Electronic Supplementary Information

Mn-doped 2D Sn-based perovskites with energy transfer from self-trapped excitons to dopants for warm white light-emitting diodes

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Experimental Section:

Characterization. XRD patterns were carried out on a rotating anode X-ray powder diffractometer (Cu Kα). Electro-Spin Resonance Spectrometer (EPR) spectra were obtained by an electron paramagnetic resonance EPR spectrometer (Bruker). TEM images were obtained on JEM-2100 transmission electron microscope. Scanning electron microscopy (SEM) images were performed on S-4800 field emission scanning electron microscope equipped with energy-dispersive X-ray (EDX) detector. ICP elemental analysis was carried out through an Agilent 720/730 ICP-OES. Absorbance spectra were taken on a Shimadzu UV-2600 spectrophotometer; emission and excitation spectra were measured using FLS 1000 photoluminescence spectrometer. Time-resolved PL lifetime and photoluminescence quantum yield measurement were carried out using FLS 1000 photoluminescence spectrometer.

Computational Methods.

Density function theory calculation were carried out by using DMol3 code. The band structure and the density of state of the crystal structure was calculated based on a generalized gradient approximation (GGA) functional and a revised Perdew-Burke-Ernzerhof (RPBE) functional. Brillouin zone was sampled with $9\times9\times1$ Monkhorst-Pack grid. The lattice parameters were fixed at the experimentally measured values while the atomic positions were optimized.

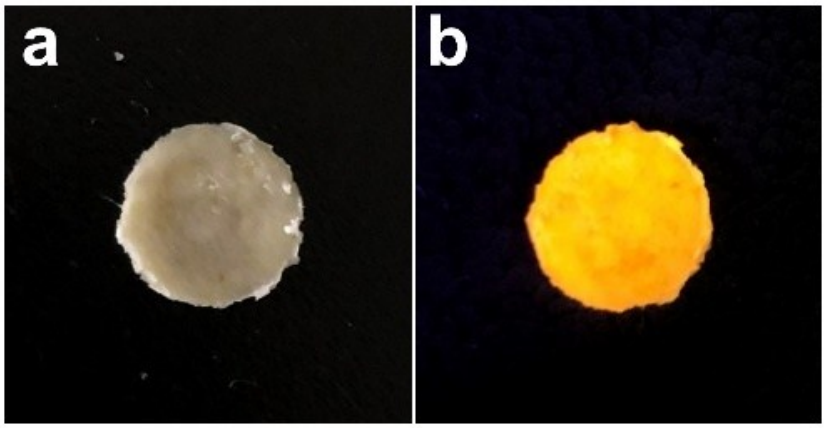

Figure S1. (a) Photographs of $(C_8H_{17}NH_2)_2Sn_{1-x}Mn_xBr_4$ (x=0.26) under room light. (b) Photographs of $(C_8H_{17}NH_2)_2Sn_{1-x}Mn_xBr_4$ (x=0.26) under UV light.

