Supplementary Material

Multicolor Mechanoluminescence for Integrated Dual-mode Stress and Temperature Sensing

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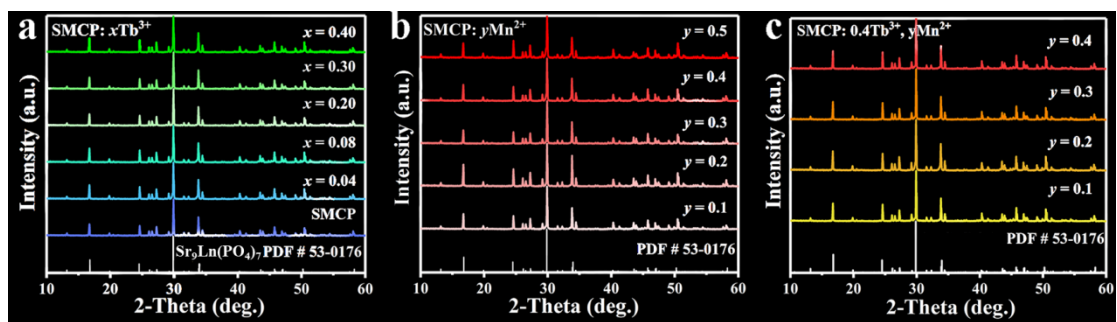*wangwj@xbmu.edu.cn (Wenjie Wang),*

