Supporting Information

Electrospinning preparation and high near-infrared temperature sensing performance of one-dimensional $Y_2Ti_2O_7:Cr^{3+}/Yb^{3+}$ nano wire-embedded-tube structures with low Cr^{3+} concentrations

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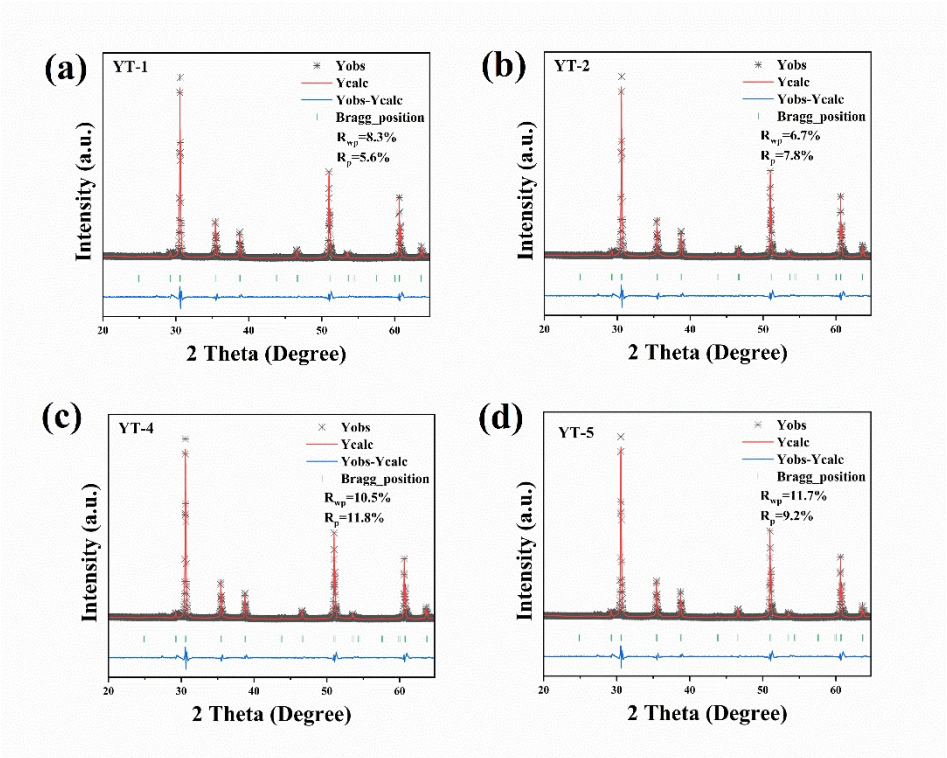

Fig. S1. Rietveld refinement of YT-1, YT-2, YT-4 and YT-5.

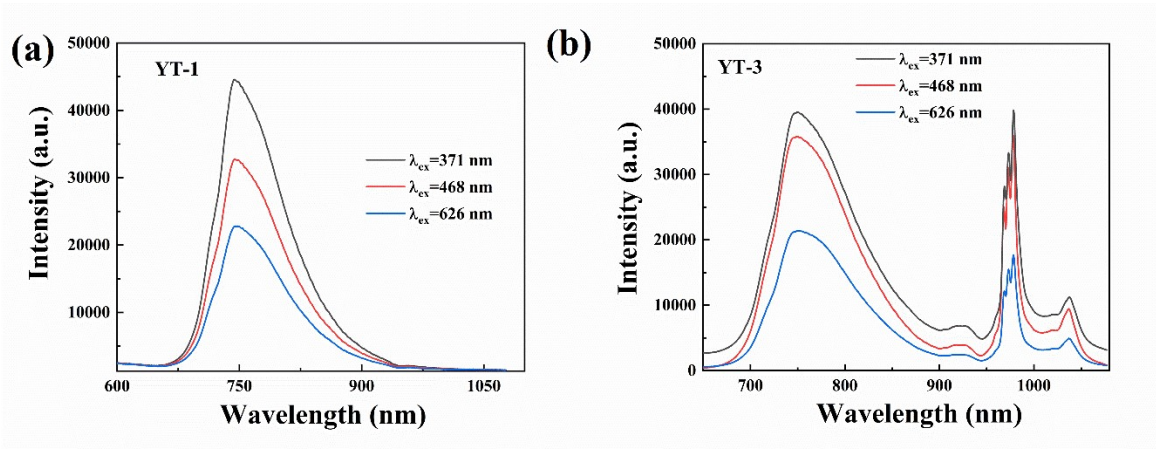

Fig. S2. The emission spectra of YT-1 and YT-3 under 371 nm, 468 nm and 626 nm excitation.

