

Electronic Supplementary Information for

A NIR-driven green affording-oxygen microrobot for targeted photodynamic therapy of tumors

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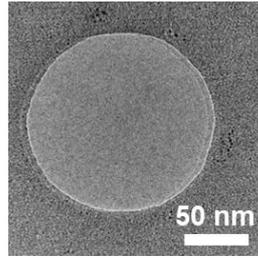
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CurNPs

Fig.S1 The TEM image of CurNPs.

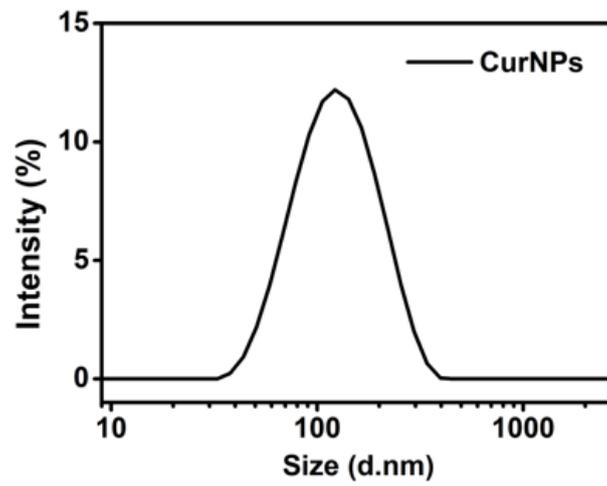


Fig. S2 Size distribution of CurNPs.

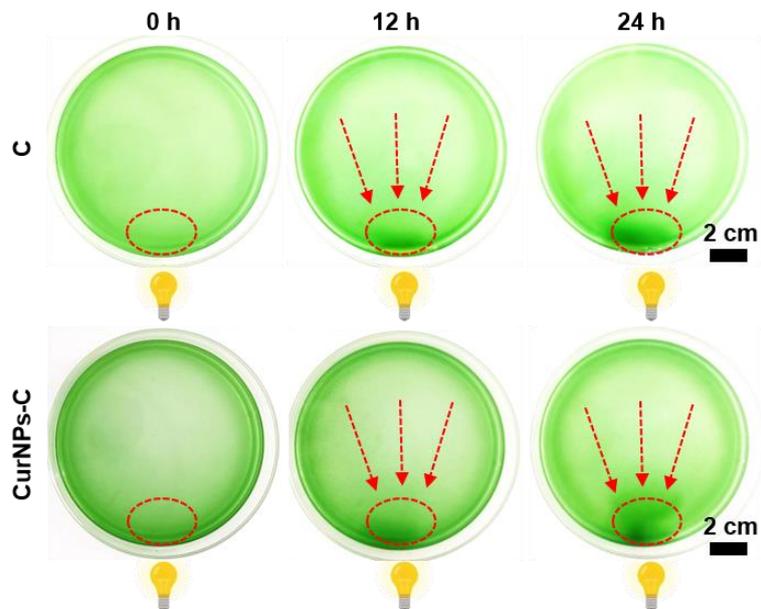


Fig. S3 Captured photographs of the phototactic experiment of C and CurNPs-C in BG11 with white light on one side.

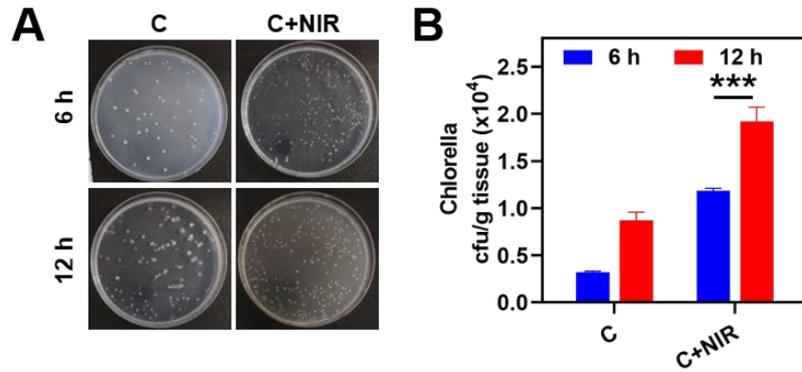


Fig. S4 In vivo biodistribution of C. (A and B) Plate coating image photographs (A) and Colony numbers (B) of tumor tissue homogenates from 4T1 tumor-bearing mice in the C and C+NIR groups at different times after intravenous injection.

