Supporting Information

Optimized lanthanide-chlorophyll nanocomposite for dual-modal imaging-guided surgery navigation and anti-cancer theranostics

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Table 1. The element amount and the corresponding SWIR/UCL intensity of the phosphors in the 1st generation.

G1	Y	Yb	Er	Y	Yb	Nd	SWIR	UCL
1	0.945	0.05	0.005	0.88	0.1	0.02	0.9813893	3.5923116
2	0.94	0.05	0.01	0.75	0.2	0.05	0.7853326	0.5182094
3	0.935	0.05	0.015	0.6	0.3	0.1	0.4238069	0.209914
4	0.895	0.1	0.005	0.7	0.2	0.1	0.7453473	0.2066262
5	0.89	0.1	0.01	0.68	0.3	0.02	0.4965911	0.8199292
6	0.885	0.1	0.015	0.85	0.1	0.05	0.591487	0.3394031
7	0.845	0.15	0.005	0.65	0.3	0.05	0.4330201	0.3684876
8	0.84	0.15	0.01	0.8	0.1	0.1	0.3580247	0.1648963
9	0.835	0.15	0.015	0.78	0.2	0.02	0.3110374	0.3877086

Table 2. The element amount and the corresponding SWIR/UCL intensity of the phosphors in the 2nd generation.

G2	Y	Yb	Er	Y	Yb	Nd	SWIR	UCL
1	0.9294808	0.052218	0.0083	0.8712	0.099	0.0198	2.4505814	2.3168299
2	0.8867773	0.093839	0.00938	0.735677	0.23843	0.0159	1.9321705	1.9355256
3	0.933853	0.04941	0.00674	0.845825	0.09612	0.04806	2.4379845	2.5617957
4	0.8906663	0.089859	0.00948	0.765464	0.20412	0.02041	1.9381783	1.5423979
5	0.8866563	0.0996	0.00372	0.8712	0.099	0.0198	2.4366279	1.8226492
6	0.976789	0.008043	0.00517	0.6732	0.297	0.0198	2.4600775	1.3031591
7	0.8811	0.099	0.0099	0.818104	0.06963	0.10226	2.4527132	0.8087936
8	0.8316	0.1485	0.0099	0.819377	0.14652	0.0241	1.6335271	1.3942361
9	0.9520627	0.022664	0.01527	0.645652	0.32283	0.02152	1.4046512	0.8734528

Table 3. The element amount and the corresponding SWIR/UCL intensity of the phosphors in the 3rd generation.

G3	Y	Yb	Er	Y	Yb	Nd	SWIR	UCL
1	0.9294808	0.052218	0.0083	0.739468	0.23966	0.01088	1.1224446	3.7030756
2	0.8867773	0.093839	0.00938	0.758831	0.19264	0.03853	2.0189523	3.136246
3	0.8867773	0.093839	0.00938	0.545303	0.42866	0.01604	1.1795145	2.4018396
4	0.976789	0.008043	0.00517	0.734564	0.23807	0.01737	2.1790886	1.4599023
5	0.9726472	8.01E-03	0.00934	0.83937	0.13249	0.01814	2.6712095	0.9065824
6	0.8905695	0.09424	0.00519	0.677264	0.29879	0.01394	0.9267462	2.7660247
7	0.9367074	0.049561	0.00373	0.856593	0.11394	0.01947	1.7855622	2.3133084
8	0.8839838	0.0993	0.00672	0.905829	0.05611	0.02806	1.7065588	2.821213
9	0.9783687	0.007081	0.00455	0.672784	0.29682	0.0204	1.1658859	0.6053464

Table 4. The element amount and the corresponding SWIR/UCL intensity of the phosphors in the 4th generation.

G4	Y	Yb	Er	Y	Yb	Nd	SWIR	UCL
1	0.9337096	0.052349	0.00394	0.852157	0.11335	0.02449	2.1593684	2.7575837
2	0.8228083	0.1566	0.01059	0.905829	0.05611	0.02806	1.6692632	2.7165272
3	0.9323949	0.053956	0.00365	0.914999	0.05668	0.01832	2.6418947	4.41841
4	0.9726472	0.008009	0.00934	0.831725	0.13129	0.02699	2.6444211	0.4469142
5	0.8867773	0.093839	0.00938	0.84686	0.11264	0.03049	1.3717895	1.6691946
6	0.9367074	0.049561	0.00373	0.749742	0.19033	0.04992	2.3248421	1.7322176
7	0.8839838	0.0993	0.00672	0.895208	0.08404	0.01075	1.7511579	2.4924163
8	0.9294808	0.052218	0.0083	0.766148	0.19478	0.02907	1.936	2.1202929
9	0.9338915	0.049412	0.0067	0.93038	0.05764	0.00199	0.7951579	3.5703452

Table 5. The element amount and the corresponding SWIR/UCL intensity of the phosphors in the 5th generation.

