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Supplementary information for

Temperature sensitivity modulation through vanadium concentration in La2MgTiO6: V5+, Cr3+ double perovskite optical thermometer

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Table S1. The calculated molar of precursors used in the syntheses.

Sample (0.5 g)	$La(CH_3COO)_3$	$Mg(NO_3)_2$	$Ti(C_3H_7O)_4$	NH_4VO_3	$Cr(NO_3)_3$
LMT	2.24E-03	1.23E-03	1.1212E-03	0.00E+00	0
LMT:0.05V	2.24E-03	1.23E-03	1.1206E-03	5.61E-07	0
LMT:0.1V	2.24E-03	1.23E-03	1.1201E-03	1.12E-06	0
LMT:0.5V	2.24E-03	1.23E-03	1.1156E-03	5.61E-06	0
LMT:1V	2.24E-03	1.23E-03	1.1100E-03	1.12E-05	0
LMT:2V	2.24E-03	1.23E-03	1.0988E-03	2.24E-05	0
LMT:0.1Cr	2.24E-03	1.23E-03	1.1201E-03	0	1.12E-06
LMT:0.1V, 0.1Cr	2.24E-03	1.23E-03	1.1189E-03	1.12E-06	1.12E-06
LMT:2V, 2Cr	2.24E-03	1.23E-03	1.0768E-03	2.24E-05	2.24E-05

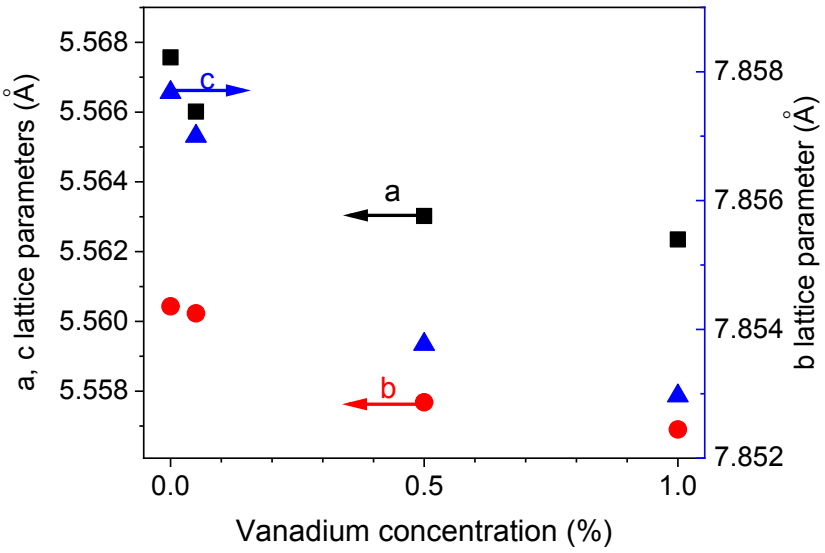

Fig. S1 Unit cell *a*, *b*, *c*, parameters of the La_2MgTiO_6 in the function of vanadium concentration.

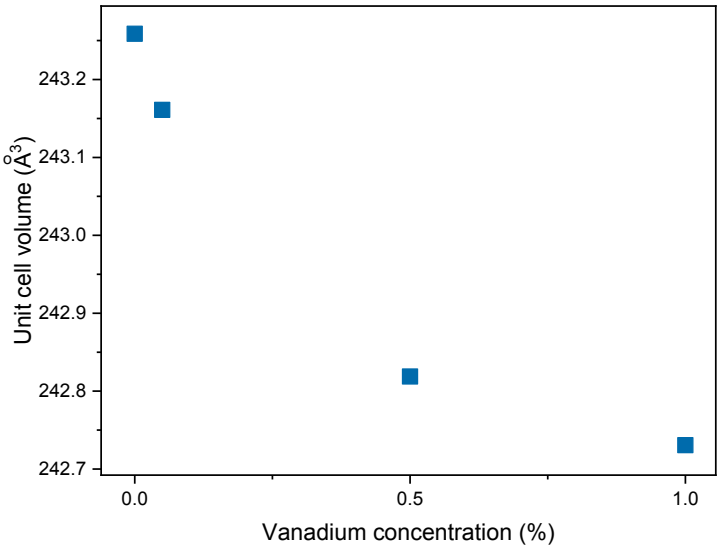

Fig. S2 Unit cell volume of the La_2MgTiO_6 in the function of vanadium concentration.

