Supporting Information

Synergistic Luminescent Thermometer of Co-doped $Ca_2GdSbO_6:Mn^{4+}/(Eu^{3+}$ or $Sm^{3+})$ Phosphors

Guixian Li [a], Yu Xue [a], Qinan Mao [a], Lang Pei [a], Hong He [a], Meijiao Liu [b], Liang Chu [c,*], Jiasong Zhong [a,*]

[a] Center of Advanced Optoelectronic Materials, College of Materials and Environmental Engineering, Hangzhou Dianzi University, Hangzhou 310018, China

[b] Department of Chemistry, Zhejiang Sci-Tech University, Hangzhou 310018, China

[c] New Energy Technology Engineering Laboratory of Jiangsu Province, School of Science, Nanjing University of Posts and Telecommunications, Nanjing 210023, China

Corresponding authors:
E-mail: chuliang@njupt.edu.cn (L. Chu), jiasongzhong@hdu.edu.cn (J.S. Zhong)

Table S1 Structural data for Ca_2GdSbO_6 and refined crystallographic parameters of the Ca_2GdSbO_6:Mn^{4+}/Eu^{3+} and Ca_2GdSbO_6:Mn^{4+}/Sm^{3+}.

	Ca_2GdSbO_6	Ca_2GdSbO_6:Mn^{4+}/Eu^{3+}	Ca_2GdSbO_6:Mn^{4+}/Sm^{3+}
Crystal system	monoclinic	monoclinic	monoclinic
Space group	$P12_1/n1$	$P12_1/n1$	$P12_1/n1$
Units Z	2	2	2
a (Å)	5.5720(8)	5.5860(3)	5.5859(6)
b (Å)	5.8530(9)	5.8485(3)	5.8487(2)
c (Å)	8.085(1)	8.0819(3)	8.0825(3)
$\alpha = \gamma$ (deg)	90	90	90
β (deg)	90.250(5)	90.284(2)	90.281(1)
V (Å^3)	263.7(1)	264.0(5)	264.0(7)
R_p (%)		6.36	6.22
R_{wp} (%)		8.28	8.12
χ^2		1.37	1.28

Table S2 Fitting parameters of Equation (1) (LIR as a function of temperature) for the Mn^{4+}/yEu^{3+} and Mn^{4+}/zSm^{3+} co-doped Ca_2GdSbO_6 samples.

Samples	D	F	ΔE_2	R^2
1%Eu	30.7218 ± 0.6267	6012.9303 ± 1286.1863	0.2743 ± 0.0081	0.9991
5%Eu	11.2228 ± 0.1883	6609.6339 ± 1237.9488	0.2789 ± 0.0071	0.9993
10%Eu	9.1320 ± 1.5275	1034.8536 ± 296.7241	0.1860 ± 0.0155	0.9943
1%Sm	40.8203 ± 0.7125	12767.7802 ± 3545.0571	0.3093 ± 0.0103	0.9988
3%Sm	13.9917 ± 0.1017	18989.1703 ± 2348.5704	0.3209 ± 0.0045	0.9998
5%Sm	20.8857 ± 0.2688	11589.2459 ± 2457.8008	0.3093 ± 0.0079	0.9993

Table S3 Thermometric performance of luminescent thermometers based on Mn^{4+}-Ln^{3+} ions.

Host	Ln^{3+}	S_r ($\%K^{-1}$)	Temperature range (K)	Reference
La_2LiSbO_6	Eu^{3+}	0.89 (503K)	303-523	[1]
$CaGdMgSbO_6$	Sm^{3+}	1.38 (548K)	298-573	[2]
Ca_2LaNbO_6	Eu^{3+}	1.51 (455K)	298-498	[3]
Ba_2LaNbO_6	Eu^{3+}	2.08 (398K)	298-498	[3]
$NaLaMgWO_6$	Eu^{3+}	0.86 (523K)	303-523	[4]
LuAG	Eu^{3+}	0.70 (303K)	303-358	[5]
$Sr_4Al_{14}O_{25}$	Tb^{3+}	2.80 (423K)	123-523	[6]
$CaGdAlO_4$	Tb^{3+}	2.30 (398K)	230-470	[7]
$BaLaMgNbO_6$	Dy^{3+}	1.82 (457K)	298-523	[8]
$YAlO_3$	Ho^{3+}	1.17 (450K)	293-563	[9]
$YAlO_3$	Er^{3+}	1.95 (530K)	293-563	[9]
Ca_2GdSbO_6	Eu^{3+}	1.38 (420K)	303-523	This work
Ca_2GdSbO_6	Sm^{3+}	1.55 (430K)	303-523	This work

Table S4 The detailed integration interval of the emission peaks of Mn^{4+}, Eu^{3+}, Sm^{3+}.

