Ultra-high sensitivity of multicolor Sm^{3+}-doped $LiSrVO_4$ phosphors for contactless optical thermometer

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Table S1. CIE coordinates and CCT values of the $LiSrVO_4$:$x$$Sm^{3+}$ phosphors as a function of Sm^{3+} ion concentration.

Compounds	CIE coordinates		CCT
	x	*y*	
$LiSrVO_4$	0.374	0.470	4578 K
$LiSrVO_4$:0.005Sm^{3+}	0.437	0.446	3303 K
$LiSrVO_4$:0.01Sm^{3+}	0.449	0.447	3124 K
$LiSrVO_4$:0.03Sm^{3+}	0.464	0.434	2818 K
$LiSrVO_4$:0.05Sm^{3+}	0.469	0.428	2706 K
$LiSrVO_4$:0.07Sm^{3+}	0.469	0.422	2661 K

Table S2. CIE coordinates of the $LiSrVO_4:0.01Sm^{3+}$ phosphors as a function of temperature.

Compounds	Temperature	CIE coordinates	
		x	*y*
$LiSrVO_4:0.01Sm^{3+}$	303 K	0.449	0.447
$LiSrVO_4:0.01Sm^{3+}$	313 K	0.462	0.430
$LiSrVO_4:0.01Sm^{3+}$	323 K	0.476	0.423
$LiSrVO_4:0.01Sm^{3+}$	333 K	0.490	0.414
$LiSrVO_4:0.01Sm^{3+}$	343 K	0.504	0.408
$LiSrVO_4:0.01Sm^{3+}$	353 K	0.517	0.402
$LiSrVO_4:0.01Sm^{3+}$	363 K	0.529	0.398
$LiSrVO_4:0.01Sm^{3+}$	373 K	0.539	0.394
$LiSrVO_4:0.01Sm^{3+}$	383 K	0.548	0.392

Table S3. Maximum S_a and S_r values of the $LiSrVO_4:0.005Sm^{3+}$, $LiSrVO_4:0.01Sm^{3+}$ and $LiSrVO_4:0.05Sm^{3+}$ phosphors.

Compounds	S_a	S_r
$LiSrVO_4:0.005Sm^{3+}$	0.071 K^{-1}	2.253% K^{-1}
$LiSrVO_4:0.01Sm^{3+}$	1.076 K^{-1}	6.167% K^{-1}
$LiSrVO_4:0.05Sm^{3+}$	0.048 K^{-1}	1.394% K^{-1}

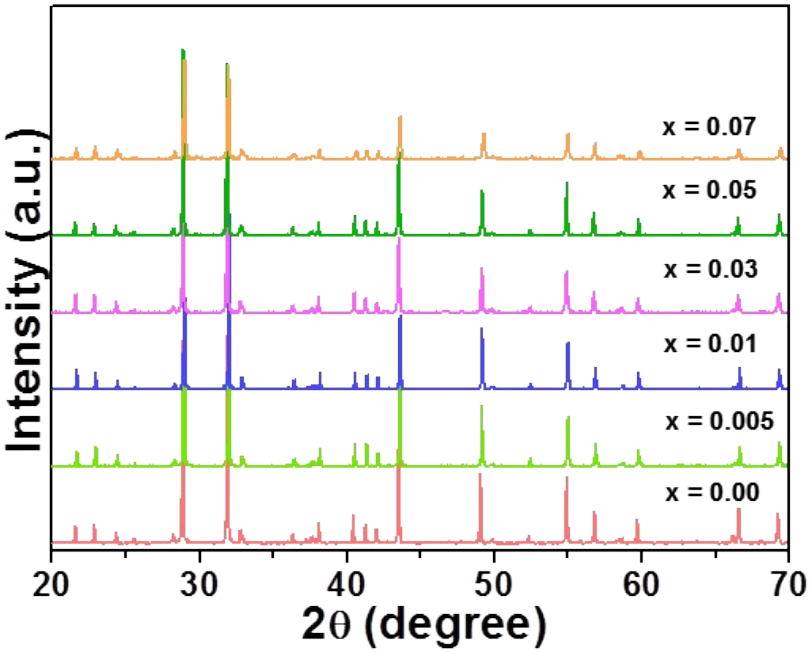

Figure S1 XRD patterns of the $LiSrVO_4$:$x$$Sm^{3+}$ phosphors as a function of Sm^{3+} ion content.

