

Supplementary Materials

Er³⁺ ions doped multiscale nanoprobe for fluorescence imaging in cellular and living mice

Cong Cao*, Yu Xie, Shiwen Li, Chang Hong

Institute of Smart Biomedical Materials, School of Materials Science and Engineering, Zhejiang

Sci-Tech University, Hangzhou, 310018, China

*Corresponding author: ccong@zstu.edu.cn (C. Cao)

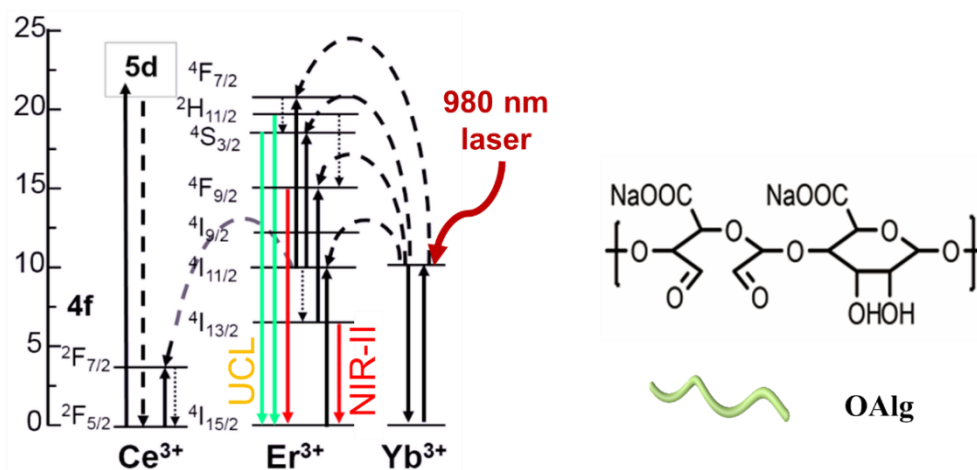


Figure S1. The energy transform of the $\text{NaYF}_4:\text{Yb},\text{Er},\text{Ce-OA}$ and the structure of OAlg molecule.