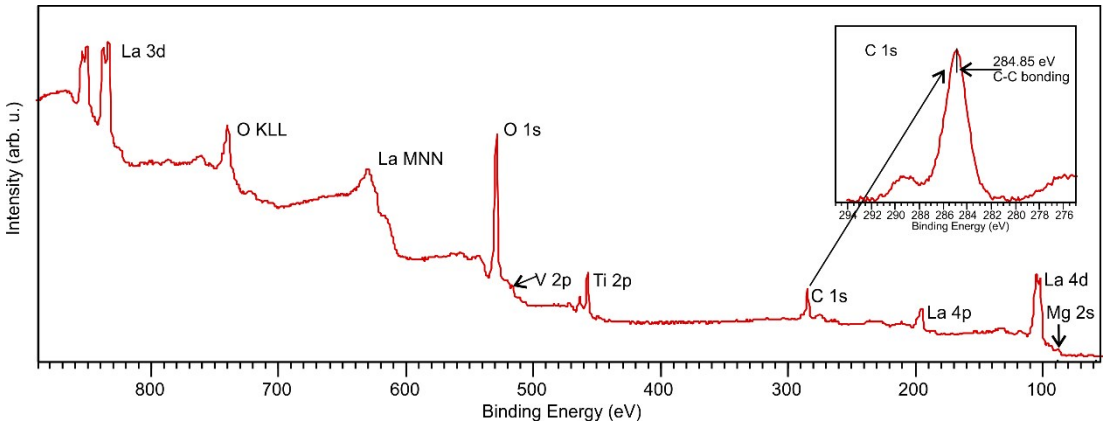

Fig. S3 Broad XPS spectrum for La_2MgTiO_6:V with core level lines of La $3d_{5/2}$, O 1s, Ti $2p_{3/2}$, Mg 2s.

Table S2 Positions and full width at half maxima (FWHM) of main core level lines.

State	Position (eV)	FWHM (eV)
La $3d_{5/2}$	833.95	6.6
O 1s	529.35	2.75
Ti $2p_{3/2}$	458.05	1.85
Mg 2s	87.65	2.2
V $2p_{3/2}$ V(V)	516.7	1.7
V $2p_{3/2}$ V(III)	515.25	2.0

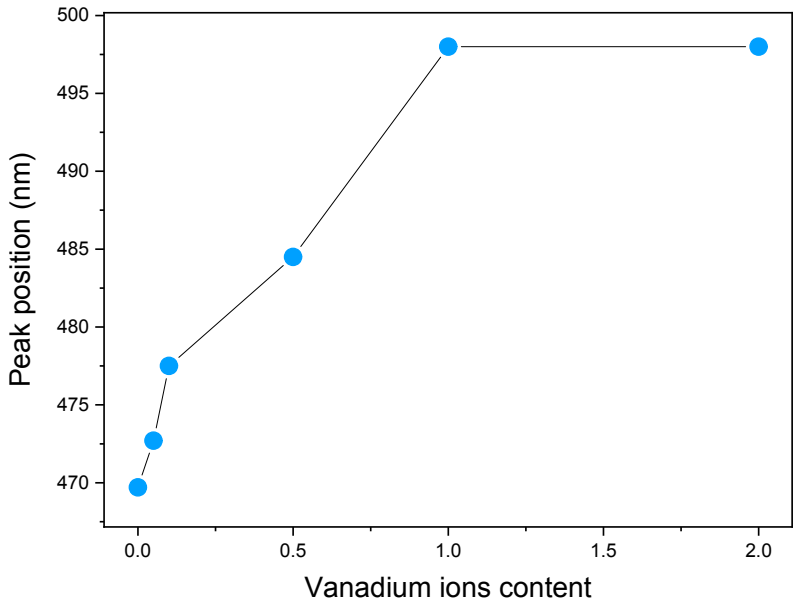

Fig. S4 Shift of maximum emission band with vanadium concentration.