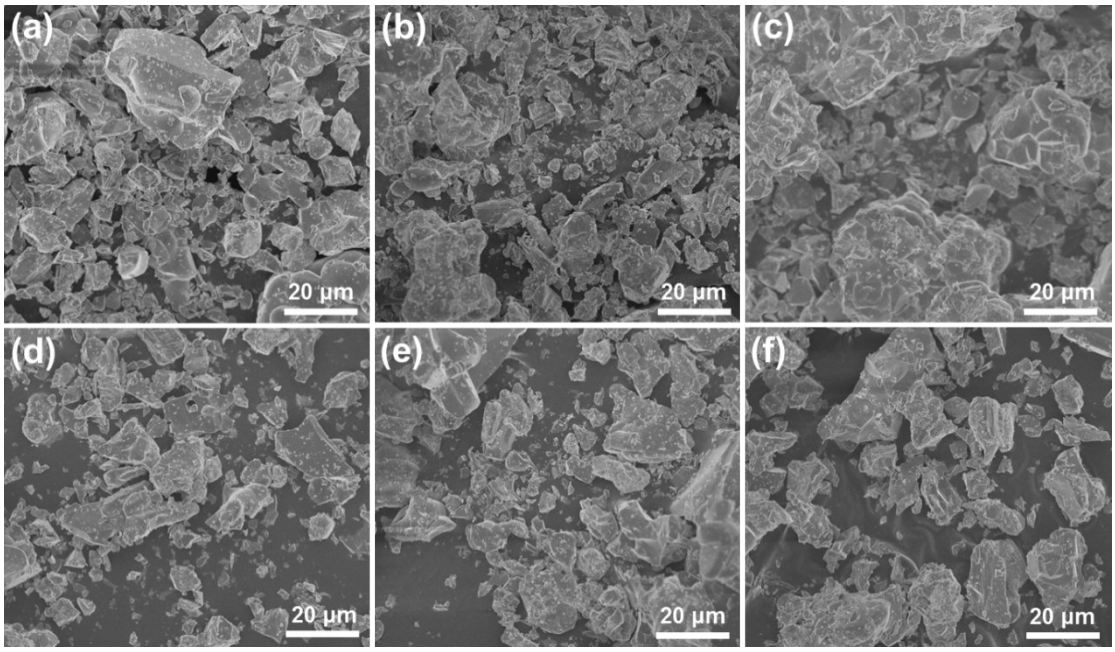

Figure S2. FE-SEM images of $LiSrVO_4$:$x$$Sm^{3+}$ (a) x = 0.00, (b) x = 0.005, (c) x = 0.01, (d) x = 0.03, (e) x = 0.05 and (f) x = 0.07phosphors.

