Electronic Supplementary Information (ESI) available

Enhanced up-conversion and temperature-sensing behaviour of $Er^{3+}$and Yb^{3+} co-doped $Y_2Ti_2O_7$by incorporation of Li^+ ions

B. P. Singh,[a] A. K. Parchur,[*b,c] R. S. Ningthoujam,[d] P. V. Ramakrishna,[e] S. Singh,[f] P. Singh,[a] S. B. Rai[b] and R. Maalej[g]

[a]Department of Physics, Indian Institute of Technology (BHU), Varanasi, India-221005

[b]Department of Physics, Banaras Hindu University, Varanasi, India-221005

[c]Department of Biological Engineering, Utah State University, Logan, Utah, USA-84322.

[d]Chemistry Division Bhabha Atomic Research Centre, Mumbai, India-400085

[e]Department of Physics, Andhra University, Visakhapatanam, India-530003

[f]Department of Pure and Applied Physics, Guru Ghasidas University, Bilaspur, India-495009

[g]Department of Physics, Sfax University, Sfax, Tunisa-3018

**E-mail: kareemskpa@hotmail.com and ak.parchur@usu.edu*

Table S1. Atomic Coordinates, Isotropic Thermal Parameters, and Occupancy Obtained from Rietveld Refinement

Samples $Y_2Ti_2O_7$:Er^{3+}/Yb^{3+}	Atom	Site	x	y	z	U (Å^2)	Occupancy
0 Li^+	Y	16d	0.5	0.5	0.5	0.011	1.97
	Er	16d	0.5	0.5	0.5	0.011	0.01
	Yb	16d	0.5	0.5	0.5	0.011	0.02
	Ti	16c	0	0	0	0.009	2.00
	O1	48f	0.324(5)	0.125	0.125	0.002	6.00
	O2	8b	0.375	0.375	0.375	0.005	0.970
a = 10.095(1) Å, V = 1028.64(3) Å^3, R_{wp} = 13.4, R_p = 15.7, χ^2 = 4.2							

[a]

Table S2. Selected Bond Distances obtained from Rietveld Refinement

Samples $Y_2Ti_2O_7$:Er^{3+}/Yb^{3+}	Bond Type	CN	Bond Length(Å)
0 Li^+	Y(16d)-O1(48f)	6	2.512(2)
	Y(16d)-O2(8b)	2	2.185(3)

	Ti(16c)-O1(48f)	6		1.937(6)		