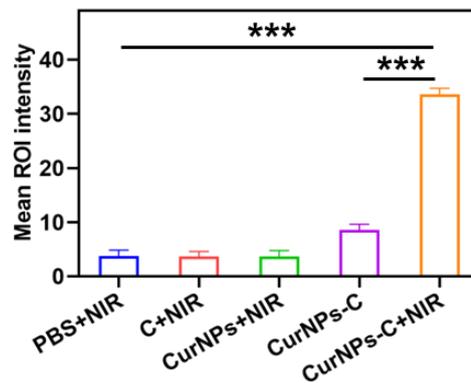


Fig. S5 Semi-quantitative analysis of apoptosis cells in solid tumors by TUNEL stain.

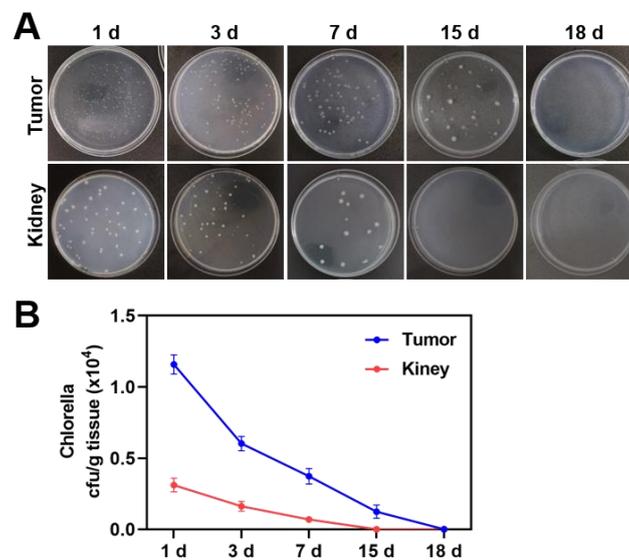


Fig. S6 The biodegradability of CurNPs-C in 4T1 tumor-bearing mice under 660 nm laser irradiation. (A and B) Plate coating image photographs (A) and Colony numbers (B) of tumor and kidney tissue homogenates from 4T1 tumor-bearing mice in the CurNPs+NIR groups at different times after intravenous injection.

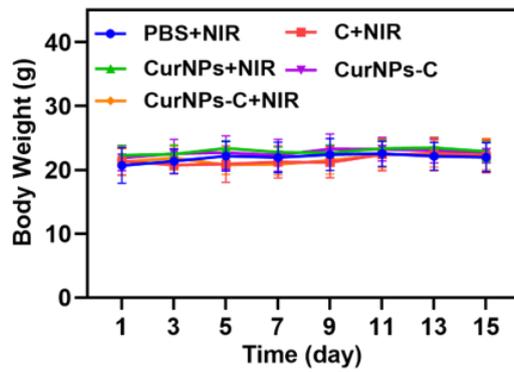


Fig. S7 The body weight curve of the mice in different groups during tumor treatment.

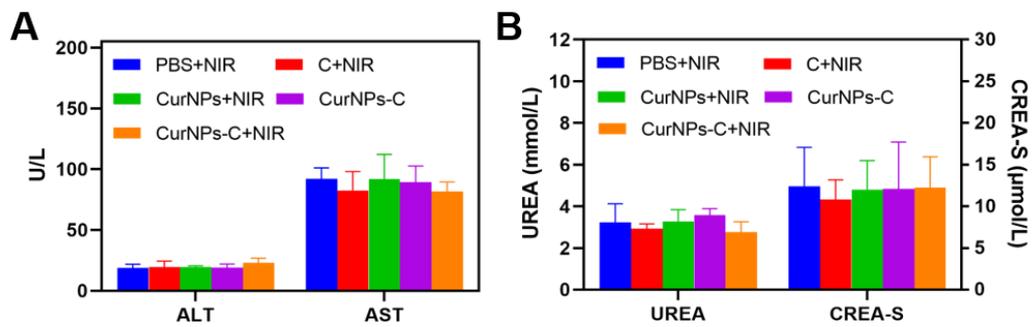


Fig. S8 The biosafety of CurNPs-C. (A) The serum levels of ALT and AST. (B) The serum levels of UREA and CREA-S.

