Supporting Information

The Red Light Emission in 2D $(C_4SH_3CH_2NH_3)_2SnI_4$ and $(C_4OH_7CH_2NH_3)_2SnI_4$ Perovskites

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Table S1. Elemental analysis of the $(TPM)_2SnI_4$ perovskite performed by X-ray fluorescence spectroscopy

No.	Component	Result	Unit	Detection limit	Elemental line	Intensity
1	C	11.8588	mass%	0.10757	C-KA	19.6850
2	S	9.2842	mass%	0.00368	S-KA	144.2332
3	Cl	0.4592	mass%	0.00909	Cl-KA	1.5698
4	Sn	13.3760	mass%	0.06005	Sn-KA	23.6686
5	I	65.0218	mass%	0.22799	I-KB1	84.3837

Table S2. Elemental analysis of the $(TFF)_2SnI_4$ perovskite performed by X-ray fluorescence spectroscopy

No.	Component	Result	Unit	Detection limit	Elemental line	Intensity
1	C	7.4117	mass%	0.05228	C-KA	25.1218
2	Cl	0.0683	mass%	0.00856	Cl-KA	0.2706
3	Sn	11.2432	mass%	0.06599	Sn-KA	19.8557
4	I	81.2768	mass%	0.25079	I -KB1	105.8344

Table S3. Crystallographic data for $(TPM)_2SnI_4$ and $(TFF)_2SnI_4$ perovskites prepared from SnO

Empirical formula	**$(TPM)_2SnI_4$**	**$(TFF)_2SnI_4$**
Formula weight	854.66	830.60
Temperature (K)	298	298
Wavelength (Å)	0.700	0.700
Crystal system	Orthorhombic	Monoclinic
Space group	*Pbca*	$P2_1/c$
Unit cell dimensions		
a, Å	8.7730(18)	16.341(5)
b, Å	8.6580(17)	8.8044(17)
c, Å	28.961(6)	8.7912(17)
α, deg	90°	90°
β, deg	90°	91.19(2)°
γ, deg	90°	90°
Volume(Å^3)	2199.8(8)	1264.6(5)
Z	4	2
Density (calculated)(Mg/m^3)	2.581	2.181
Absorption coefficient(mm^{-1})	6.589	5.894
F(000)	1536	752
Crystal size(mm^3)	0.570 × 0.073 × 0.033	0.670 × 0.047 × 0.036
Theta range for data collection	2.674 to 33.555°	2.628 to 30.550°
Index ranges	-12 ≤ h ≤ 12, -11 ≤ k ≤ 11, -42 ≤ l ≤ 42	-22 ≤ h ≤ 22 -12 ≤ k ≤ 11 -11 ≤ l ≤ 12
Reflections collected	22122	15559
Independent reflections	3767 [R(int) = 0.1093]	3368 [R(int) = 0.1213]
Completeness to theta = 25.242°	97.3 %	99.9 %
Refinement method	Full-matrix least-squares on F^2	Full-matrix least-squares on F^2
Data/restraints/ parameters	3767 / 6 / 89	3368 / 45 / 88
Goodness-of-fit on F^2	1.208	1.159
Final R indices [I > 2sigma(I)]	R1 = 0.1587, wR2 = 0.2828	R1 = 0.1630, wR2 = 0.3832
R indices (all data)	R1 = 0.1694, wR2 = 0.2910	R1 = 0.1744, wR2 = 0.3905
Absolute structure parameter		
Extinction coefficient	0.175(11)	
Largest diff. peak and hole (e Å^{-3})	4.710 and -9.534	12.193 and -3.889