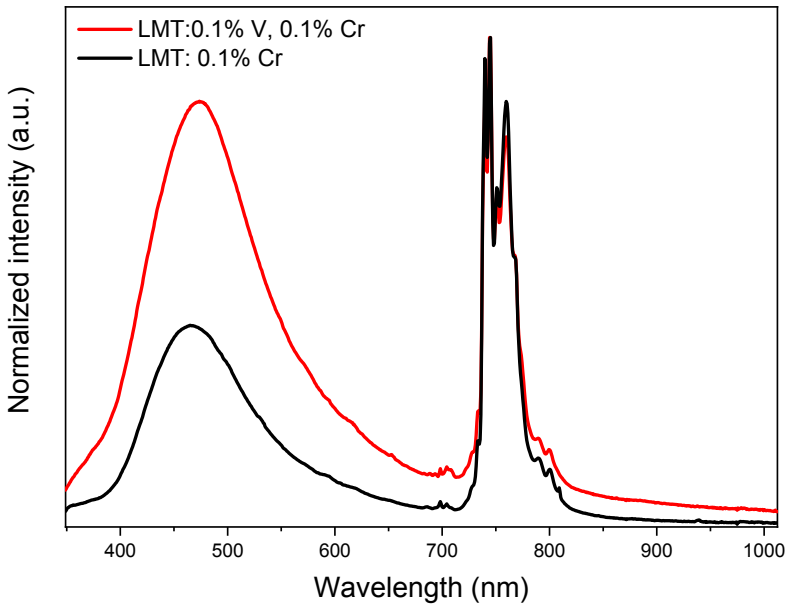

Fig. S5 Normalized emission spectra of La_2MgTiO_6:0.1% V, 0.1% Cr and La_2MgTiO_6:0.1% Cr.

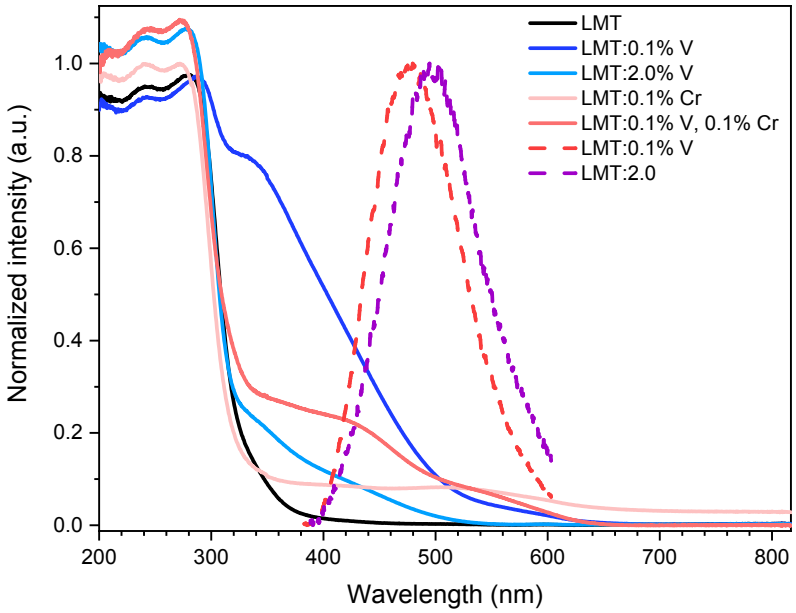

Fig. S6 Absorption (strait line) and emission (dashed line) of investigated samples.