G5	Y	Yb	Er	Y	Yb	Nd	SWIR	UCL
1	0.8886418	0.094937	0.00642	0.892642	0.0838	0.01356	1.3997409	2.4129166
2	0.8816358	0.0935	0.01486	0.766148	0.19478	0.02907	1.4440415	1.914517
3	0.960279	0.026174	0.00355	0.907461	0.05622	0.02632	3.2911917	3.0762568
4	0.9726472	0.008009	0.00934	0.853326	0.1347	0.00198	0.7665803	1.6045942
5	0.9337096	0.052349	0.00394	0.889563	0.08351	0.01692	1.65	1.9728865
6	0.8839838	0.0993	0.00672	0.84564	0.11248	0.03188	1.757513	1.8520053
7	0.9294808	0.052218	0.0083	0.698531	0.26914	0.02233	1.4183938	1.3790247
8	0.9337096	0.052349	0.00394	0.869598	0.09074	0.02966	3.1935233	2.1687065
9	0.9338915	0.049412	0.0067	0.904351	0.0849	0.00075	0.6943005	2.5353041

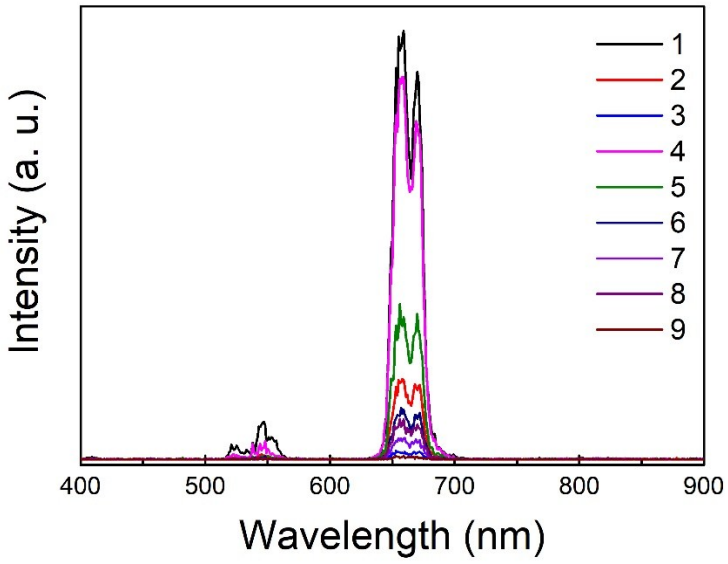

Fig. S1 The UCL luminescence spectra in the 1st generation under 980 nm.