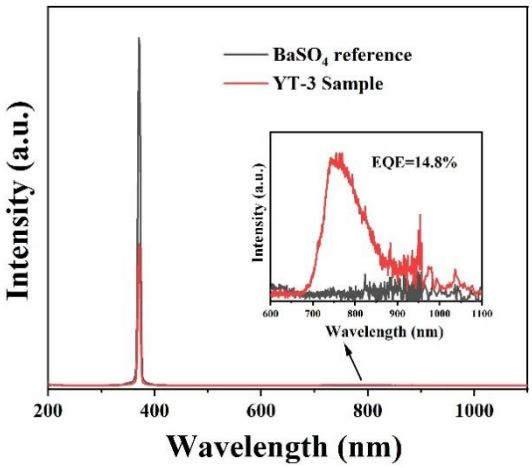

Fig. S3. The EQE (600-1100 nm) of YT-3 sample under 371 nm excitation.

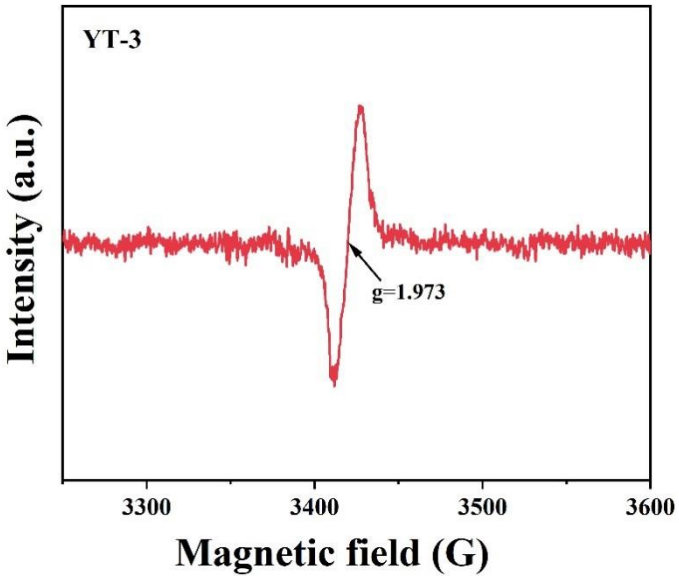

Fig. S4. EPR spectrum of YT-3 (oxygen vacancies are measured directly at room temperature).

Table S1. Rietveld refinement results of the YT-1, YT-2, YT-3, YT-4 and YT-5 samples.

Formula	**YT-1**	**YT-2**	**YT-3**	**YT-4**	**YT-5**
Radiation type	Cu Kα radiation with λ = 1.5406 Å	Cu Kα radiation with λ = 1.5406 Å	Cu Kα radiation with λ = 1.5406 Å	Cu Kα radiation with λ = 1.5406 Å	Cu Kα radiation with λ = 1.5406 Å
2θ range	20-65°	20-65°	20-65°	20-65°	20-65°
Symmetry	Cubic	Cubic	Cubic	Cubic	Cubic
Space group	Fd-3 m (227)	Fd-3 m (227)	Fd-3 m (227)	Fd-3 m (227)	Fd-3 m (227)
Cell parameters	a= 10.0998 (2) b=10.0998 (2) c=10.0998 (2) α = β = γ = 90°	a= 10.1221 (2) b=10.1221 (2) c=10.1221 (2) α = β = γ = 90°	a= 10.1224 (2) b=10.1224 (2) c=10.1224 (2) α = β = γ = 90°	a= 10.1228 (2) b=10.1228 (2) c=10.1228 (2) α = β = γ = 90°	a= 10.1231 (2) b=10.1231 (2) c=10.1231 (2) α = β = γ = 90°
Reliability factors	R_{wp} = 8.5% R_p = 5.6%	R_{wp} = 6.7% R_p = 7.8%	R_{wp} = 3.65% R_p = 2.2%	R_{wp} = 10.5% R_p = 11.8%	R_{wp} = 11.7% R_p = 9.2%