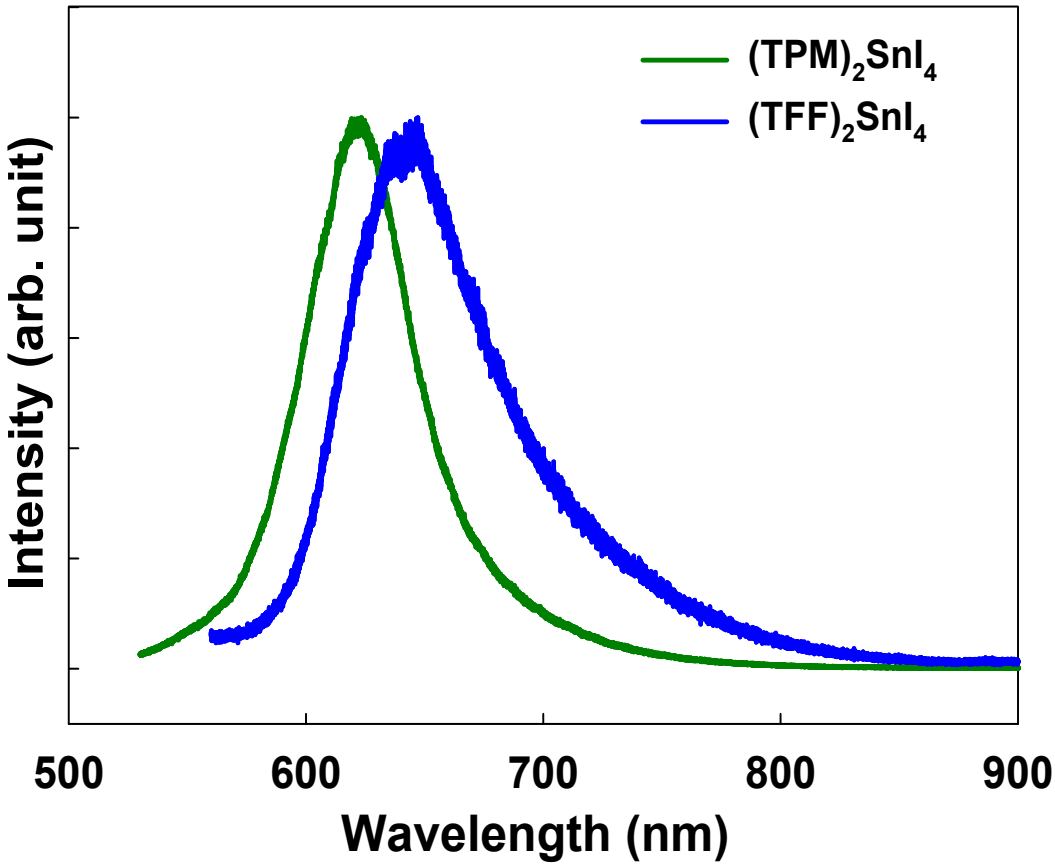

Figure S1. Photoluminescence spectra for the crystals of $(TPM)_2SnI_4$ and $(TFF)_2SnI_4$ perovskites prepared from SnO. The excitation wavelength is 514 nm.

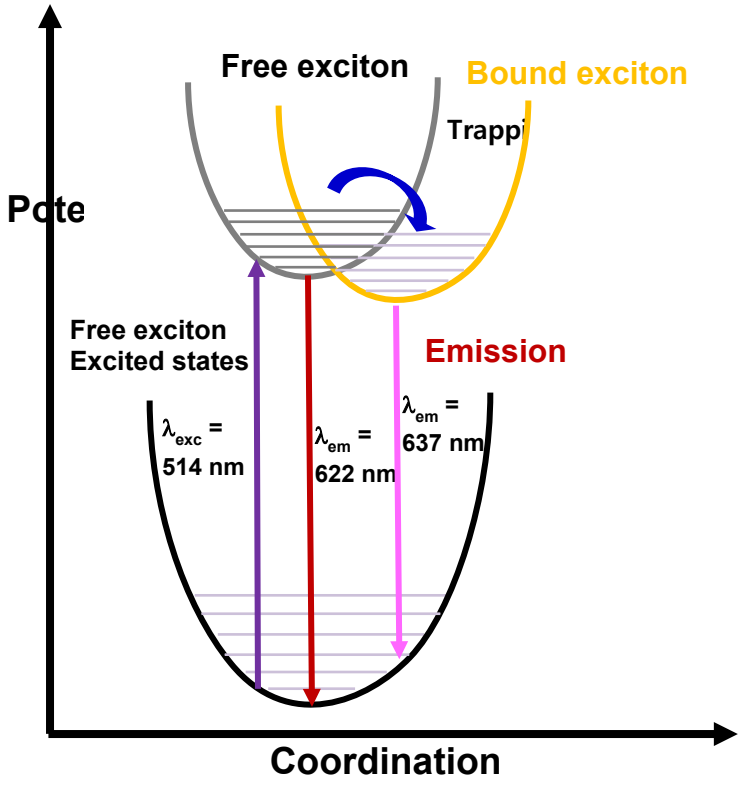

Figure S2. Configuraion coordinate diagram for free excition and bound exciton state for the compound $(TPM)_2SnI_4$