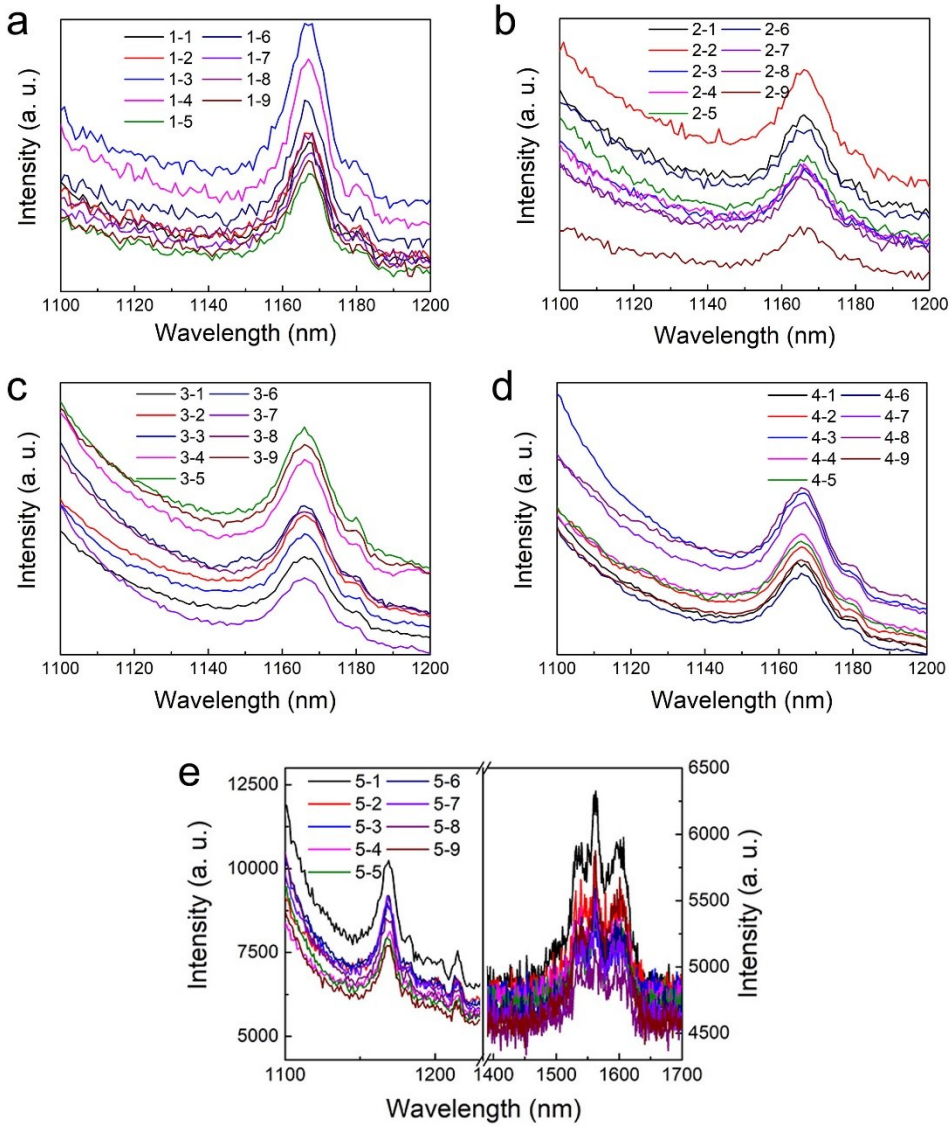

Fig. S2 SWIR luminescence spectra under 980 nm laser in (a-e) the 1st to the 5th generation.