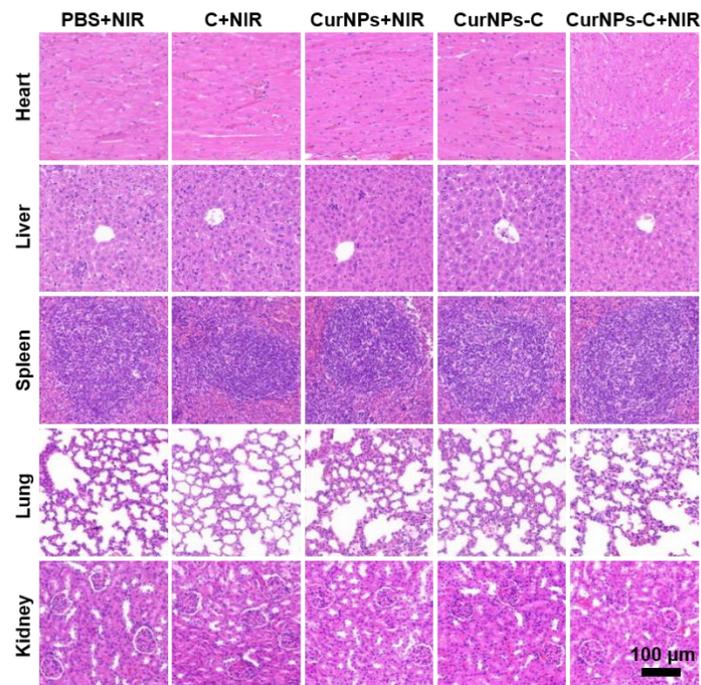


Fig. S9 H&E images of the main organs for evaluating the biosafety of CurNPs-C at the end of the tumor treatment.

Table S1. P value and summary of comparison of each group in Figure 2E

Tukey's multiple comparisons test	P Value	Summary
Control+NIR vs. CurNPs	>0.9999	ns
Control+NIR vs. C	>0.9999	ns
Control+NIR vs. CurNPs-C	0.9511	ns
Control+NIR vs. CurNPs+NIR	>0.9999	ns
Control+NIR vs. C+NIR	<0.0001	***
Control+NIR vs. CurNPs-C+NIR	<0.0001	***
CurNPs vs. C	>0.9999	ns
CurNPs vs. CurNPs-C	0.9738	ns
CurNPs vs. CurNPs+NIR	>0.9999	ns
CurNPs vs. C+NIR	<0.0001	***
CurNPs vs. CurNPs-C+NIR	<0.0001	***
C vs. CurNPs-C	0.9794	ns
C vs. CurNPs+NIR	>0.9999	ns
C vs. C+NIR	<0.0001	***
C vs. CurNPs-C+NIR	<0.0001	***
CurNPs-C vs. CurNPs+NIR	0.984	ns
CurNPs-C vs. C+NIR	<0.0001	***
CurNPs-C vs. CurNPs-C+NIR	<0.0001	***
CurNPs+NIR vs. C+NIR	<0.0001	***
CurNPs+NIR vs. CurNPs-C+NIR	<0.0001	***
C+NIR vs. CurNPs-C+NIR	0.241	ns

Statistical analysis was conducted by one-way ANOVA analysis followed by Tukey's post-test. The asterisk was considered as statistical significance ($*p < 0.05$, $**p < 0.01$, $***p < 0.001$) and ns indicates no significance difference.