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Fig. S1 a-c. XRD patterns of as-prepared SMCP: xTb^{3+} ($0 \leqslant x \leqslant 0.4$)、SMCP: yMn^{2+} ($0.1 \leqslant y \leqslant 0.5$)、SMCP: 0.4Tb^{3+}, yMn^{2+} ($0 \leqslant y \leqslant 0.4$) samples and the standard data of the Sr$_9$Cr(PO$_4$)$_7$ phase (PDF # 53-0176).
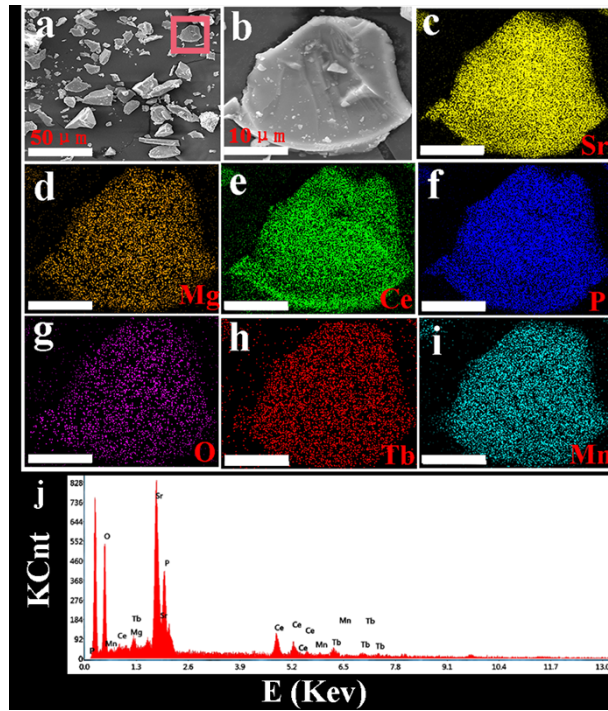
Fig. S2 a-b. SEM images of SMCP: $0.4Tb^{3+}$, $0.4Mn^{2+}$; c-j. Elemental mappings and EDS for Sr, Mg, Ce, P, O, Tb and Mn.
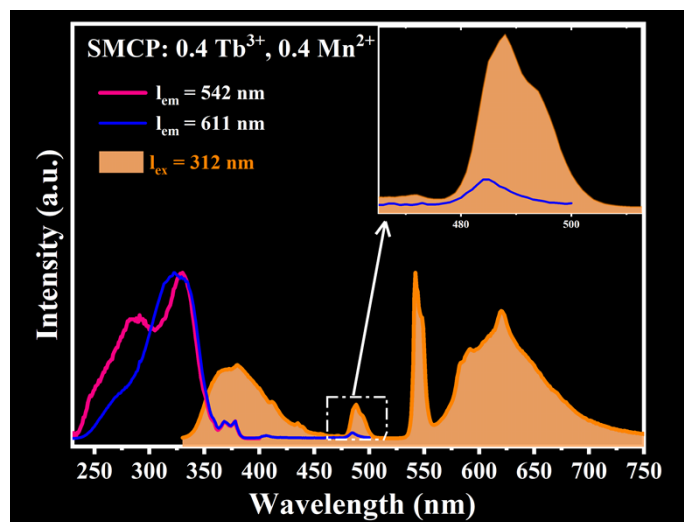
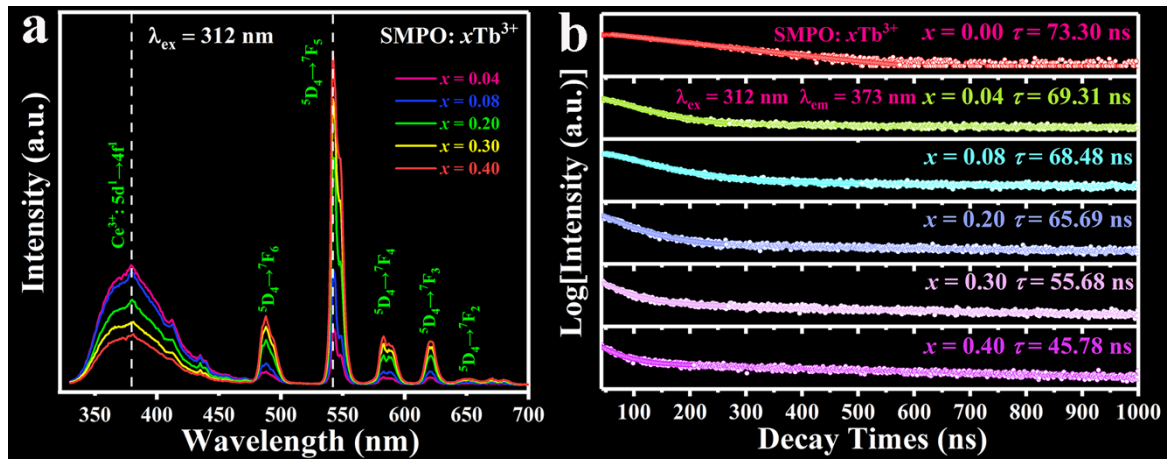Fig. S3 PL and PLE spectra of SMCP: $0.4Tb^{3+}$, $0.4Mn^{2+}$.