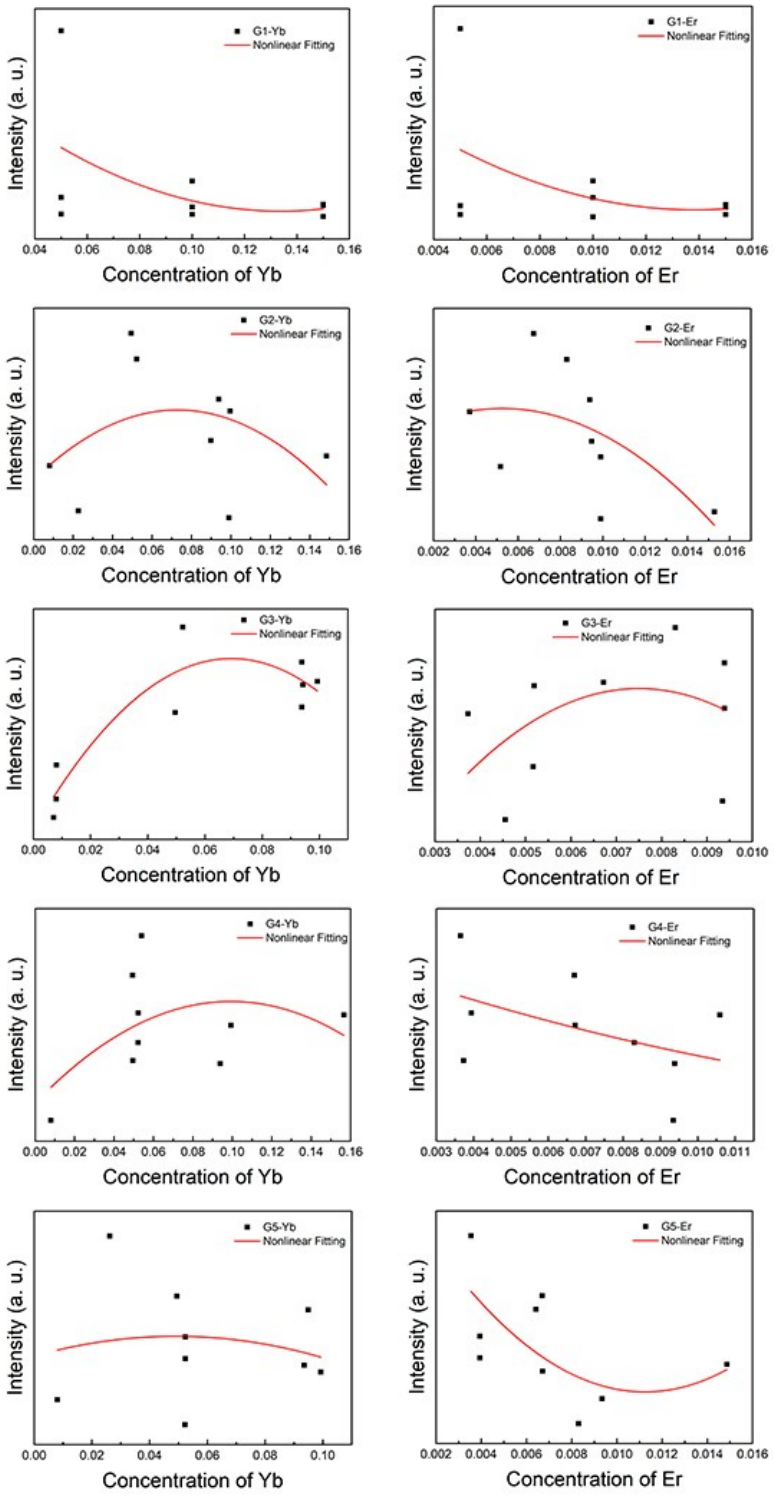

Fig. S3 Scatter plot and function fitting of the UCL intensity versus the concentration of Yb and Er in the core.

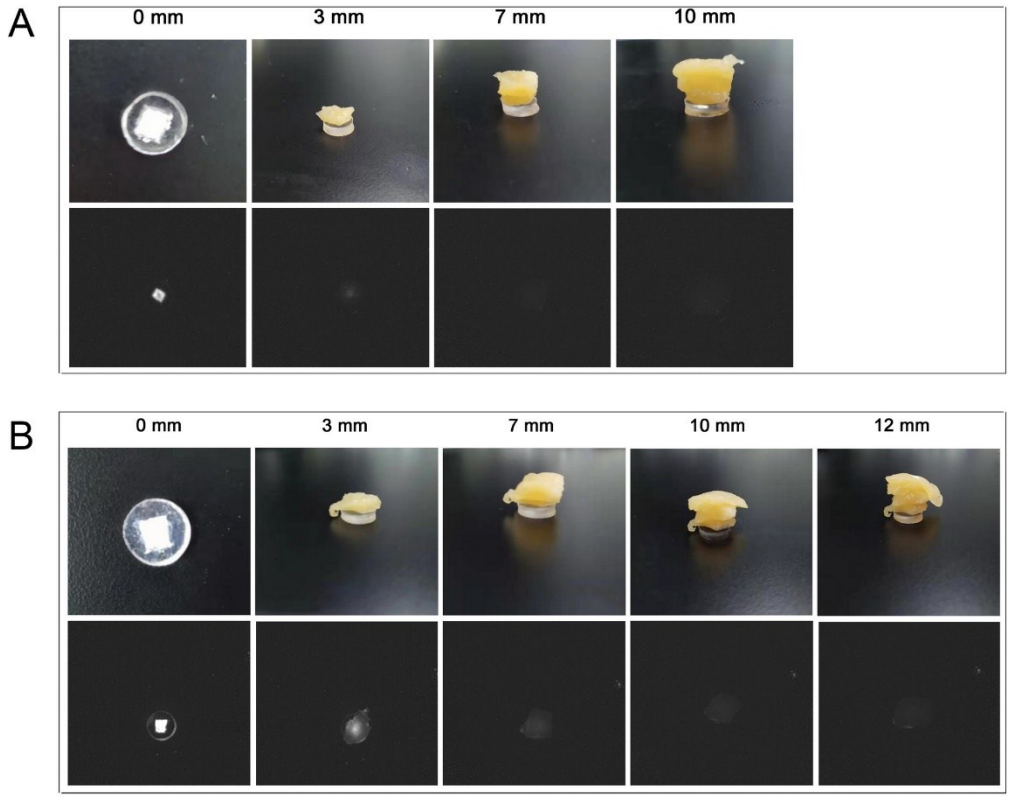

Fig. S4 The SWIR penetration depth of the Sample 5-3 under 808 nm laser irradiation (0.4 W).

