

Electronic Supplementary Information

Reversible human-temperature-responsive luminescence switching in a Mn(II)-based metal halide

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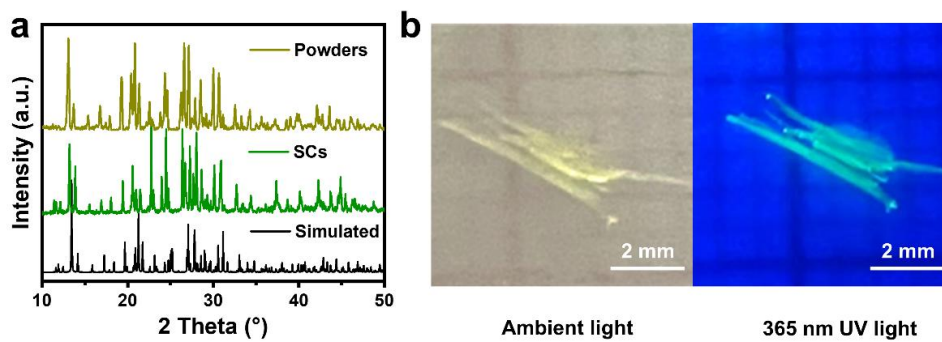


Fig. S1. (a) The simulated PXRD pattern from SCXRD data and experimental PXRD patterns of $(\text{TMS})_2\text{MnBr}_4$ SCs and powders. (b) Photographs of $(\text{TMS})_2\text{MnBr}_4$ SCs (under ambient light and 365 nm UV light).

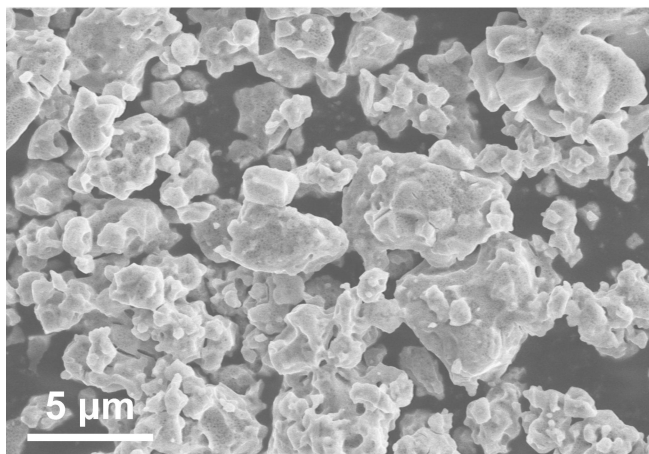


Fig. S2. The SEM image of the ball-milled (TMS)₂MnBr₄ powders.

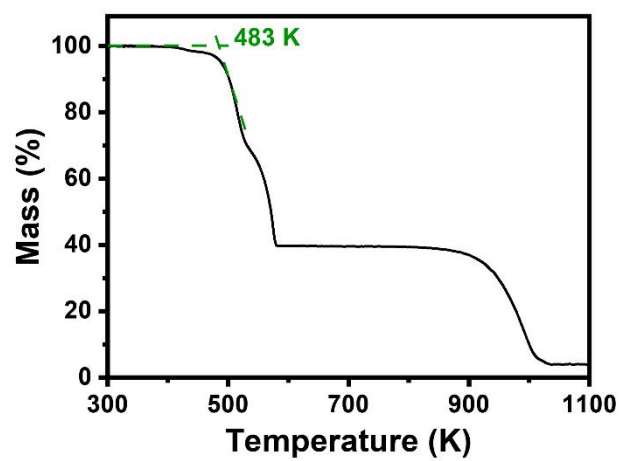


Fig. S3. Thermogravimetric (TG) analysis of the ball-milled $(\text{TMS})_2\text{MnBr}_4$ powders.

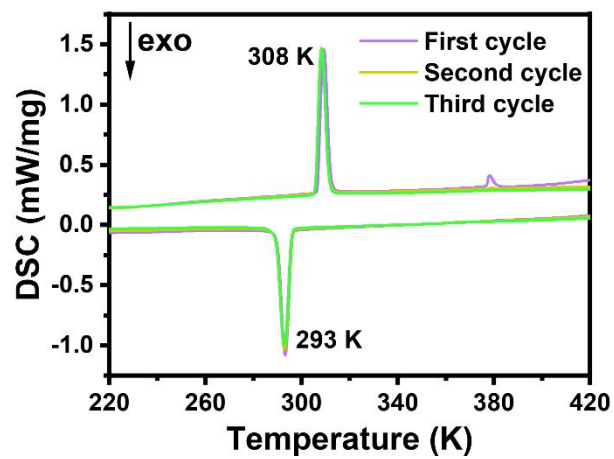


Fig. S4. Differential scanning calorimetry (DSC) plots of the ball-milled $(\text{TMS})_2\text{MnBr}_4$ powders during three heating-cooling cycles.

