT) (a), asparagine aminotransferase (AST) (b), blood urea nitrogen (BUN) (c), and creatinine (CREA) (d) in female BALB/c mice after intravenous injection of CS-DA@Ru NPs ( $200 \mu\text{g mL}^{-1}$ ) for different times. Complete blood panel analysis data of white blood cells (WBC) (e), red blood cells (RBC) (f), platelets (PLT) (g), mean corpuscular volume (MCV) (h), mean corpuscular hemoglobin concentration (MCHC) (i), mean corpuscular hemoglobin (MCH) (j), hemoglobin (HGB) (k), and hematocrit (HCT) (l) in female BALB/c mice after intravenous injection of CS-DA@Ru NPs ( $200 \mu\text{g mL}^{-1}$ ) for different times.



**Fig. S12.** H&E staining of major organs (heart, liver, spleen, lung, and kidney) of 4T1 tumor-bearing BALB/c mice treated with saline, and CS-DA@Ru NPs with or without 1064 nm ( $1.0 \text{ W cm}^{-2}$ ) irradiation for 5 min. Scale bar: 100  $\mu\text{m}$ .



**Fig. S13.** Photographs of tumor changes of 4T1 tumor-bearing mice on day 0, 1, 7, 14 after various treatments.