Table S2. Spectroscopic parameters of Cr^{3+} ions in various crystals. Dq is the crystal field splitting, B and C are the Racah parameters. E(^2E_g) is energy of the Cr^{3+} ^2E_g level.

Host material	Dq/B	B/cm^{-1}	C/cm^{-1}	C/B	E(^2E_g) energy/ cm^{-1}	Ref.
Cs_2NaAlF_6	2.37	695	3180	4.58	15270	S1
K_2LiAlF_6	2.29	702	3358	4.78	15221	S2
K_2NaScF_6	1.97	794	3231	4.07	15390	S3
$KMgF_3$	1.91	760	3426	4.51	15734	S4
$KZnF_3$	1.81	713	3211	4.50	15113	S5
MgF_2	2.90	516	3797	7.36	15267	S6
Al_2O_3	2.60	640	3300	5.16	14663	S7
$CaYAlO_4$	2.54	705	2750	3.9	13475	S8
$CdWO_4$	1.82	777	3428	4.41	15823	S9
Ga_2O_3	3.15	529	3413	6.45	14286	S10
α-Ga_2O_3	2.97	552	3382	6.13	14343	71
β-Ga_2O_3	2.58	641	3187	4.97	14343	71
$LaMgAl_{11}O_{19}$	2.90	603	3882	6.44	14451	S11
$LiIn(WO_4)_2$	2.56	534	3294	6.17	13890	S12
$MgAl_2O_4$	3.35	553	3416	6.18	14492	S13
$Y_2Ti_2O_7$	2.59	604	3012	4.97	15625	This work

Reference

S1. J. L. Huang, X. Y. Kuang and Y. Li, Chem. Phys. Lett., 2008, **458**, 227.

S2. A. M. Reisz, M. G. Brik, C. N. Avram, and N. M. Avram, Physica B, 2010, **405**, 1244.

S3. J. F. Dolan, A. G. Rinzler, L. A. Kappers and R. H. Bartram, J. Phys. Chem. Solids, 1992, **905**, 905-912.

S4. M. G. Brik, N. M. Avram and I. Tanaka, Phys. Stat. Sol. B, 2004, **241**, 2982.

S5. P. T. C. Freire, O. Pilla and V. Lemos, Phys. Rev. B, 1994, **49**, 9232.

S6. R. Nistora, L. Andreici and N. M. Avram, Acta Physica Polon. A, 2009, **116**, 538.

S7. G. J. Wang, X. F. Long, L. Z. Zhang, G. F. Wang, S. Polosan and T. Tsuboi, J.Lumin., 2008, **128**, 1556.

S8. M. Yamaga, P. I. Macfarlane, K. Holliday, B. Henderson, N. Kodama and Y. Inoue, J. Phys.: Condens. Matter, 1996, **8**, 3487.

S9. G. J. Wang, L. Z. Zhang, Z. B. Lin and G. F. Wang, J. Alloys Compds., 2010, **489**, 293.

S10. Y. H. Wang, K. Xu, D. R. Li, H. Zhao and Z. F. Hu, Opt. Mater., 2014, **36**, 1798.

S11. V. Singh, G. Sivaramaiah, J. L. Rao and S. H. Kim, Mater. Res. Bull., 2014, **60**, 397.

S12. K. Hermanowicz, J. Phys.: Condens. Matter, 2006, **18**, 10601.

S13. A. R. Molla, C. R. Kesavulu, R. P. S. Chakradhar, A. Tarafder, S. K. Mohanty, J. L. Rao, B. Karmakar and S. K. Biswas, J. Alloys Compds., 2014, **583**, 498.