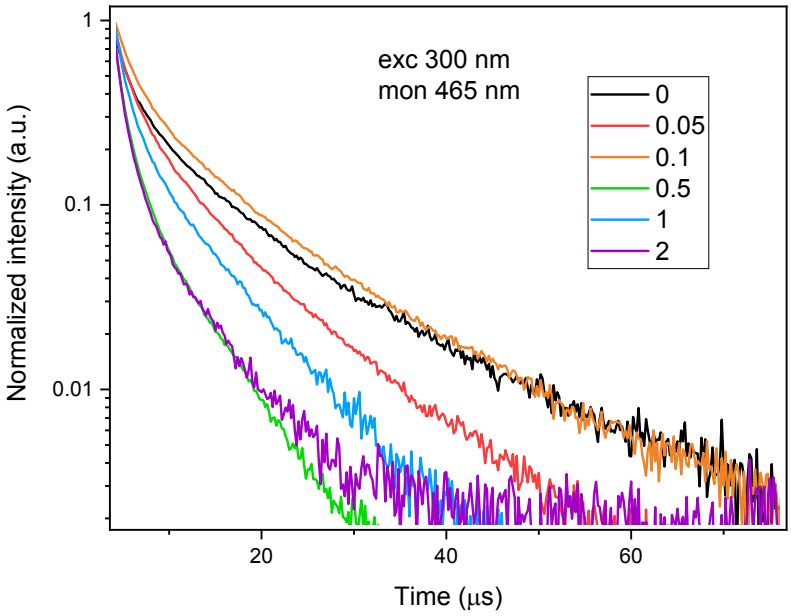

Fig. S7 Emission Decay curve of La2MgTiO6 and samples doped with vanadium ions monitored at 465 nm.

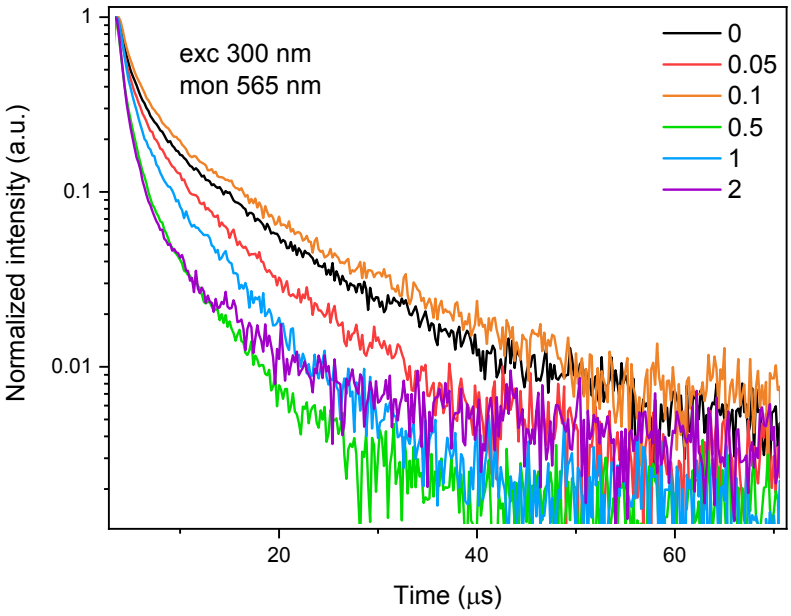

Fig. S8 Emission Decay curves of La_2MgTiO_6 and samples doped with vanadium ions monitored at 565 nm.

Table S3 Emission decay times of investigated samples.

LMT: xV	**mon 465 nm**		**mon 565 nm**	
	τ_1 [μs]	τ_2[μs]	τ_1[μs]	τ_2[μs]
0	1.78	10.93	-	-
0.05	1.57	8.33	0.98	5.95

0.1	2.02	11.13	1.27	8.51
0.5	0.91	4.75	0.66	3.53
1.0	1.13	6.55	0.87	5.37
2.0	0.83	4.23	0.63	3.61