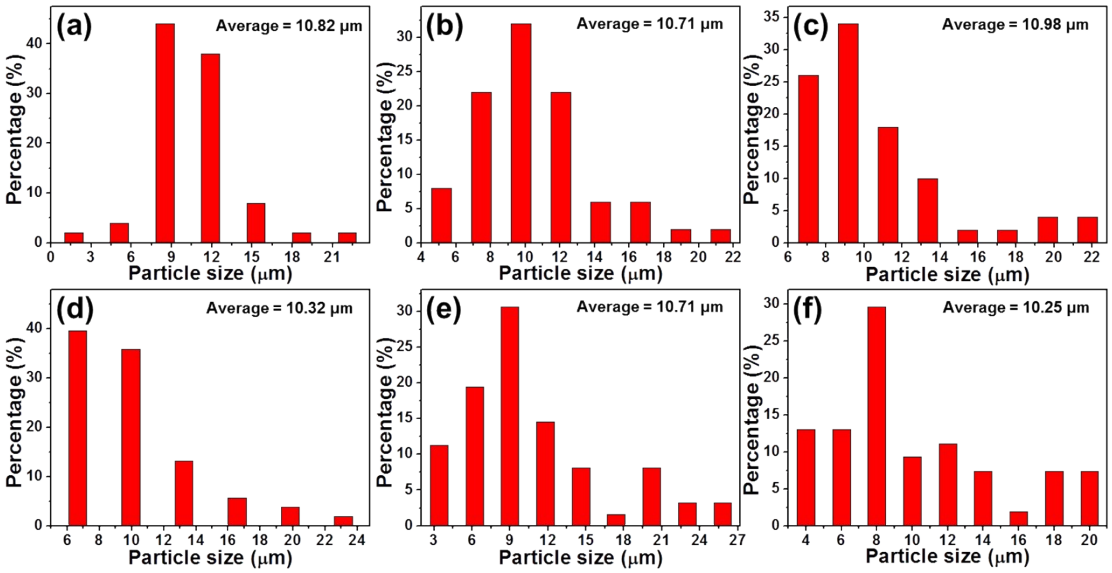

Figure S3. Particle size distribution $LiSrVO_4$:$x$$Sm^{3+}$ (a) x = 0.00, (b) x = 0.005, (c) x = 0.01, (d) x = 0.03, (e) x = 0.05 and (f) x = 0.07phosphors.

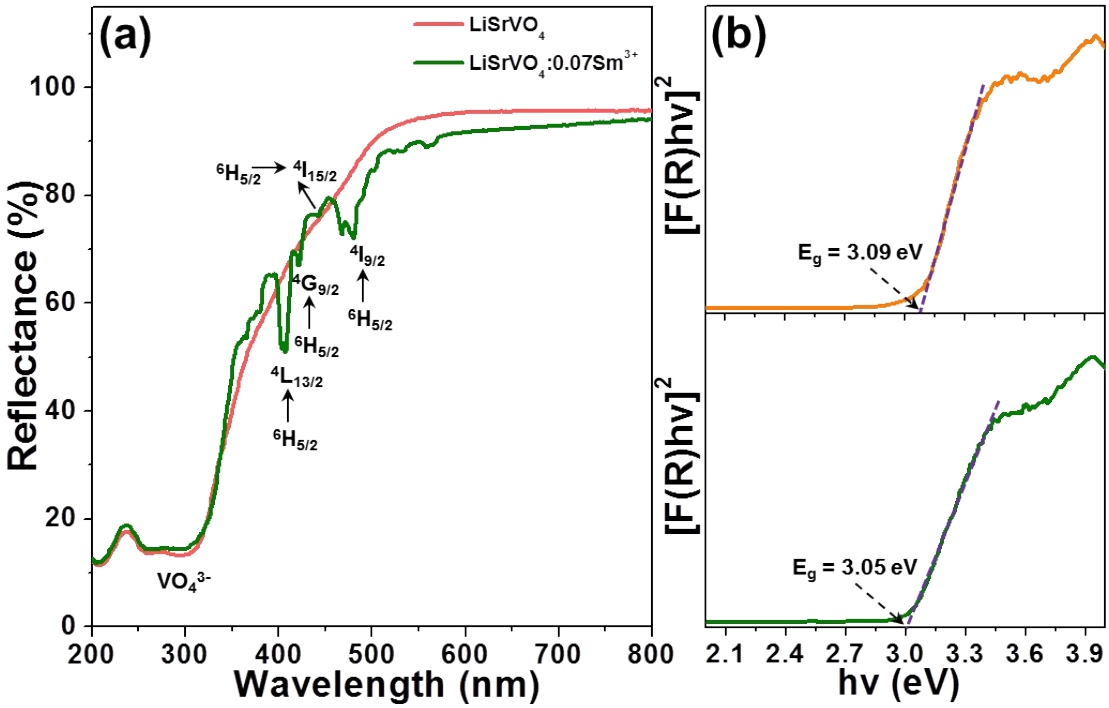

Figure S4. (a) UV-Vis DRS spectra of the $LiSrVO_4$ and $LiSrVO_4$:0.01Sm^{3+} phosphors. The determination of the optical band gap of (b) $LiSrVO_4$ and (c) $LiSrVO_4$:0.01Sm^{3+} phosphors.