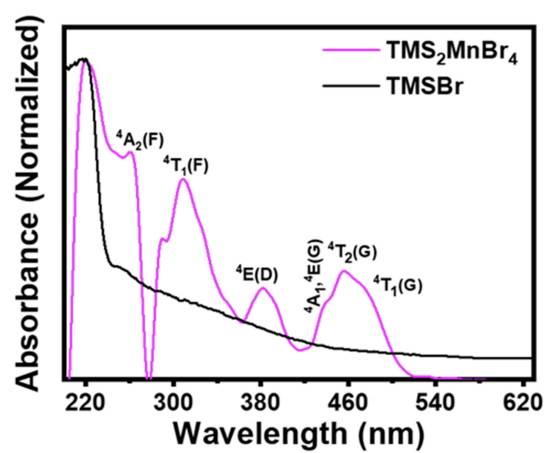


Fig. S5. The UV-Vis absorption spectra of $(\text{TMS})_2\text{MnBr}_4$ powders and TMSBr .

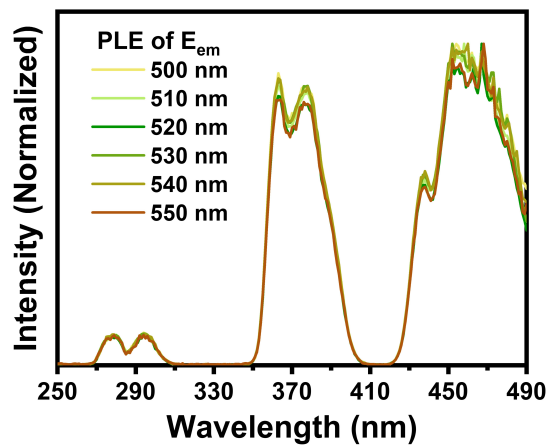


Fig. S6. Emission-wavelength-dependent PLE spectra of ball-milled $(TMS)_2MnBr_4$ powders.

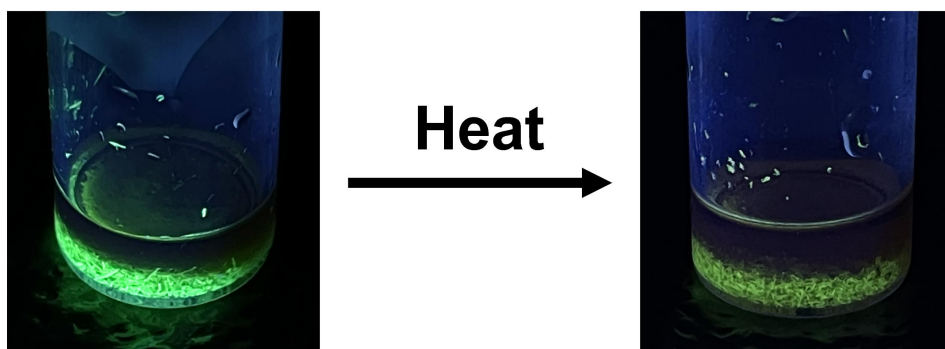


Fig. S7. Photographs of $(\text{TMS})_2\text{MnBr}_4$ single crystals before and after heating (under ambient and 365 nm UV light)

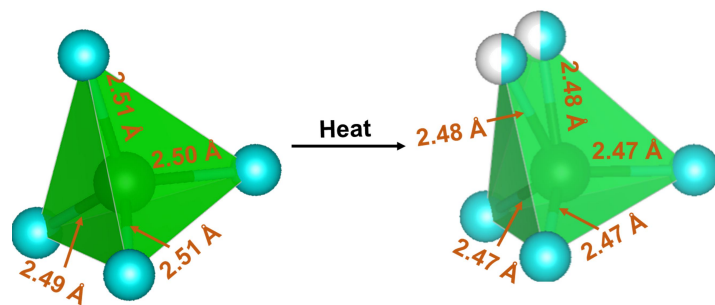


Fig. S8. The length of Mn-Br bonds of $(\text{TMS})_2\text{MnBr}_4$ before and after heating.

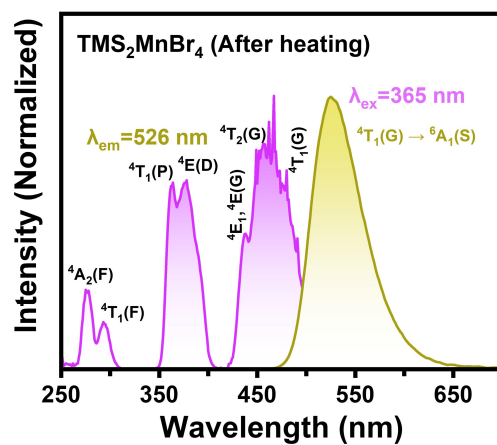


Fig. S9. The steady-state PLE and PL spectra of (TMS)₂MnBr₄ powders at 310 K.