Emission peak	Integration interval (nm)
Mn^{4+}:$^2E \rightarrow {}^4A_2$	650 - 695
Eu^{3+}:$^5D_0 \rightarrow {}^7F_2$	605 - 630
Sm^{3+}:$^4G_{5/2} \rightarrow {}^6H_{7/2}$	580 - 620

*The emission spectrum is not deconvoluted.

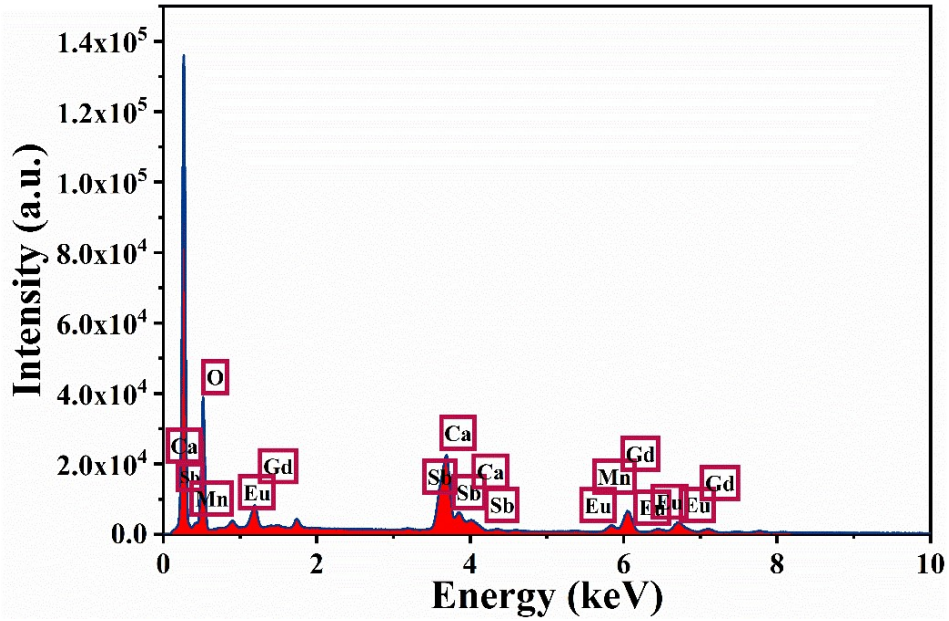

Fig. S1 EDX spectrum of $Ca_2GdSbO_6:Mn^{4+}$, Eu^{3+} samples.

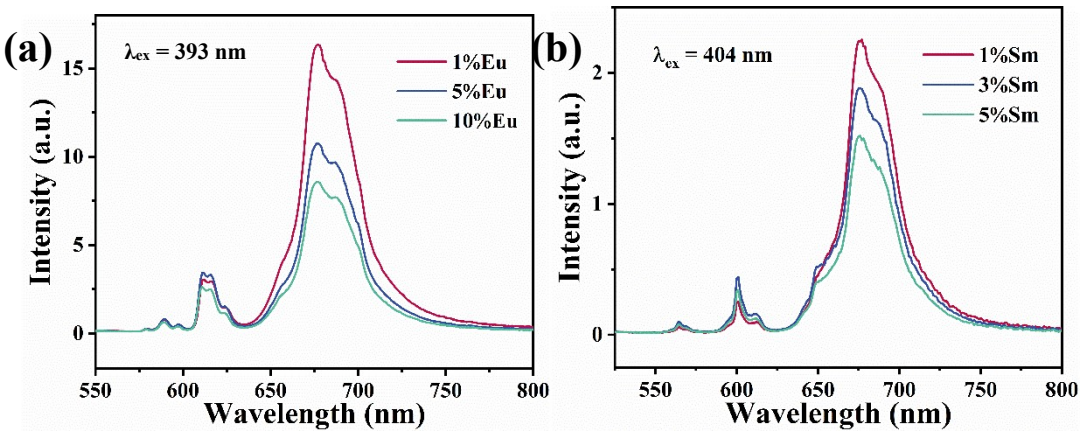

Fig. S2 The room temperature PL spectra of (a) $Ca_2GdSbO_6:Mn^{4+}/yEu^{3+}$, and (b) $Ca_2GdSbO_6:Mn^{4+}/zSm^{3+}$ phosphors.

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