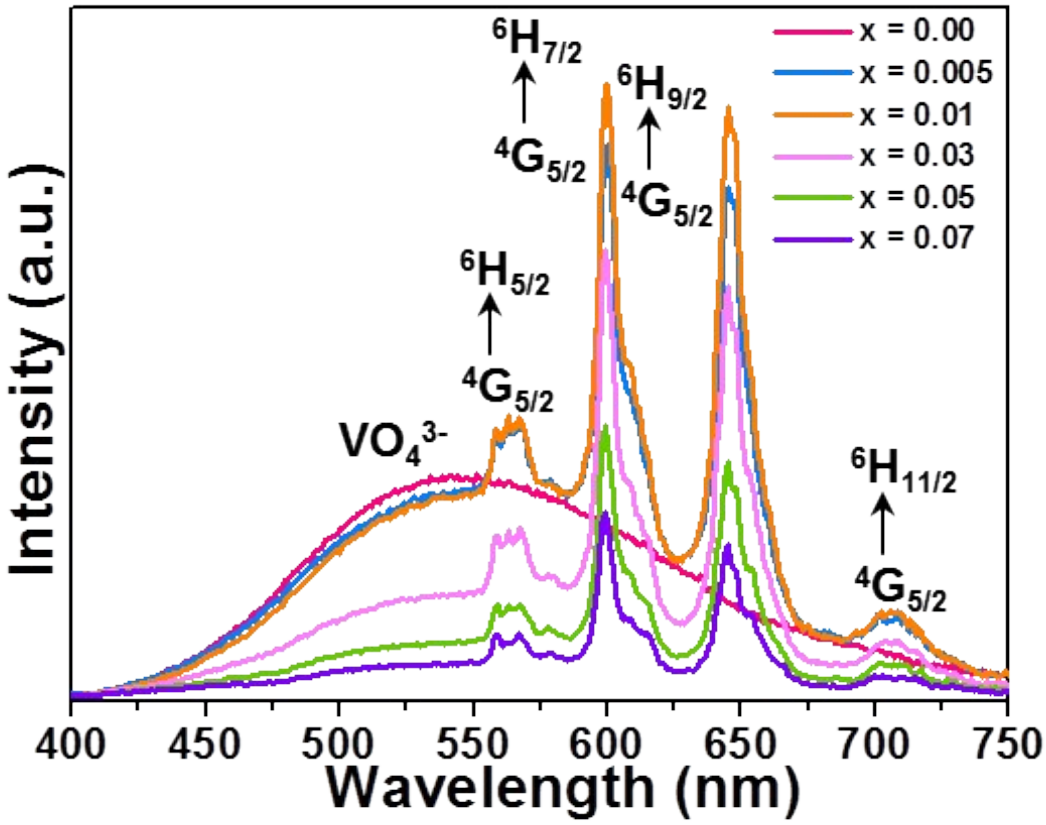

Figure S5. Emission spectra of the $LiSrVO_4$:*x*Sm^{3+} phosphors with different doping concentrations excited at 343 nm.