Table S2. P value and summary of comparison of each group in Figure 2F

Tukey's multiple comparisons test	P Value	Summary
Control+NIR vs. CurNPs	0.2462	ns
Control+NIR vs. C	0.2879	ns
Control+NIR vs. CurNPs-C	0.0629	ns
Control+NIR vs. CurNPs+NIR	<0.0001	***
Control+NIR vs. C+NIR	<0.0001	***
Control+NIR vs. CurNPs-C+NIR	<0.0001	***
CurNPs vs. C	>0.9999	ns
CurNPs vs. CurNPs-C	0.9774	ns
CurNPs vs. CurNPs+NIR	<0.0001	***
CurNPs vs. C+NIR	<0.0001	***
CurNPs vs. CurNPs-C+NIR	<0.0001	***
C vs. CurNPs-C	0.9597	ns
C vs. CurNPs+NIR	<0.0001	***
C vs. C+NIR	<0.0001	***
C vs. CurNPs-C+NIR	<0.0001	***
CurNPs-C vs. CurNPs+NIR	<0.0001	***
CurNPs-C vs. C+NIR	<0.0001	***
CurNPs-C vs. CurNPs-C+NIR	<0.0001	***
CurNPs+NIR vs. C+NIR	0.0002	***
CurNPs+NIR vs. CurNPs-C+NIR	<0.0001	***
C+NIR vs. CurNPs-C+NIR	<0.0001	***

Statistical analysis was conducted by one-way ANOVA analysis followed by Tukey's post-test. The asterisk was considered as statistical significance ($*p < 0.05$, $**p < 0.01$, $***p < 0.001$) and ns indicates no significance difference.

Table S3. P value and summary of comparison of each group in Figure 3C

Tukey's multiple comparisons test	P Value	Summary
Control vs. 10 ⁷ C	0.9992	ns
Control vs. 10 ⁸ C	0.9982	ns
Control vs. 10 ⁹ C	0.8126	ns
Control vs. Control +NIR	>0.9999	ns
Control vs. 10 ⁷ C+NIR	0.9382	ns
Control vs. 10 ⁸ C+NIR	0.2463	ns
Control vs. 10 ⁹ C+NIR	0.0001	***
10 ⁷ C vs. 10 ⁸ C	>0.9999	ns
10 ⁷ C vs. 10 ⁹ C	0.9773	ns
10 ⁷ C vs. Control +NIR	0.9999	ns
10 ⁷ C vs. 10 ⁷ C+NIR	0.9983	ns
10 ⁷ C vs. 10 ⁸ C+NIR	0.505	ns
10 ⁷ C vs. 10 ⁹ C+NIR	0.0003	***
10 ⁸ C vs. 10 ⁹ C	0.9861	ns
10 ⁸ C vs. Control +NIR	0.9996	ns
10 ⁸ C vs. 10 ⁷ C+NIR	0.9993	ns
10 ⁸ C vs. 10 ⁸ C+NIR	0.5514	ns
10 ⁸ C vs. 10 ⁹ C+NIR	0.0003	***
10 ⁹ C vs. Control +NIR	0.8713	ns
10 ⁹ C vs. 10 ⁷ C+NIR	>0.9999	ns
10 ⁹ C vs. 10 ⁸ C+NIR	0.9538	ns
10 ⁹ C vs. 10 ⁹ C+NIR	0.0017	**
Control +NIR vs. 10 ⁷ C+NIR	0.9666	ns
Control +NIR vs. 10 ⁸ C+NIR	0.2994	ns
Control +NIR vs. 10 ⁹ C+NIR	0.0001	***
10 ⁷ C+NIR vs. 10 ⁸ C+NIR	0.8431	ns
10 ⁷ C+NIR vs. 10 ⁹ C+NIR	0.0009	***
10 ⁸ C+NIR vs. 10 ⁹ C+NIR	0.0134	*

Statistical analysis was conducted by one-way ANOVA analysis followed by Tukey's post-test. The asterisk was considered as statistical significance (* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$) and ns indicates no significance difference.

