

Suppotring Information

Luminescence/Temperature-sensing properties of multifunctional rare-earth upconversion Kevlar nanofiber composite under 1550 nm

Juan Li¹, Shengang Xu^{1,3}, Yingliang Liu^{1,3*}, Shaokui Cao^{1,2*}

^aSchool of Materials Science and Engineering, Zhengzhou University, Zhengzhou 450001, People's Republic of China.

^bHuanghe Science and Technology College, Zhengzhou, Henan 450063, People's Republic of China.

^cHenan Key Laboratory of Advanced Nylon Materials and Application, Zhengzhou University, Zhengzhou 450001, People's Republic of China.

Correspondence: liuylxn@zzu.edu.cn (Y.L.); caoshaokui@zzu.edu.cn (S.C.)

Table S1 Chemical composition of Ln³⁺ in UCNPs

Y ³⁺ content (mol%)	Er ³⁺ content (mol%)	Tm ³⁺ content (mol%)
95	5	0
92.5	7.5	0
90	10	0
87.5	12.5	0
85	15	0
80	20	0
60	40	0
40	60	0
20	80	0
0	100	0
1%	99.5	0.5
0	99	1

Table S2 UCNPs/KNFs composites with different mass ratio between UCNPs and KNFs

Sample number	V _{M-KNFs} (mL) (3 mg/mL)	V ₁ (mL) (6 mg/mL)	V ₂ (mL) (6 mg/mL)	V ₃ (mL) (6 mg/mL)	Deionized water (mL)
1	10	0	0	0	5
2-1	10	0.55	0	0	4.45
2-2	10	1.25	0	0	3.75
2-3	10	2.14	0	0	2.86
2-4	0	2.14	0	0	12.86
3-1	10	0	0.55	0	4.45
3-2	10	0	1.25	0	3.75
3-3	10	0	2.14	0	2.86
3-4	0	0	2.14	0	12.86
4-1	10	0	0	0.55	4.45
4-2	10	0	0	1.25	3.75
4-3	10	0	0	2.14	2.86
4-4	0	0	0	2.14	12.86

Note: V₁, V₂ and V₃ were volume of PEG-modified NaYF₄: Er(12.5 mol%) @NaYF₄, NaErF₄ @NaYF₄ and NaErF₄: Tm(0.5 mol%) @NaYF₄ aqueous solutions, respectively.