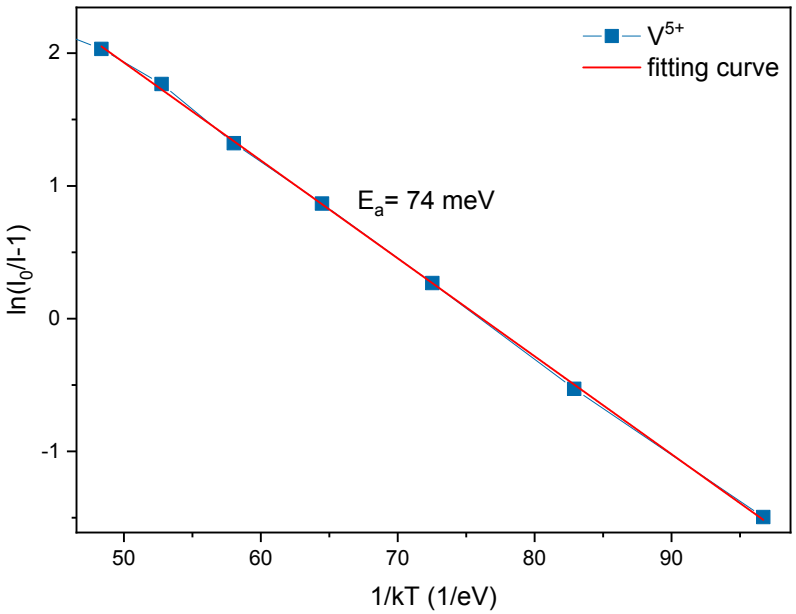

Fig. S9 Activation energies (E_a) for thermal quenching of V^{5+} emission in La_2MgTiO_6, calculated from a function of $\ln(I_0/I-1)$ versus 1/kT.

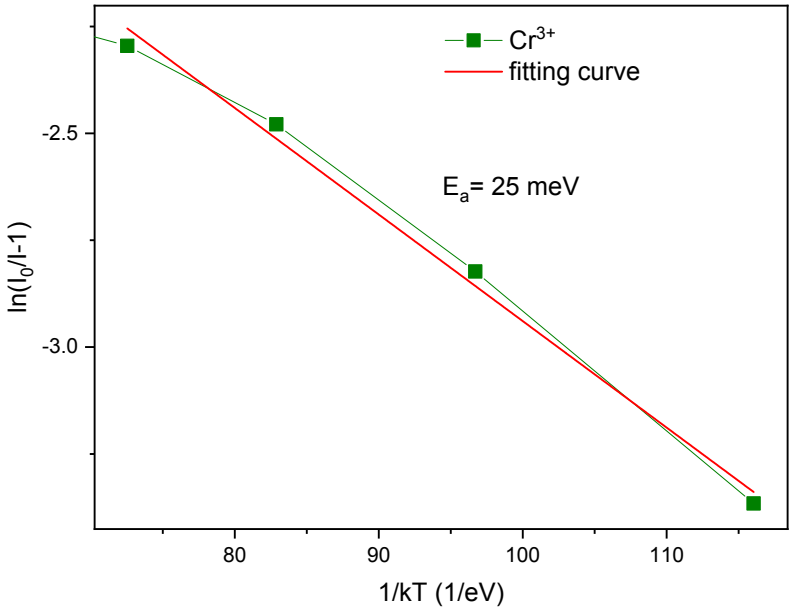

Fig. S10 Activation energies (E_a) for thermal quenching of Cr^{3+} emission in La_2MgTiO_6, calculated from a function of $\ln(I_0/I-1)$ versus 1/kT.