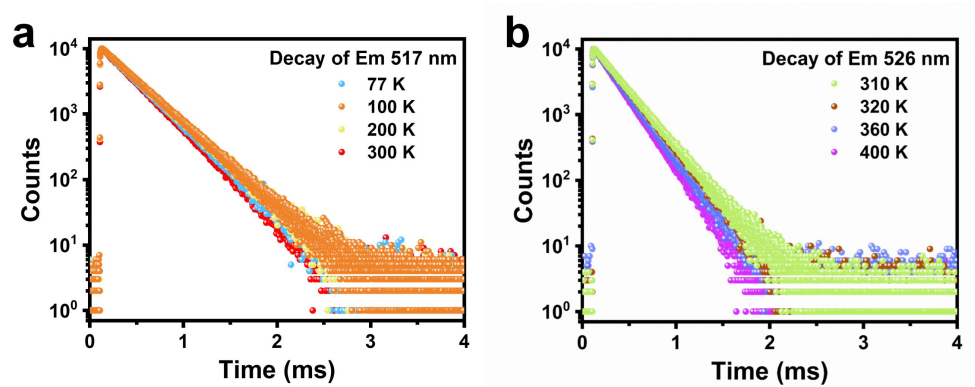


Fig. S10. (a) The TRPL spectra of ball-milled $(\text{TMS})_2\text{MnBr}_4$ powders by monitoring 517 nm at 77 K, 100 K, 200 K, and 300 K. (b) The TRPL spectra by monitoring 526 nm at 310 K, 320 K, 360 K, and 400 K.

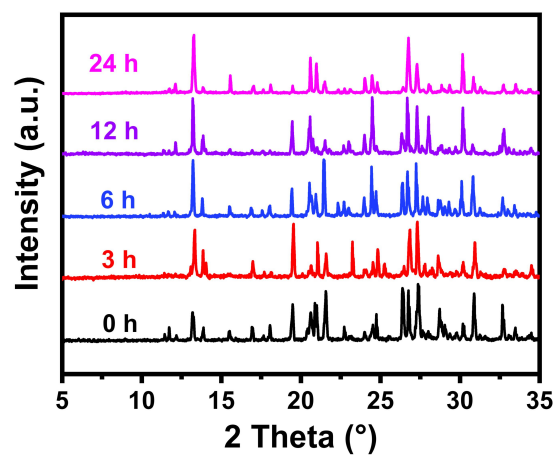


Fig. S11. PXRD patterns of $(\text{TMS})_2\text{MnBr}_4$ power under continuous 24 h UV radiation.

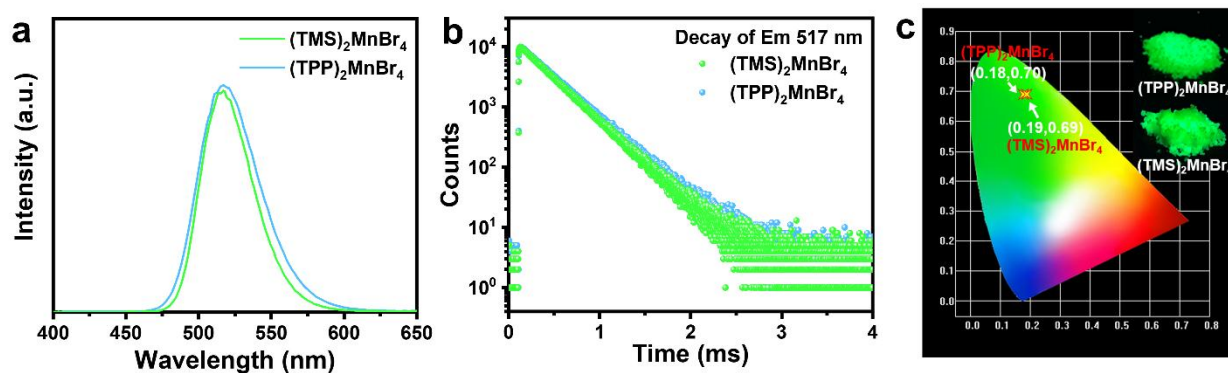


Fig. S12. (a) Steady-state PL spectra under the excitation of 365 nm incident light. (b) TRPL spectra by monitoring 517 nm. (c) CIE chromaticity coordinate diagrams of $(\text{TMS})_2\text{MnBr}_4$ and $(\text{TPP})_2\text{MnBr}_4$ powders.