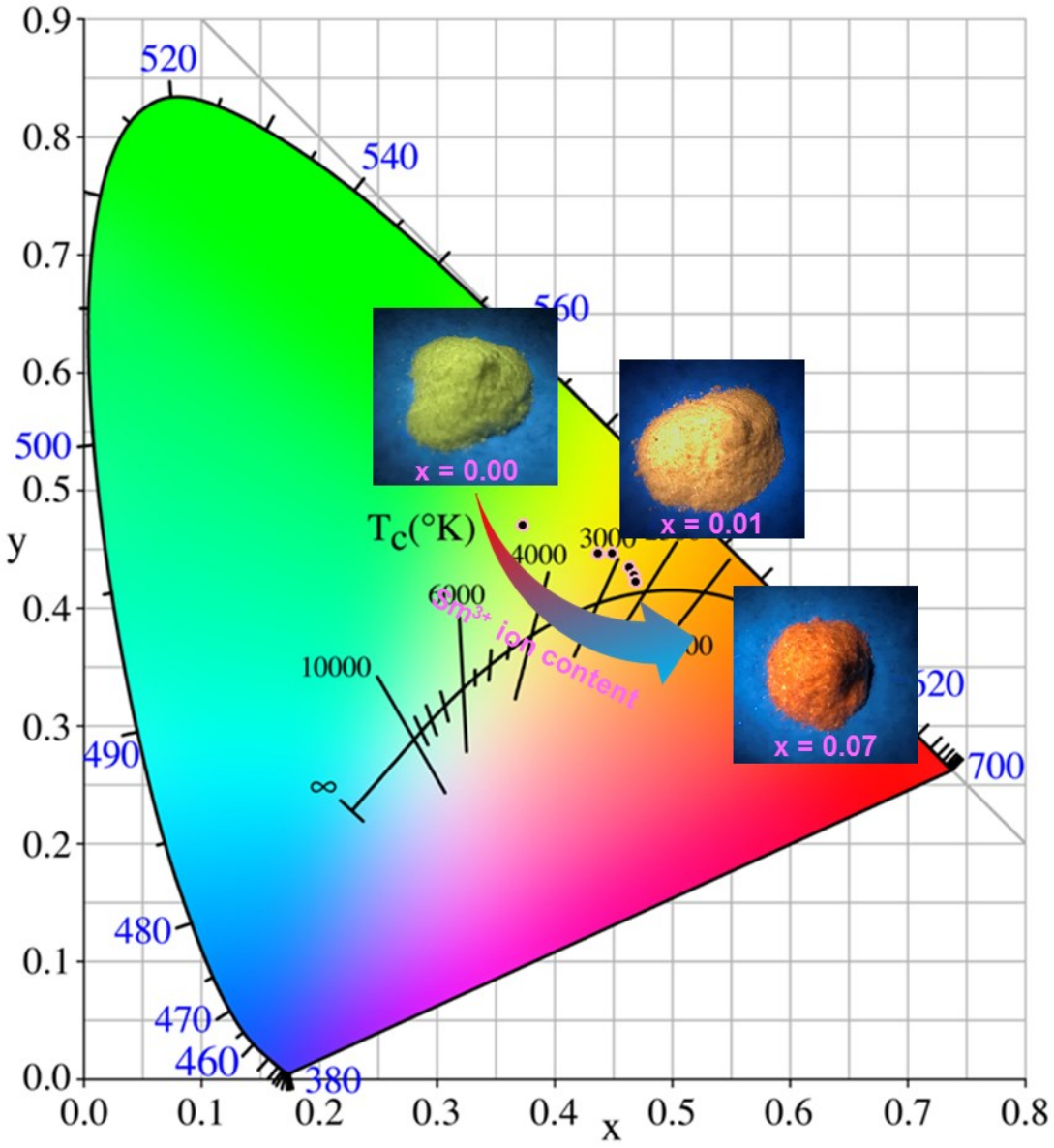

Figure S6. CIE chromaticity diagram of the $LiSrVO_4$:$x$$Sm^{3+}$ phosphors. Inset shows the optical images of the resultant phosphors upon 365 nm lamp irradiation.