Fig. S4 a. Dependence of PL spectra of SMCP: xTb^{3+}(x = 0.04, 0.08, 0.2, 0.3, 0.4) excited at 312 nm; b. Decay curves of host emission in SMCP: xTb^{3+}(x = 0.04, 0.08, 0.2, 0.3, 0.4) at 312nm excitation and 373nm monitoring.
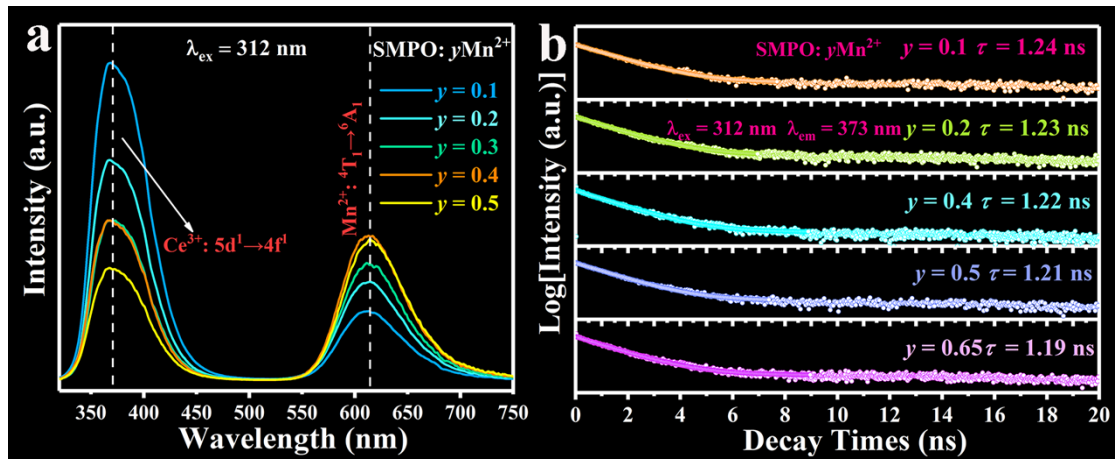
Fig. S5 a. Dependence of PL spectra of SMCP: yMn^{2+} (x = 0.1, 0.2, 0.3, 0.4, 0.5) excited at 312 nm; b. Decay curves of host emission in SMCP: yMn^{2+} (x = 0.1, 0.2, 0.3, 0.4, 0.5) at 312 nm excitation and 373 nm monitoring.
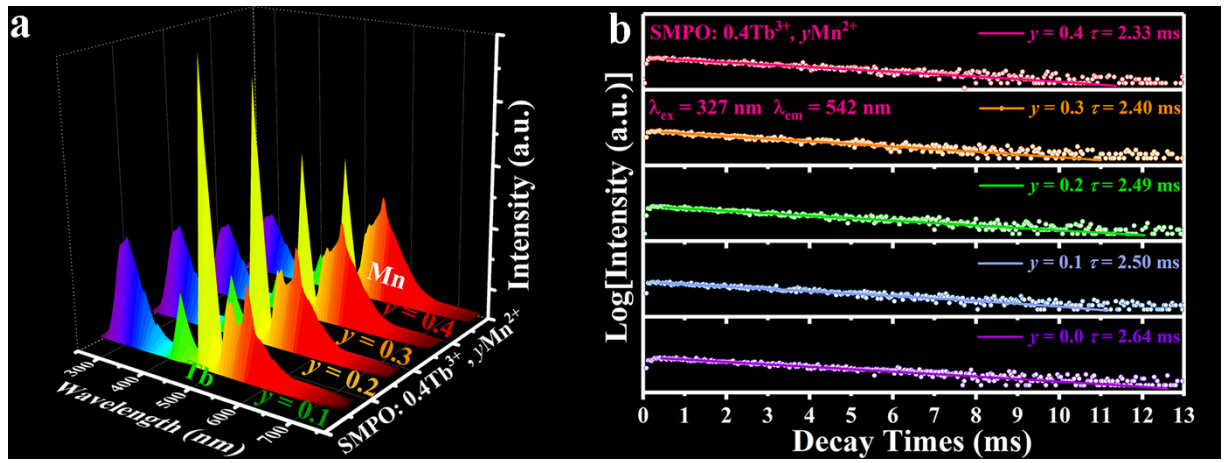
Fig. S6 a. Dependence of PL spectra of SMCP: $0.4Tb^{3+}$, yMn^{2+} ($y = 0.1, 0.2, 0.3, 0.4$) excited at 312 nm; b. Decay curves of Tb emission in SMCP: $0.4Tb^{3+}$, yMn^{2+} ($y = 0.1, 0.2, 0.3, 0.4$) at 327 nm excitation and 542 nm monitoring.
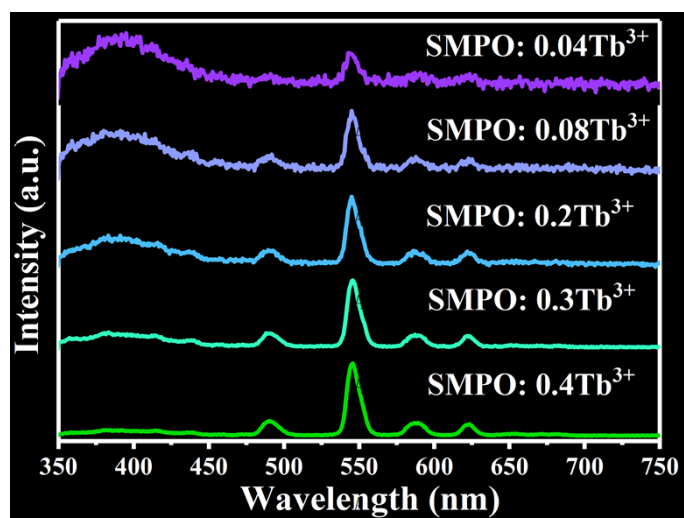
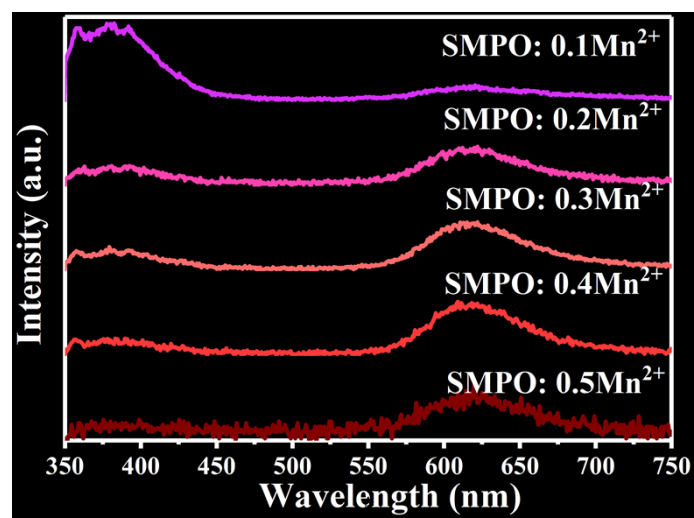Fig. S7 Dependence of ML spectra of SMCP: xTb^{3+}(x = 0.04, 0.08, 0.2, 0.3, 0.4) in the dark under stretching.