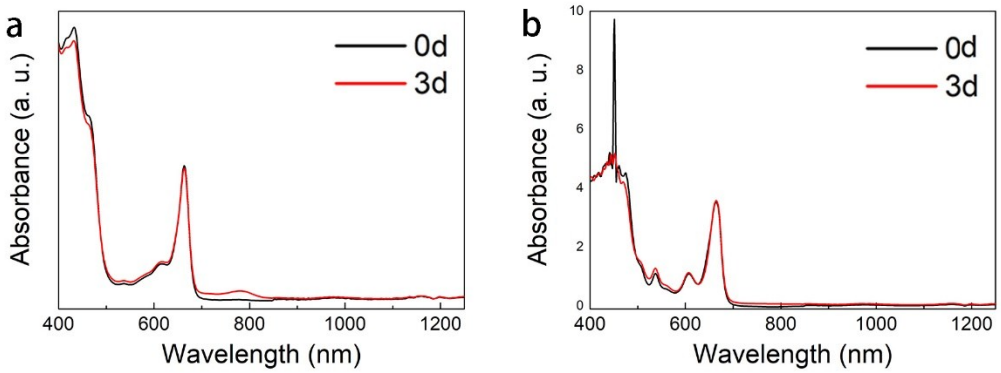

Fig. S5 UV-vis absorption spectra of chlorophyll in (a) spinach and (b) ginkgo in ethanol kept for 3 days.

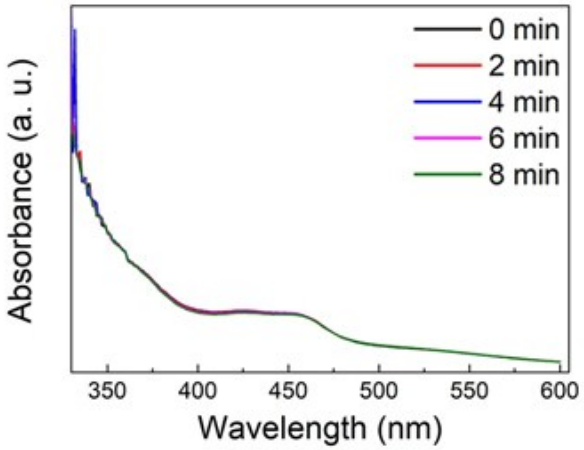

Fig. S6 UV-vis absorption spectra of DPBF solution treated with anthocyanidin.

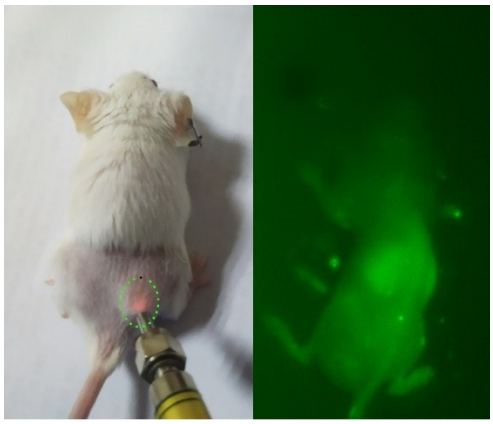

Fig. S7 *In vivo* UCL imaging and SWIR imaging of brightest phosphor.

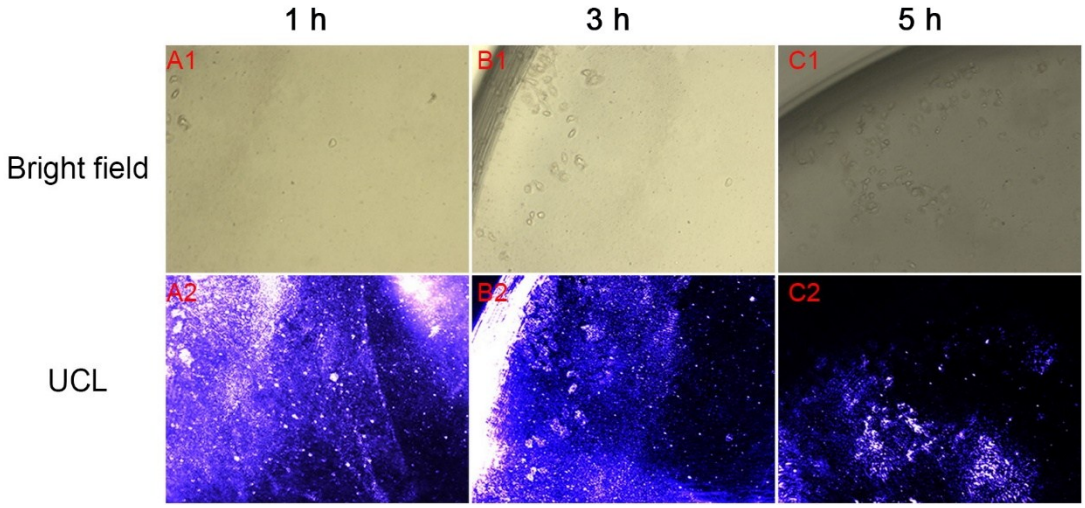

Fig. S8 Optical microscopy images of cells with Ph-chl intracellular under 980 nm laser irradiation.