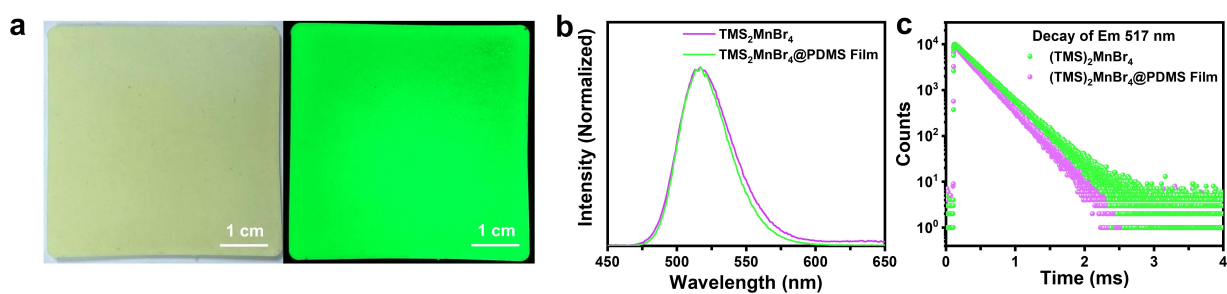


Fig. S13. (a) The photographs of the $(TMS)_2MnBr_4@PDMS$ film under visible light and 365 nm UV irradiation. (b) Steady-state PL spectra under the excitation of 365 nm UV light. (c) TRPL spectra of $(TMS)_2MnBr_4$ and $(TMS)_2MnBr_4@PDMS$ film by probing 517 nm.

Table S1. Single-crystal X-ray diffraction data of (TMS)₂MnBr₄ at 150 K and 313 K.

Compound	(TMS) ₂ MnBr ₄	(TMS) ₂ MnBr ₄
Formula weight	528.90	528.90
Temperature (K)	150	313
Crystal system	orthorhombic	orthorhombic
Space group	P2 ₁ 2 ₁ 2 ₁	<i>Pnma</i>
a (Å)	9.01520(10)	12.5715(9)
b (Å)	13.0979(2)	8.8296(14)
c (Å)	14.2021(2)	16.0251(19)
α (°)	90	90
β (°)	90	90
γ (°)	90	90
Volume (Å ³)	1676.99(4)	1778.8(4)
Z	4	4
ρ _{calc.} (g/mm ³)	2.095	1.975
μ (mm ⁻¹)	19.628	18.505
Radiation	Cu Kα (λ = 1.54184 Å)	Cu Kα (λ = 1.54184 Å)
2θ range for data collection (°)	9.184 ≤ 2θ ≤ 152.284	8.94 ≤ 2θ ≤ 145.932
Index ranges	-6 ≤ h ≤ 11, -16 ≤ k ≤ 15, -15 ≤ l ≤ 17	-9 ≤ h ≤ 15, -10 ≤ k ≤ 9, -19 ≤ l ≤ 14
R(reflections), wR ₂ (reflections)	0.0306, 0.0759	0.2333, 0.6007
Data completeness	1.0000	1.0000
Parameters refined	124	107
Goodness-of-fit on F ²	1.103	1.5050

Table S2. The excitation-wavelength-dependent PLQY values of the ball-milled $(\text{TMS})_2\text{MnBr}_4$ powders.

Wavelength (nm)	PLQY (%)
355	45.4
365	69.8
375	70.0
385	66.6
395	60.2
405	28.1
415	14.5
425	34.6
435	59.1
445	59.4
455	59.8
465	58.5

Table S3. The data of temperature-dependent TRPL spectra.

Temperature (K)	Lifetime (μs)
77	321.01
100	335.83
200	333.89
300	306.81
310	253.41
320	248.36
360	224.49
400	208.43

Table S4. The PL characteristics of different thermal-responsive Mn(II)-based OIMHs.

Chemical formula	Peak position (RT, nm)	PLQY (%)	Responsive temperature (K)	Reversibility	Refs.
C ₂₉ H ₂₃ Br ₂ MnN	588	10.1	480/80	Reversible	1
(ASN) ₂ MnBr ₄	525	13.07	373	Reversible	2
(C ₄ H ₉ NH ₃) ₂ MnI ₄	550/672	20.05	343	Reversible	3
(TMPA) ₂ MnI ₄	545/660	22.98	220/383	Reversible	4
(C ₄ NOH ₁₀) ₅ Mn ₂ Cl ₉ ·C ₂ H ₅ OH	620	29	363	Irreversible	5
C ₄ H ₁₄ N ₂ MnBr ₄	516/623	N.M.	80/490	Reversible	6
(TMS) ₂ MnBr ₄	517	69.8	308 (Human temperature)	Reversible	This work

Notes and References

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