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Supporting Information

Multifunctional $CaSc_2O_4$:Yb^{3+}/Er^{3+} one-dimensional nanofibers: Electrospinning synthesis and concentration-modulated upconversion luminescent properties

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Preparation of bulk $CaSc_2O_4:Yb^{3+},Er^{3+}$ phosphor

Bulk $CaSc_2O_4$:5mol%Yb^{3+},3mol%Er^{3+} phosphor was prepared via solid state reaction. Typically, raw materials including $CaCO_3$ (AR), Sc_2O_3 (99.99%), Yb_2O_3 (99.99%) and Er_2O_3 (99.99%) were ground homogeneously by an agate mortar for 1h. Then the mixture was calcined at 1500 ℃ for 4h. After cooling to room temperature naturally, the product was reground for the further study.

Preparation of hexagonal $NaYF_4:Yb^{3+},Er^{3+}$ nanoparticles

Hexagonal $NaYF_4$:20mol%Yb^{3+},2mol%Er^{3+} nanoparticles were prepared reported in the literature. Typically, the solution of oleic acid (6 mL) and octadecene (15 mL) containing YCl_3 , $YbCl_3$ and $ErCl_3$ was heated at 110 ℃ under vacuum for 1h. After being cooled down to room temperature, 10 ml of methanol solution containing NaOH (0.1 g) and NH_4F (0.148 g) was slowly added into the solution with magnetic stirring. Keeping stirring continuously, the solution was heated at 70 ℃ for 30 min to remove methanol, and then heated at 320 ℃ for 1 h under nitrogen. After the solution was cooled down naturally, the product was collected via centrifugation and washed with ethanol and washed with cyclohexane for three times. Finally, $NaYF_4:Yb^{3+},Er^{3+}$ nanoparticles were dried at 80 ℃ for 10 h.

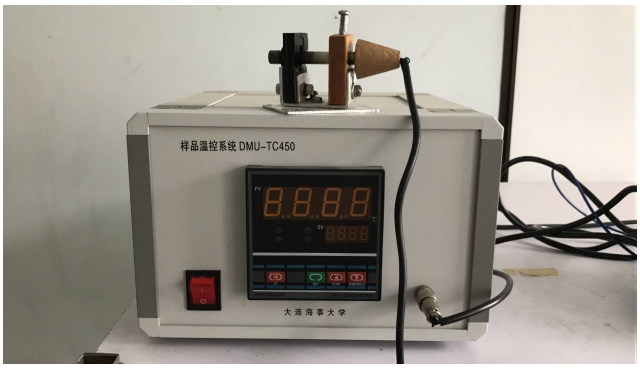

Fig. S1. Picture of the self-made temperature controller.

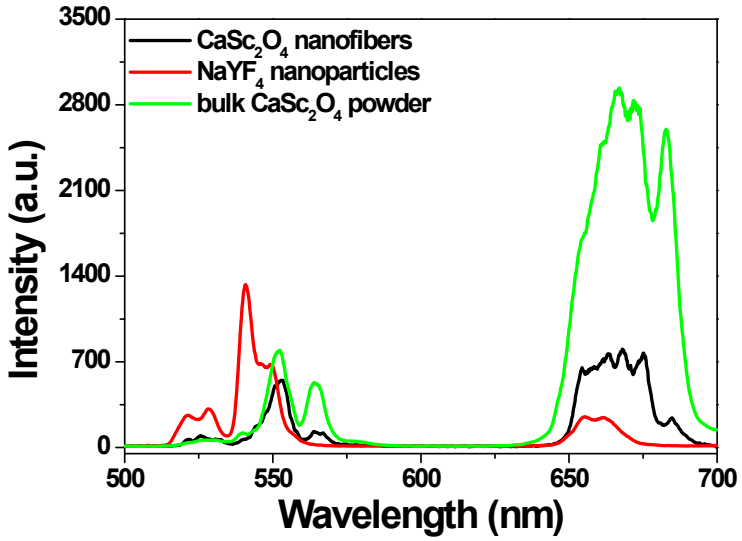

Fig. S2. Upconversion emission spectra of the $CaSc_2O_4$ nanofibers, $NaYF_4$ nanoparticles and bulk $CaSc_2O_4$ phosphor upon excitation of 980 nm at 560 mW/cm^2.

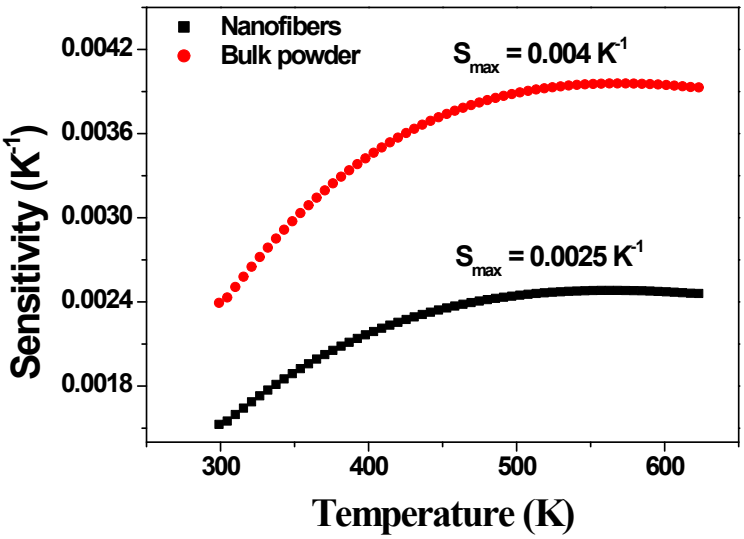

Fig. S3. Sensitivity as a function of temperature for the $CaSc_2O_4$ nanofibers and bulk $CaSc_2O_4$ phosphor.

Reference

1. J. Li, J. H. Zhang, Z. D. Hao, X. Zhang, J. H. Zhao and Y. S. Luo, *J. Appl. Phys*., 2013, **113**,

223507.

2. W. Yu, W. Xu, H. W. Song and S. Zhang, *Dalton Trans*., 2014, **43**, 6139-6147.