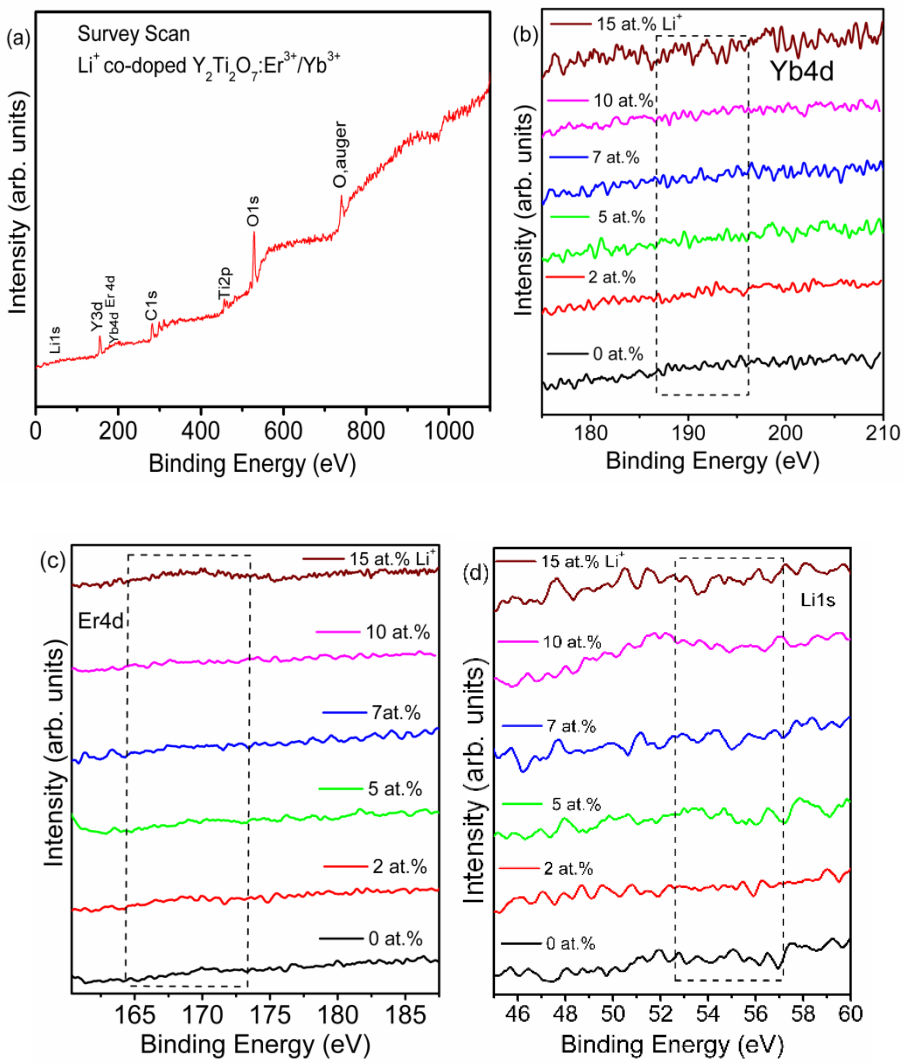

Fig.S1 (a) Survey Scan of 2 at.% Li^+ co-doped $Y_2Ti_2O_7:Er^{3+}/Yb^{3+}$ (b) XPS spectra of Yb(4d), (c) XPS spectra of Er(4d) and (d) XPS spectra of Li1s.

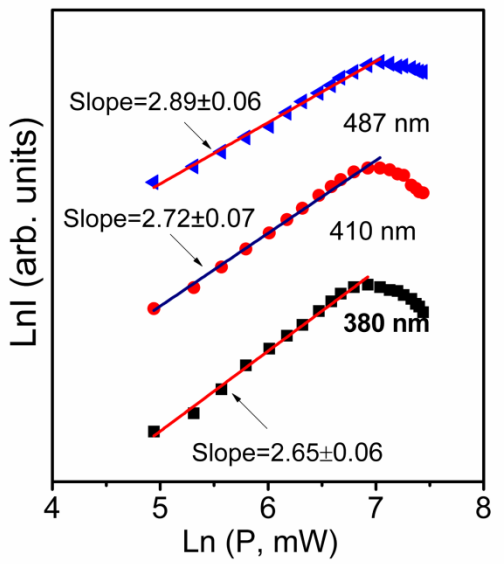

Fig. S2 Power dependence of UV and blue bands (380, 410 and 487 nm).

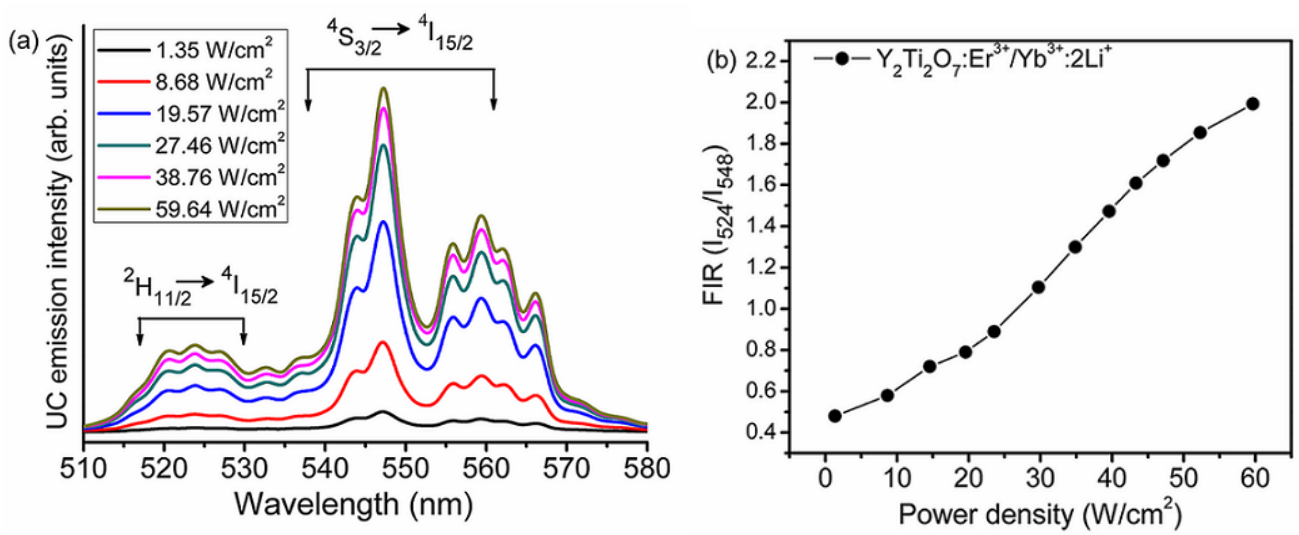

Fig. S3 show (a) Variation in the Up-conversion intensity at different pump power densities (b) Variation in FIR at different pump power densities at room temperature.