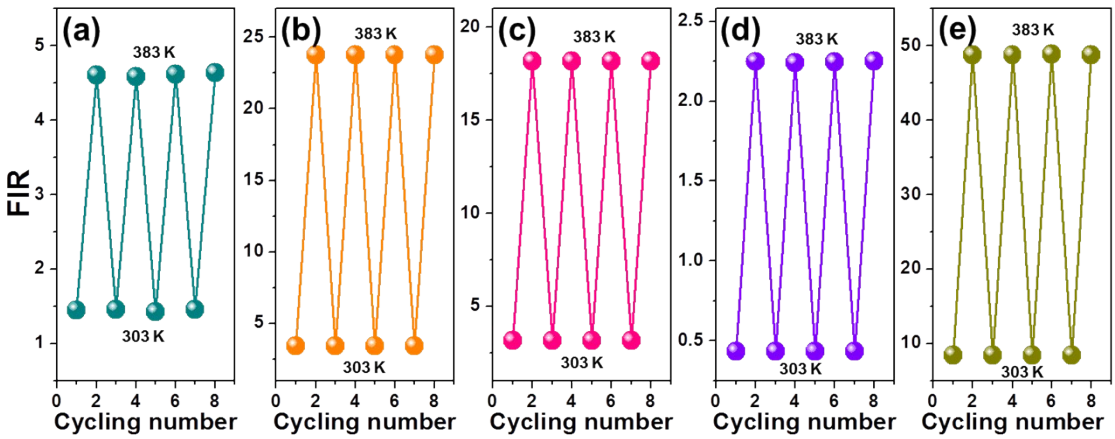

Figure S7. Temperature-induced switching of FIR values of (a) $^6H_{5/2}/VO_4^{3-}$, (b) $^6H_{7/2}/VO_4^{3-}$, (c) $^6H_{9/2}/VO_4^{3-}$, (d) $^6H_{11/2}/VO_4^{3-}$ and (e) total integrated $^6H_{11/2}/VO_4^{3-}$ of $LiSrVO_4$:0.01Sm^{3+} phosphors in the range of 303-383 K.

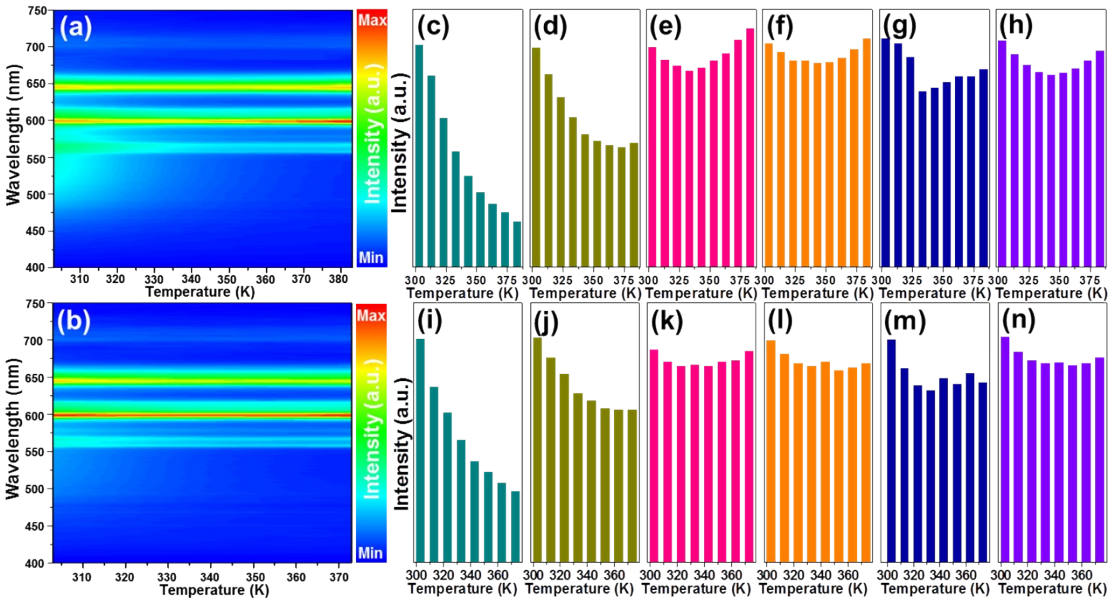

Figure S8. Contour mapping of thermal evolution emission spectra of (a) the $LiSrVO_4$:0.005Sm^{3+} and (b) $LiSrVO_4$:0.05Sm^{3+} phosphors. Temperature dependent emission intensities of (c) VO_4^{3-} group, (d) $^4G_{5/2} \rightarrow {}^6H_{5/2}$ transition, (e) $^4G_{5/2} \rightarrow {}^6H_{7/2}$ transition, (f) $^4G_{5/2} \rightarrow {}^6H_{9/2}$ transition, (g) $^4G_{5/2} \rightarrow {}^6H_{11/2}$ transition and (h) total integrated $^4G_{5/2} \rightarrow {}^6H_J$ (J = 5/2, 7/2, 9/2, 11/2) transitions. Temperature dependent emission intensities of (i) VO_4^{3-} group, (j) $^4G_{5/2} \rightarrow {}^6H_{5/2}$ transition, (k) $^4G_{5/2} \rightarrow {}^6H_{7/2}$ transition, (l) $^4G_{5/2} \rightarrow {}^6H_{9/2}$ transition, (m) $^4G_{5/2} \rightarrow {}^6H_{11/2}$ transition and (n) total integrated $^4G_{5/2} \rightarrow {}^6H_J$ (J = 5/2, 7/2, 9/2, 11/2) transitions.