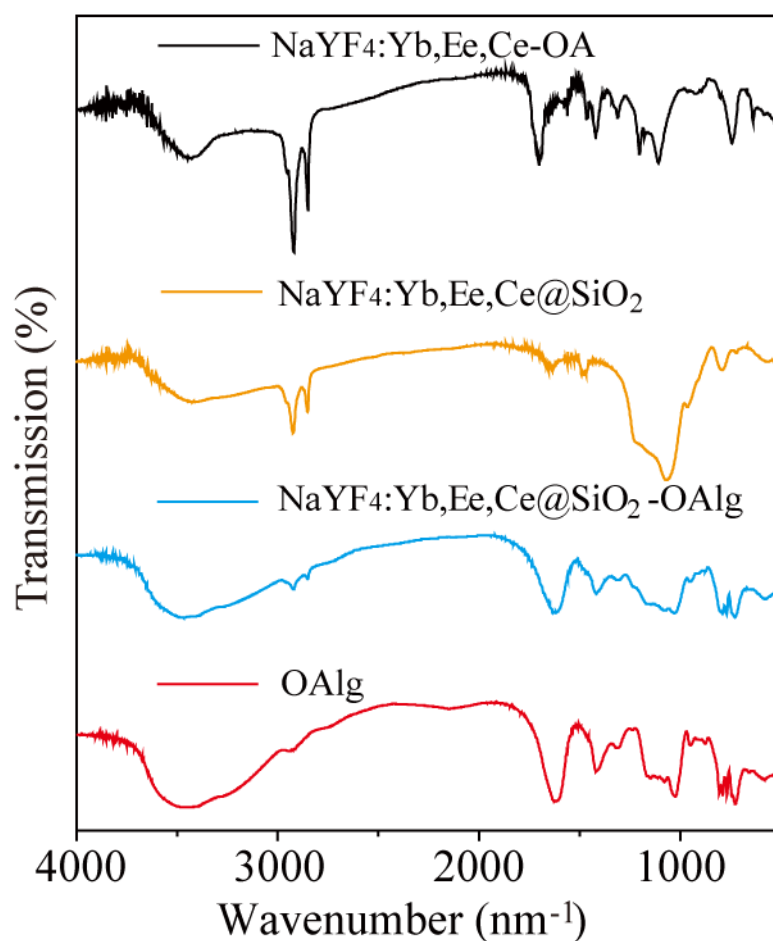


Figure S2. FTIR measurement of $\text{NaYF}_4:20\%\text{Yb},2\%\text{Er},3\%\text{Ce}$ nanoparticles capped with OA ($\text{NaYF}_4:\text{Yb},\text{Er},\text{Ce-OA}$), $\text{NaYF}_4:\text{Yb},\text{Er},\text{Ce}@SiO_2$ nanoparticles, $\text{NaYF}_4:\text{Yb},\text{Er},\text{Ce}@SiO_2\text{-OAlg}$ nanoparticles and the OAlg molecule.

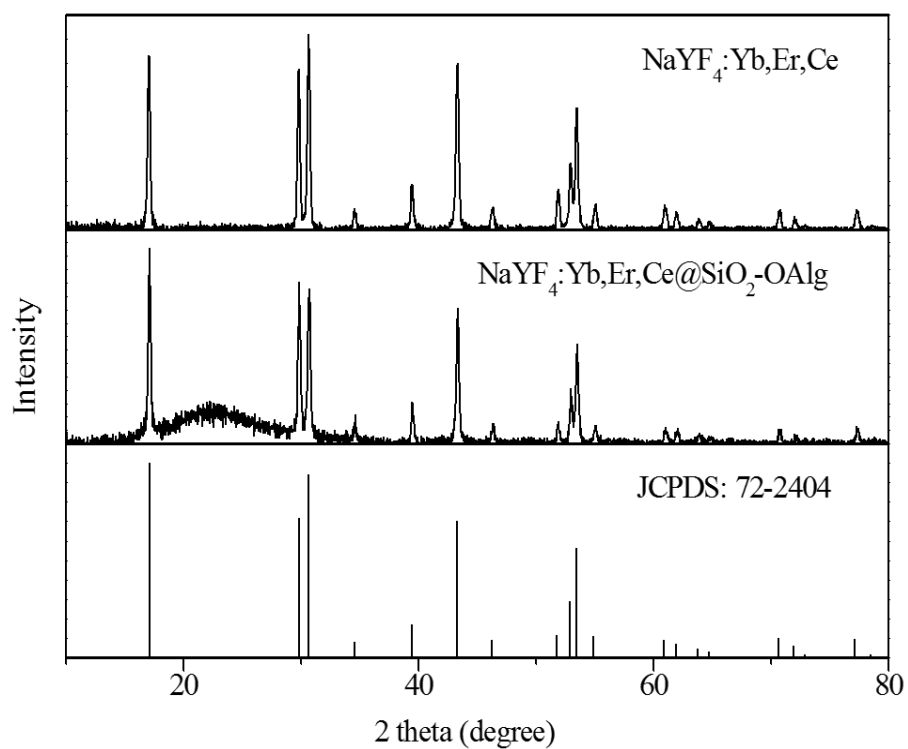


Figure S3. XRD measurement of $\text{NaYF}_4:\text{Yb,Er,Ce}$ nanoparticles and $\text{NaYF}_4:\text{Yb,Er,Ce}@ \text{SiO}_2\text{-OAlg}$ nanoparticles.