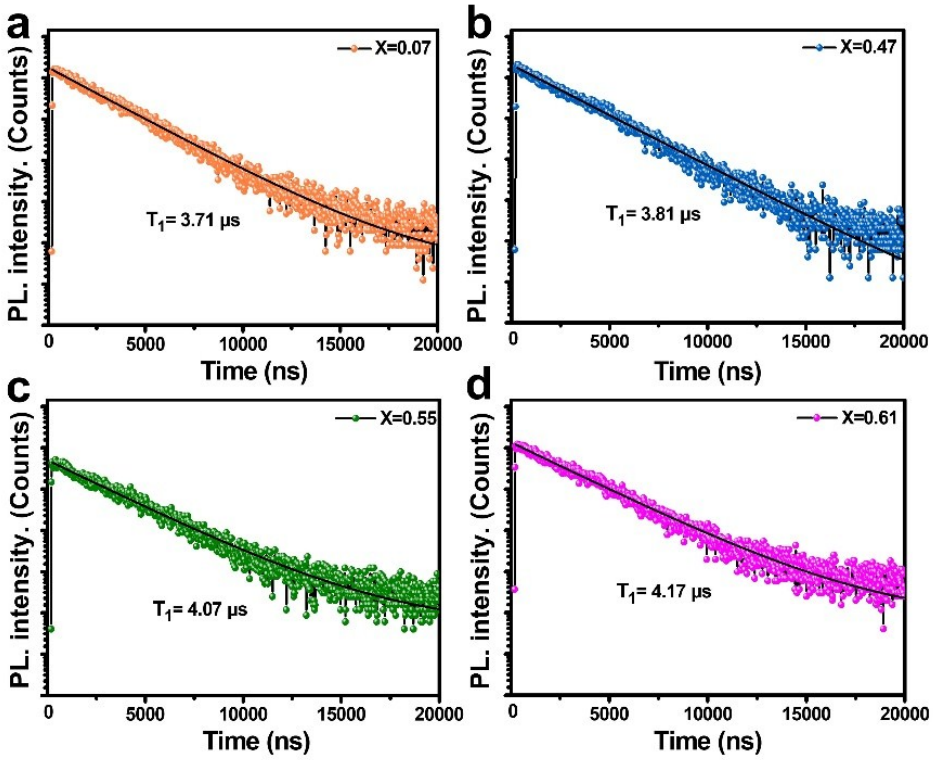

Figure S2. Time-resolved PL decay and fitting curves of the emission for $(C_8H_{17}NH_2)_2Sn_{1-x}Mn_xBr_4$ (a) x=0.07 (b) x=0.47 (c) x=0.55 and (d) x=0.61, respectively.

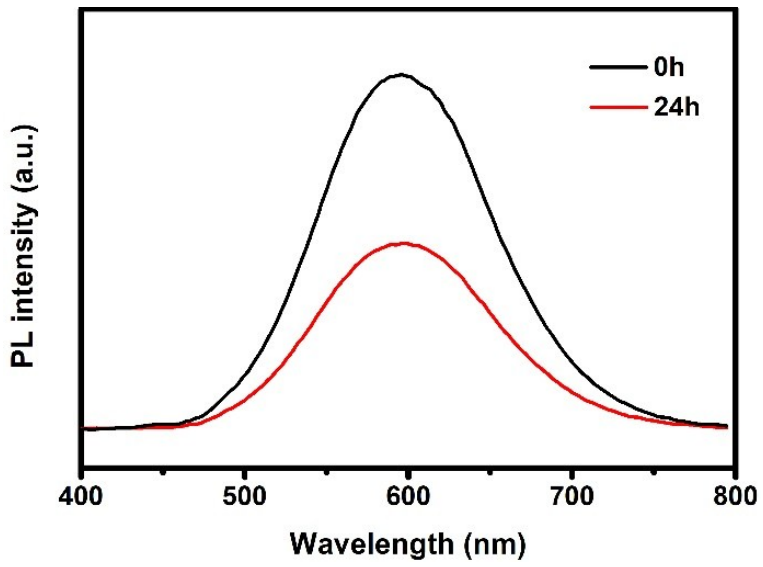

Figure S3. Photoluminescence spectra of $(C_8H_{17}NH_2)_2Sn_{1-x}Mn_xBr_4$ (x=0.26) powders after being stored in air for 24 hours.

Table S1. Summary progress of the PLQY of Mn-doped 2D perovskites synthesized by solid-state grinding.

Mn-doped 2D perovskites	Synthesis highlight	PLQY	Ref.
Mn-doped $(C_6H_{18}N_2O_2)PbBr_4$	Solid-state grinding	12%	[18]
Mn-doped $(C_4H_9NH_3)_2PbCl_4$	Solid-state grinding	27%	[21]
Mn-doped $(C_4H_9NH_3)_2PbBr_4$	Solid-state grinding	37%	[30]
Mn-doped $(C_8H_{17}NH_2)_2SnBr_4$	Solid-state grinding	42%	This work

Table S2. PL emission peak wavelengths FWHM, solid PLQYs excited by 365 nm, and PL decay lifetimes excited by 340 nm of $(C_8H_{17}NH_2)_2Sn_{1-x}Mn_xBr_4$ (x=0.07, 0.26, 0.47 and 0.61).

$(C_8H_{17}NH_2)_2Sn_{1-x}Mn_xBr_4$	PL (nm)	FWHM (nm)	PLQY (%)	Lifetime (ns)
X=0.07	587	110	63.95	3708.72
X=0.26	593	116	41.93	4090.67
X=0.47	600	121	38.76	3809.81
X=0.61	603	124	1.89	4166.33