Fig. S8 Dependence of ML spectra of SMCP: yMn^{2+} (x = 0.1, 0.2, 0.3, 0.4, 0.5) in the dark under stretching.
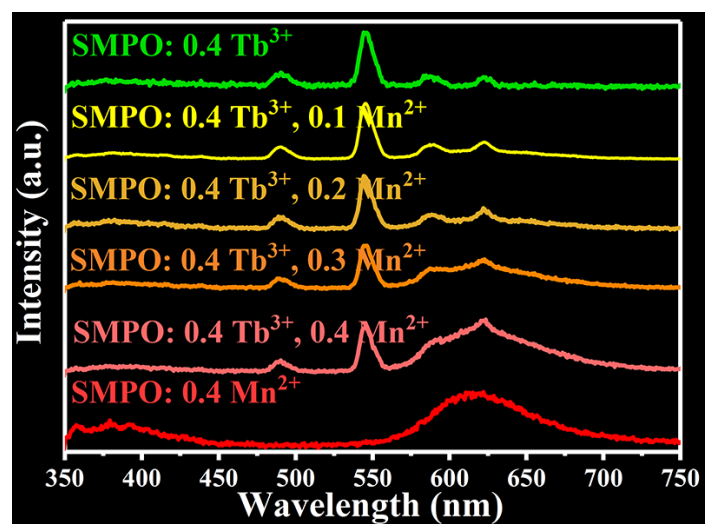
Fig. S9 Dependence of ML spectra of SMCP: $0.4Tb^{3+}$, yMn^{2+}(y = 0.1, 0.2, 0.3, 0.4) in the dark under stretching.
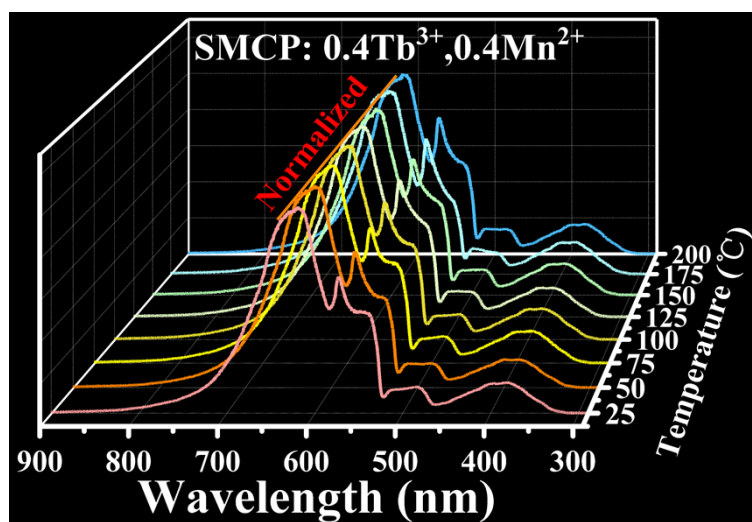
Fig. S10 ML spectra of SMCP: $0.4Tb^{3+}$, $0.4Mn^{2+}$ at different temperature .