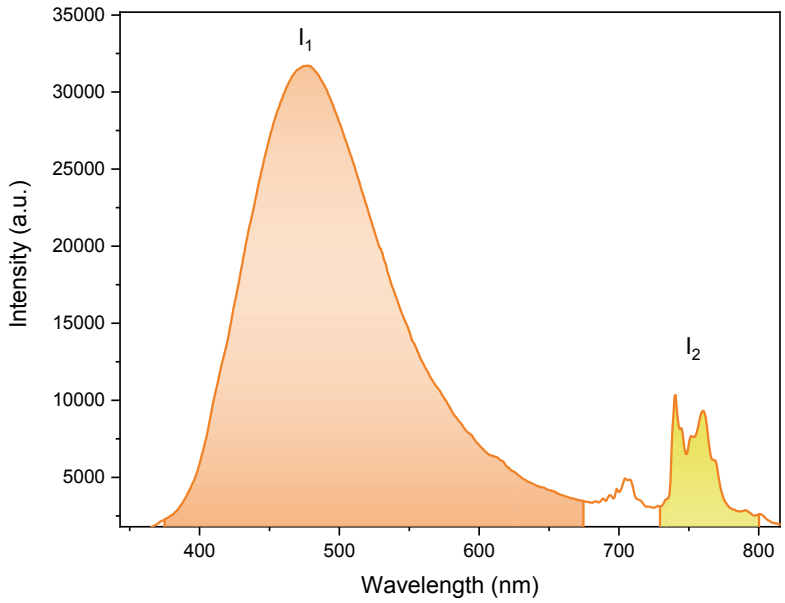

Fig. S11 Integration areas of representative sample La_2MgTiO_6: 0.1% V.

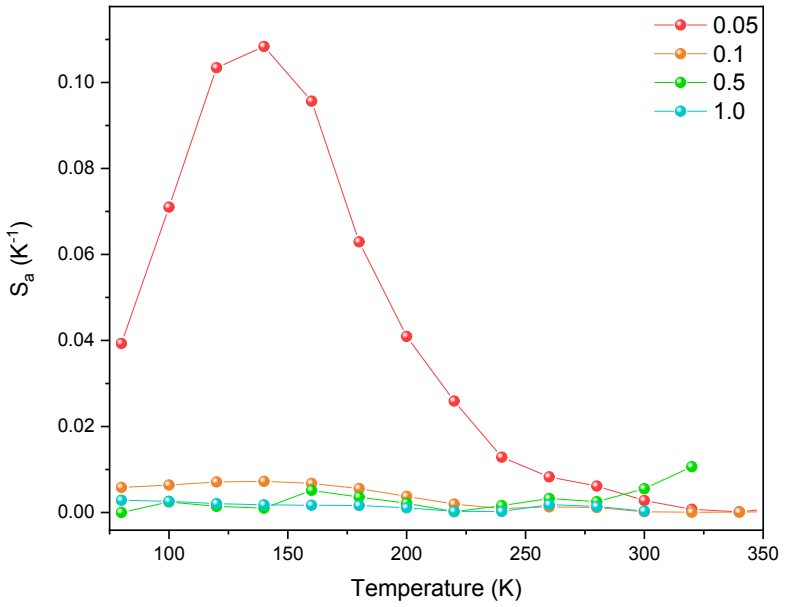

Fig. S12 Absolute sensitivity of La_2MgTiO_6:x% V.

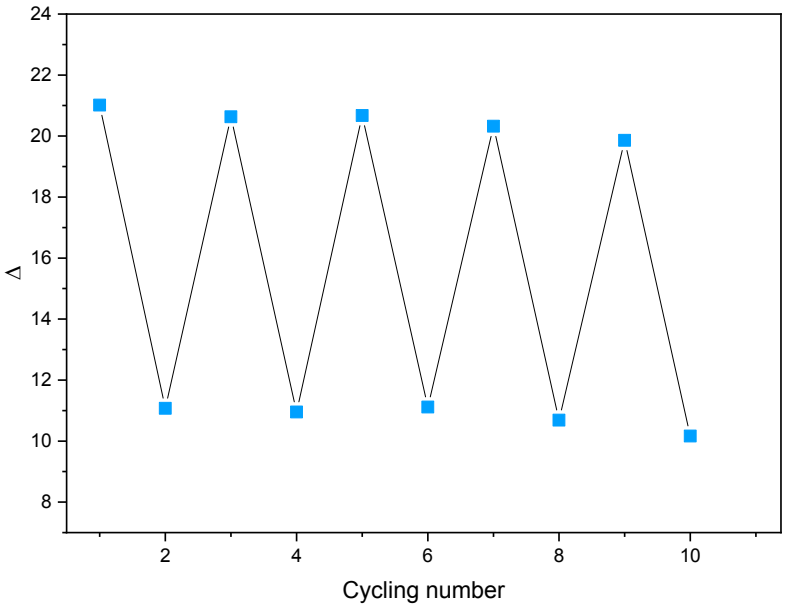

Fig. S13 Repeatability of Δ temperature parameter of I_1/I_2 emission evaluated at 80 K and 150 K during 10 heating/cooling cycles.