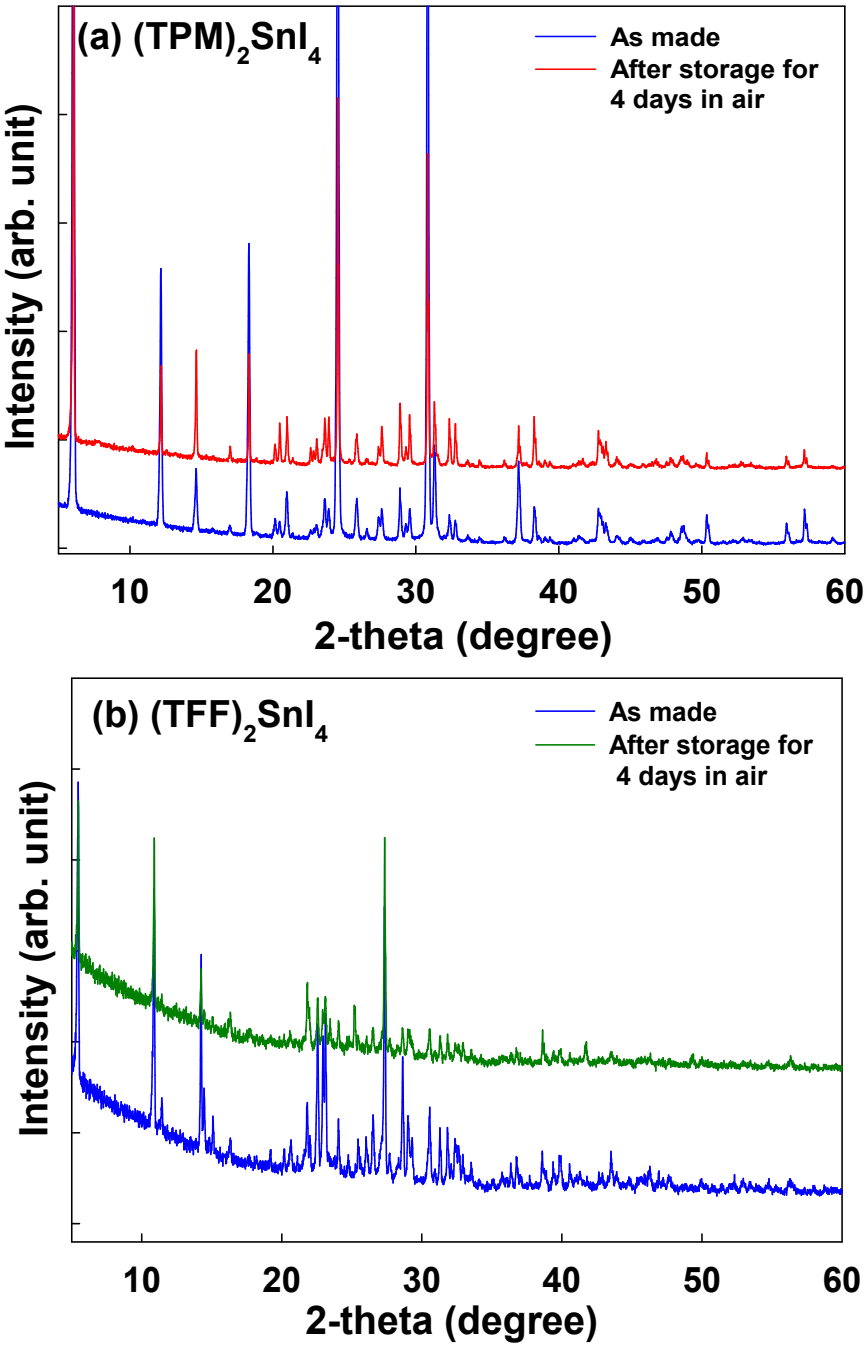

Figure S3. Comparison of the PXRD patterns for the as made $(TPM)_2SnI_4$ and $(TFF)_2SnI_4$ perovskites crystals and the ones after storage in air for 4 days.