Table 1 Final refined structural parameters for SMCP

Formula	SMCP
Crystal system	Monoclinic
Space group	I2/a (No. 15)
Vol (Å^3)	2542.21
Unit cell dimens (Å)	a = b = 7.896 (4) Å c = 5.207 (2) Å
Reliability factors	R_{wp} = 9.65 %, R_p = 7.11 %
Program	GSAS

Table 2 CIE diagram of PL

PL CIE (x,y)	x	y
SMCP	0.1895	0.0606
SMCP: 0.02Tb	0.2249	0.2195
SMCP: 0.08Tb	0.2523	0.3094
SMCP: 0.2Tb	0.2942	0.4485
SMCP: 0.3Tb	0.312	0.5072
SMCP: 0.4Tb	0.3194	0.5309
SMCP: 0.1Mn	0.4433	0.2433
SMCP: 0.2Mn	0.5161	0.2985
SMCP: 0.3Mn	0.5498	0.3191
SMCP: 0.4Mn	0.568	0.3299
SMCP: 0.5Mn	0.5798	0.3338
SMCP: 0.4Tb, 0.1Mn	0.4133	0.4386
SMCP: 0.4Tb, 0.2Mn	0.4441	0.4278
SMCP: 0.4Tb, 0.3Mn	0.4933	0.4048
SMCP: 0.4Tb, 0.4Mn	0.5131	0.3994

Table 3 CIE diagram of ML

ML CIE (x,y)	x	y
SMCP	0. 2375	0. 1755
SMCP: 0.02Tb	0. 2912	0. 2907
SMCP: 0.08Tb	0. 2917	0. 3371
SMCP: 0.2Tb	0. 2924	0. 3734
SMCP: 0.3Tb	0. 3153	0. 4478
SMCP: 0.4Tb	0. 3329	0. 5226
SMCP: 0.1Mn	0. 3688	0. 2237
SMCP: 0.2Mn	0. 5176	0. 3421
SMCP: 0.3Mn	0. 5492	0. 3435
SMCP: 0.4Mn	0. 5597	0. 3413
SMCP: 0.5Mn	0. 4744	0. 3589
SMCP: 0.4Tb, 0.1Mn	0. 4115	0. 4633
SMCP: 0.4Tb, 0.2Mn	0. 4053	0. 4286
SMCP: 0.4Tb, 0.3Mn	0. 4726	0. 4069
SMCP: 0.4Tb, 0.4Mn	0. 5143	0. 3919