Table S4. P value and summary of comparison of each group in Figure 3D

Tukey's multiple comparisons test	P Value	Summary
NIR- Control vs. NIR- C	0.8592	ns
NIR- Control vs. NIR- CurNPs	0.5337	ns
NIR- Control vs. NIR- CurNPs-C	0.149	ns
NIR- Control vs. NIR+ Control	>0.9999	ns
NIR- Control vs. NIR+ C	<0.0001	***
NIR- Control vs. NIR+ CurNPs	<0.0001	***
NIR- Control vs. NIR+ CurNPs-C	<0.0001	***
NIR- C vs. NIR- CurNPs	0.9985	ns
NIR- C vs. NIR- CurNPs-C	0.8041	ns
NIR- C vs. NIR+ Control	0.955	ns
NIR- C vs. NIR+ C	<0.0001	***
NIR- C vs. NIR+ CurNPs	<0.0001	***
NIR- C vs. NIR+ CurNPs-C	<0.0001	***
NIR- CurNPs vs. NIR- CurNPs-C	0.9826	ns
NIR- CurNPs vs. NIR+ Control	0.71	ns
NIR- CurNPs vs. NIR+ C	<0.0001	***
NIR- CurNPs vs. NIR+ CurNPs	<0.0001	***
NIR- CurNPs vs. NIR+ CurNPs-C	<0.0001	***
NIR- CurNPs-C vs. NIR+ Control	0.242	ns
NIR- CurNPs-C vs. NIR+ C	0.0003	***
NIR- CurNPs-C vs. NIR+ CurNPs	<0.0001	***
NIR- CurNPs-C vs. NIR+ CurNPs-C	<0.0001	***
NIR+ Control vs. NIR+ C	<0.0001	***
NIR+ Control vs. NIR+ CurNPs	<0.0001	***
NIR+ Control vs. NIR+ CurNPs-C	<0.0001	***
NIR+ C vs. NIR+ CurNPs	0.424	ns
NIR+ C vs. NIR+ CurNPs-C	<0.0001	***
NIR+ CurNPs vs. NIR+ CurNPs-C	<0.0001	***

Statistical analysis was conducted by one-way ANOVA analysis followed by Tukey's post-test. The asterisk was considered as statistical significance ($*p < 0.05$, $**p < 0.01$, $***p < 0.001$) and ns indicates no significance difference.

Table S5. P value and summary of comparison of each group in Figure S4B

Tukey's multiple comparisons test	P Value	Summary
C 6 h vs. C+NIR 6 h	<0.0001	***
C 6 h vs. C 12 h	0.0003	***
C 6 h vs. C+NIR 12 h	<0.0001	***
C+NIR 6 h vs. C 12 h	0.0105	*
C+NIR 6 h vs. C+NIR 12 h	<0.0001	***
C 12 h vs. C+NIR 12 h	<0.0001	***

Statistical analysis was conducted by one-way ANOVA analysis followed by Tukey's post-test. The asterisk was considered as statistical significance ($*p < 0.05$, $**p < 0.01$, $***p < 0.001$).

Table S6. P value and summary of comparison of each group in Figure 4B

Tukey's multiple comparisons test	P Value	Summary
CurNPs 6 h vs. CurNPs-C 6 h	<0.0001	***
CurNPs 6 h vs. CurNPs-C+NIR 6 h	<0.0001	***
CurNPs 6 h vs. CurNPs 12 h	>0.9999	ns
CurNPs 6 h vs. CurNPs-C 12 h	<0.0001	***
CurNPs 6 h vs. CurNPs-C+NIR 12 h	<0.0001	***
CurNPs-C 6 h vs. CurNPs-C+NIR 6 h	<0.0001	***
CurNPs-C 6 h vs. CurNPs 12 h	<0.0001	***
CurNPs-C 6 h vs. CurNPs-C 12 h	<0.0001	***
CurNPs-C 6 h vs. CurNPs-C+NIR 12 h	<0.0001	***
CurNPs-C+NIR 6 h vs. CurNPs 12 h	<0.0001	***
CurNPs-C+NIR 6 h vs. CurNPs-C 12 h	<0.0001	***
CurNPs-C+NIR 6 h vs. CurNPs-C+NIR 12 h	<0.0001	***
CurNPs 12 h vs. CurNPs-C 12 h	<0.0001	***
CurNPs 12 h vs. CurNPs-C+NIR 12 h	<0.0001	***
CurNPs-C 12 h vs. CurNPs-C+NIR 12 h	<0.0001	***

Statistical analysis was conducted by one-way ANOVA analysis followed by Tukey's post-test. The asterisk was considered as statistical significance ($*p < 0.05$, $**p < 0.01$, $***p < 0.001$) and ns indicates no significance difference.