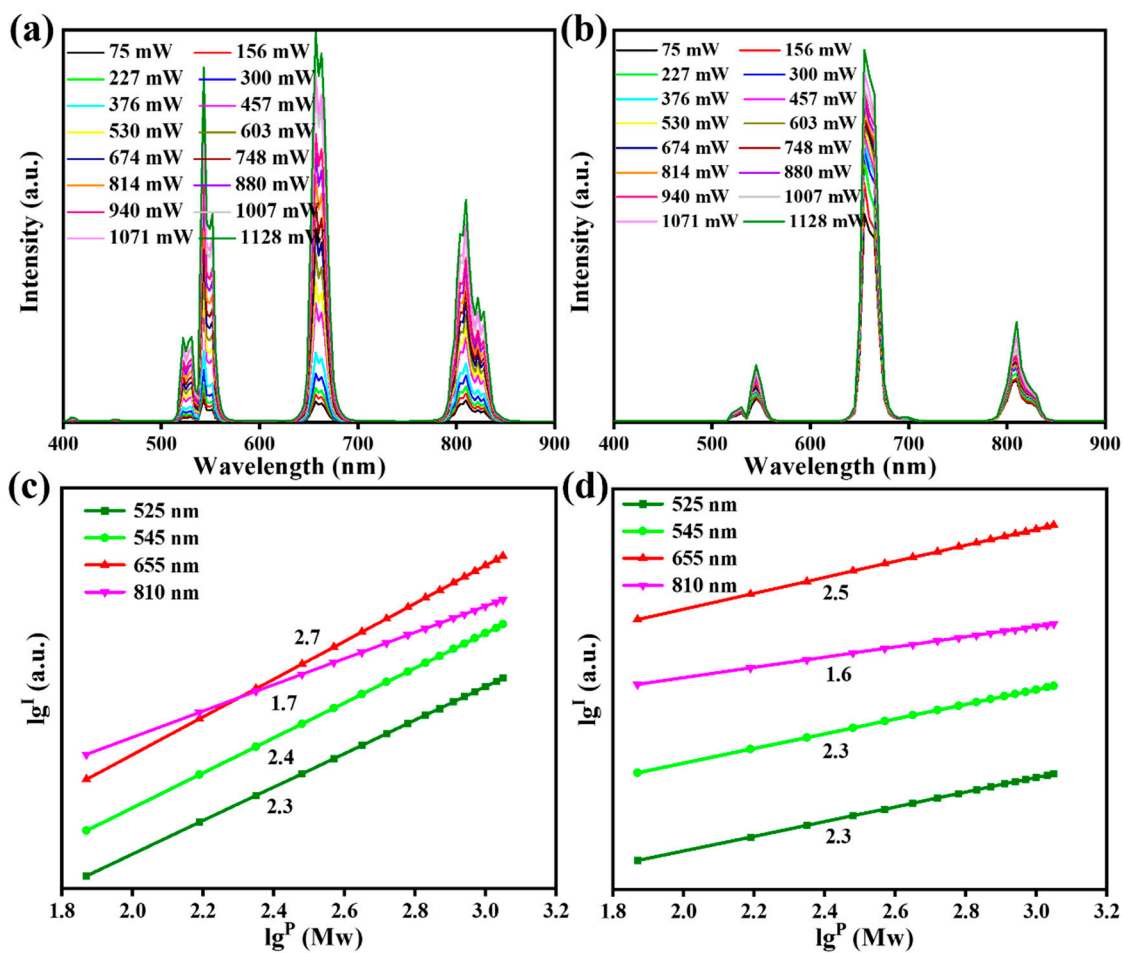


Figure. S1 Upconversion emission spectra of $\text{NaErF}_4 @ \text{NaYF}_4$ (a) and $\text{NaErF}_4: \text{Tm}(0.5 \text{ mol}\%) @ \text{NaYF}_4$ (b) under different excitation power at 1550 nm; emission intensity as a logarithmic function of excitation power for $\text{NaErF}_4 @ \text{NaYF}_4$ (c) and $\text{NaErF}_4: \text{Tm}(0.5 \text{ mol}\%) @ \text{NaYF}_4$ (d). The numbers next to the lines refers to the slope of each line.

Table S3 Mechanical tensile parameters of pure KNFs, pure M-KNFs, and UCNPs/KNFs composite films.

Sample	Tensile strength (MPa)	Strain at fracture (%)	Young's modulus (GPa)
Pure KNFs	192.37	3.01	6.39
Pure M-KNFs	161.23	2.78	5.80
UCNPs (10%)/KNFs	122.70	2.20	5.58
UCNPs (20%)/KNFs	96.60	2.04	4.73
UCNPs (30%)/KNFs	62.82	1.36	4.62

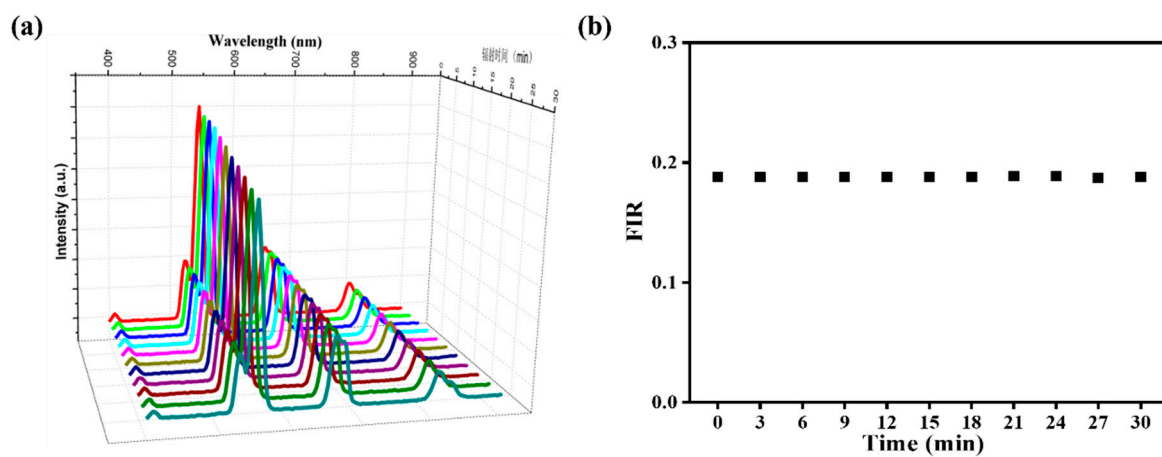


Figure. S2 The upconversion spectra of UCNPs/Kevlar films upon 1550 nm (2.5 W/cm^2) at different time (a); The dependence of FIR on irradiation time (b)