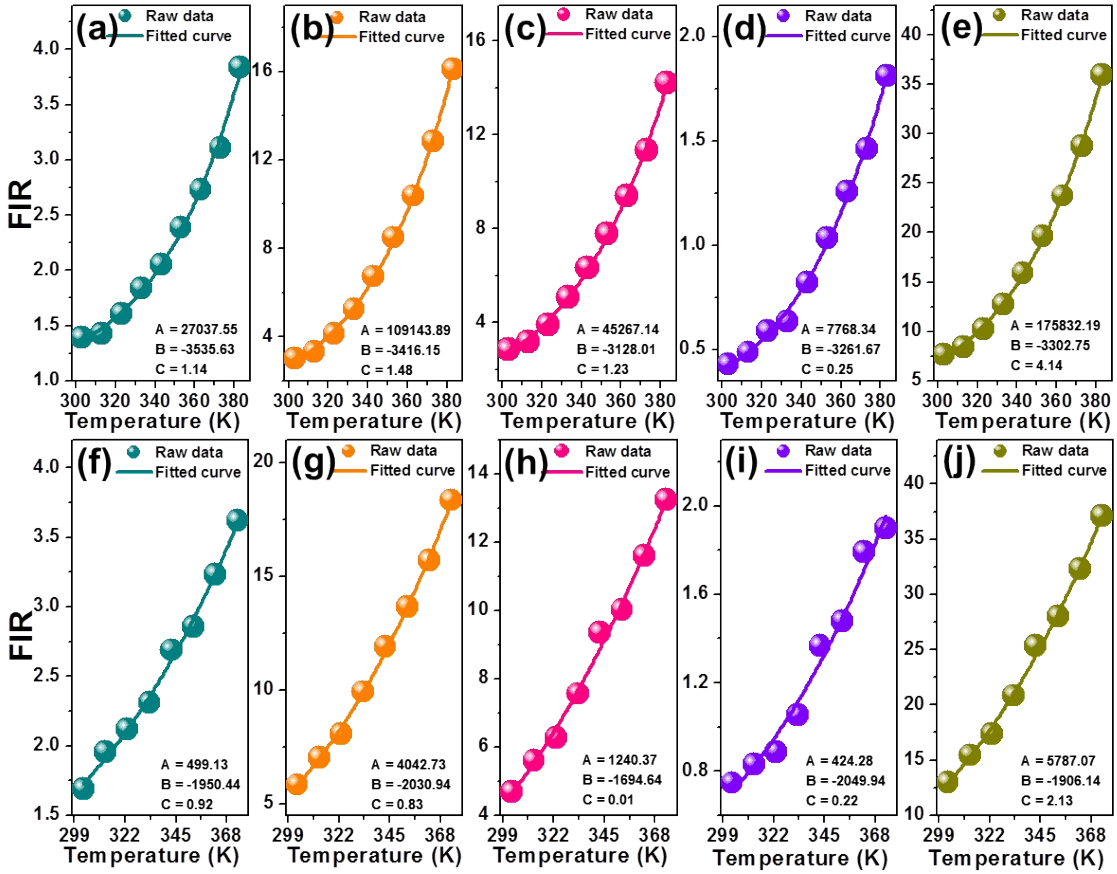

Figure S9. Temperature dependent FIR values of (a) $^6H_{5/2}/VO_4^{3-}$, (b) $^6H_{7/2}/VO_4^{3-}$, (c) $^6H_{9/2}/VO_4^{3-}$, (d) $^6H_{11/2}/VO_4^{3-}$ and (e) total integrated $^6H_{11/2}/VO_4^{3-}$ of $LiSrVO_4$:0.005Sm^{3+} phosphors. Temperature dependent FIR values of (f) $^6H_{5/2}/VO_4^{3-}$, (g) $^6H_{7/2}/VO_4^{3-}$, (h) $^6H_{9/2}/VO_4^{3-}$, (i) $^6H_{11/2}/VO_4^{3-}$ and (j) total integrated $^6H_{11/2}/VO_4^{3-}$of $LiSrVO_4$:0.05Sm^{3+} phosphors.