Table S7. P value and summary of comparison of each group in Figure 4D

Tukey's multiple comparisons test	P Value	Summary
CurNPs vs. CurNPs-C	<0.0001	***
CurNPs vs. CurNPs-C+NIR	<0.0001	***
CurNPs-C vs. CurNPs-C+NIR	<0.0001	***

Statistical analysis was conducted by one-way ANOVA analysis followed by Tukey's post-test. The asterisk was considered as statistical significance ($*p < 0.05$, $**p < 0.01$, $***p < 0.001$).

Table S8. P value and summary of comparison of each group in Figure 4F

Tukey's multiple comparisons test	P Value	Summary
CurNPs vs. CurNPs-C	0.0042	**
CurNPs vs. CurNPs-C+NIR	<0.0001	***
CurNPs-C vs. CurNPs-C+NIR	0.0005	***

Statistical analysis was conducted by one-way ANOVA analysis followed by Tukey's post-test. The asterisk was considered as statistical significance ($*p < 0.05$, $**p < 0.01$, $***p < 0.001$).

Table S9. P value and summary of comparison of each group in Figure 5B

Two-tailed Student's t-tests	P Value	Summary
PBS+NIR vs. C+NIR	0.0303	*
PBS+NIR vs. CurNPs+NIR	0.1652	ns
PBS+NIR vs. CurNPs-C	0.0011	**
PBS+NIR vs. CurNPs-C+NIR	<0.0001	***
C+NIR vs. CurNPs+NIR	0.6419	ns
C+NIR vs. CurNPs-C	0.2744	ns
C+NIR vs. CurNPs-C+NIR	0.0013	**
CurNPs+NIR vs. CurNPs-C	0.1949	ns
CurNPs+NIR vs. CurNPs-C+NIR	0.0043	**
CurNPs-C vs. CurNPs-C+NIR	0.0001	***

Statistical analysis was conducted by Student's t-tests. The asterisk was considered as statistical significance ($*p < 0.05$, $**p < 0.01$, $***p < 0.001$) and ns indicates no significance difference.

Table S10. P value and summary of comparison of each group in Figure 5D

Two-tailed Student's t-tests	P Value	Summary
PBS+NIR vs. C+NIR	0.7068	ns
PBS+NIR vs. CurNPs+NIR	0.7946	ns
PBS+NIR vs. CurNPs-C	0.0268	*
PBS+NIR vs. CurNPs-C+NIR	0.0002	***
C+NIR vs. CurNPs+NIR	0.9809	ns
C+NIR vs. CurNPs-C	0.0804	ns
C+NIR vs. CurNPs-C+NIR	0.0011	**
CurNPs+NIR vs. CurNPs-C	0.1768	ns
CurNPs+NIR vs. CurNPs-C+NIR	0.01	**
CurNPs-C vs. CurNPs-C+NIR	0.0046	**

Statistical analysis was conducted by Student's t-tests. The asterisk was considered as statistical significance ($*p < 0.05$, $**p < 0.01$, $***p < 0.001$) and ns indicates no significance difference.

Table S11. P value and summary of comparison of each group in Figure S5B

Tukey's multiple comparisons test	P Value	Summary
PBS+NIR vs. C+NIR	>0.9999	ns
PBS+NIR vs. CurNPs+NIR	>0.9999	ns
PBS+NIR vs. CurNPs-C	0.0018	**
PBS+NIR vs. CurNPs-C+NIR	<0.0001	***
C+NIR vs. CurNPs+NIR	>0.9999	ns
C+NIR vs. CurNPs-C	0.0016	**
C+NIR vs. CurNPs-C+NIR	<0.0001	***
CurNPs+NIR vs. CurNPs-C	0.0017	**
CurNPs+NIR vs. CurNPs-C+NIR	<0.0001	***
CurNPs-C vs. CurNPs-C+NIR	<0.0001	***

Statistical analysis was conducted by one-way ANOVA analysis followed by Tukey's post-test. The asterisk was considered as statistical significance ($*p < 0.05$, $**p < 0.01$, $***p < 0.001$) and ns indicates no significance difference.