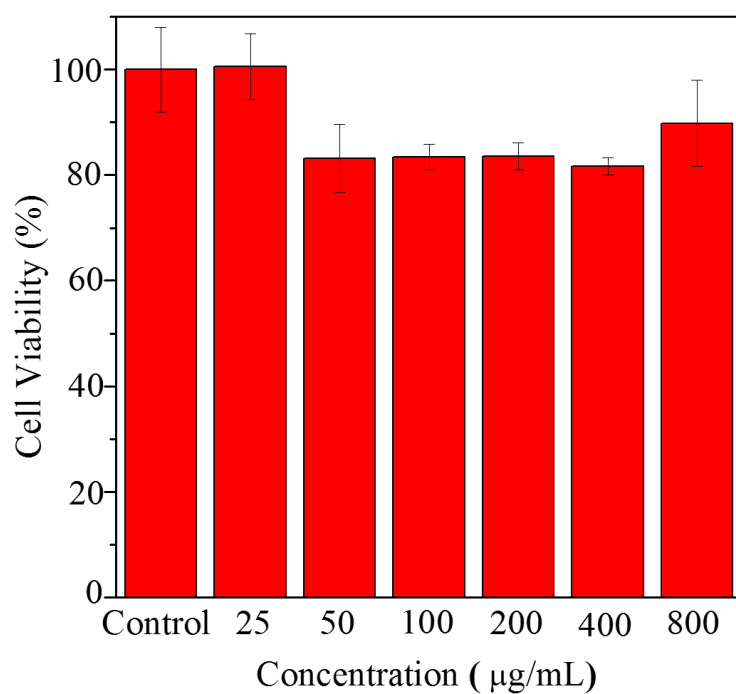


Figure S4. The cell toxicity of $\text{NaYF}_4:\text{Yb,Er,Ce}@ \text{SiO}_2\text{-OAlg}$ nanoparticles.

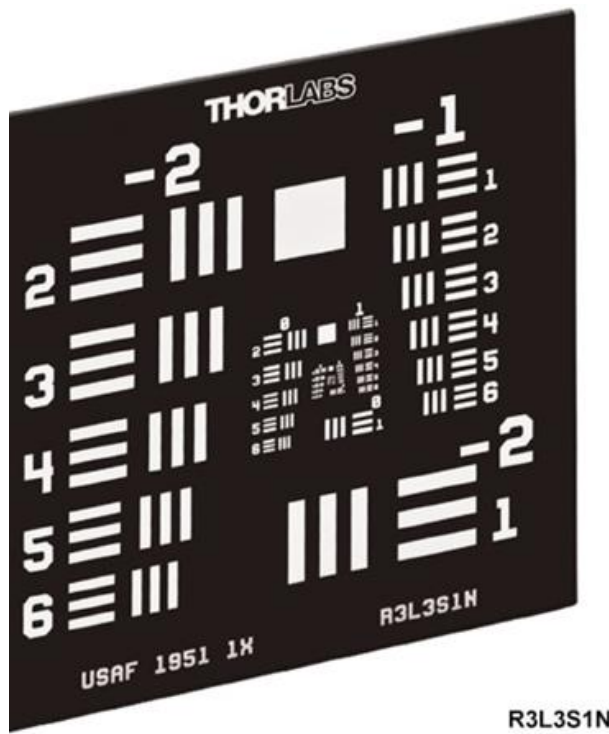


Figure S5. The photo of R3L3S1N card from Thorlabs Co.

Group	Element	Frequency	Line Width (um)	Group	Element	Frequency	Line Width (um)	Group	Element	Frequency	Line Width (um)	Group	Element	Frequency	Line Width (um)
-2	1	0.2500	2000	4	1	16.00	31.3	1	1	2.000	250	7	1	128.0	3.91
	2	0.2806	1782		2	17.96	27.8		2	2.245	223		2	143.7	3.48
	3	0.3150	1587		3	20.16	24.8		3	2.520	198		3	161.3	3.10
	4	0.3536	1414		4	22.63	22.1		4	2.828	177		4	181.0	2.76
	5	0.3969	1260		5	25.40	19.7		5	3.174	157		5	203.2	2.46
	6	0.4454	1122		6	28.51	17.5		6	3.564	140		6	228.1	2.19
-1	1	0.5000	100	5	1	32.00	15.6	2	1	4.00	125	8	1	256.0	1.95
	2	0.5612	891		2	35.92	13.9		2	4.490	111		2	287.4	1.74
	3	0.6300	794		3	40.32	12.4		3	5.040	99.2		3	322.5	1.55
	4	0.7071	707		4	45.25	11.0		4	5.657	88.4		4	362.0	1.38
	5	0.7937	630		5	50.80	9.84		5	6.350	78.7		5	406.4	1.23
	6	0.8909	561		6	57.02	8.77		6	7.127	70.2		6	456.1	1.10
0	1	1.00	500	6	1	64.00	7.81	3	1	8.000	62.5	9	1	512.0	0.977
	2	1.122	445		2	71.84	6.96		2	8.980	55.7		2	574.7	0.870
	3	1.260	397		3	80.63	6.20		3	10.08	49.6		3	645.1	0.775
	4	1.414	354		4	90.51	5.52		4	11.31	44.2		4	724.1	0.691
	5	1.587	315		5	101.6	4.92		5	12.70	39.4		5	812.7	0.615
	6	1.782	281		6	114.0	4.38		6	14.25	35.1		6	912.3	0.548

Figure S6. 1951 USAF Resolution Target Data from Thorlabs Co.