Supplementary Information for article

Optical and scintillation properties of hybrid manganese(II) halides with formamidinium and acetamidinium cations

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Table S1. Parameters of the crystal structure refinement.

Phase	**Ac_2MnBr_4**	**FA_3MnBr_5**	**$(i\text{-}PrOH)_4MnBr_2$**
Empirical formula	$C_4H_{14}Br_4MnN_4$	$C_3H_{15}Br_5MnN_6$	$C_{12}H_{32}Br_2MnO_4$
M, g/mol	492.73	589.65	455.12
Crystal system	Triclinic	Orthorombic	Monoclinic
Space group	$P\bar{1}$	*Pnma*	$P2_1/c$
a, Å	7.87110(7)	11.2782(4)	5.78966(8)
b, Å	7.97838(9)	15.3630(4)	10.52718(16)
c, Å	12.90853(12)	9.5551(2)	16.74863(19)
α, deg.	72.6600(9)	90	90
β, deg.	78.5236(7)	90	97.3885(12)
γ, deg.	67.0044(10)	90	90
V, Å^3	709.158(14)	1655.58(8)	1012.33(2)
Z	2	4	2
D (calc), g/cm^3	2.307	2.366	1.493
μ, mm^{-1}	20.549	20. 517	9.980
F(000)	462	1100	462
Crystal size, mm	0.18×0.05×0.04	0.34×0.24×0.22	0.10×0.10×0.10

Θ range for data collection, deg.	3.603 – 77.991	3.88 – 77.58	4.974 – 77.759
Index ranges	$-9 \le h \le 9$ $-10 \le k \le 9$ $-16 \le l \le 16$	$-14 \le h \le 13$ $-17 \le k \le 19$ $-8 \le l \le 12$	$-7 \le h \le 7$ $-13 \le k \le 12$ $-21 \le l \le 20$
Reflections collected/independent	93076/3004	9286/1772	11458/2139
R_{int}	0.0850	0.0978	0.0413
Reflections with I>2σ(I)	3001	1705	2001
Goodness-of-fit on F	1.057	1.014	1.076
Final R indices [I>2σ(I)]	$R_1 = 0.0306$ $wR_2 = 0.0826$	$R_1 = 0.0448$ $wR_2 = 0.1100$	$R_1 = 0.0268$ $wR_2 = 0.0601$
R indices (all data)	$R_1 = 0.0306$ $wR_2 = 0.0827$	$R_1 = 0.0466$ $wR_2 = 0.1117$	$R_1 = 0.0297$ $wR_2 = 0.0613$
T_{min} / T_{max}	0.036 / 0.404	0.006 / 0.084	0.352 / 1.000
Largest diff. peak/hole, e/Å^3	1.689/-0.879	1.137/-0.609	0.520 / -0.445

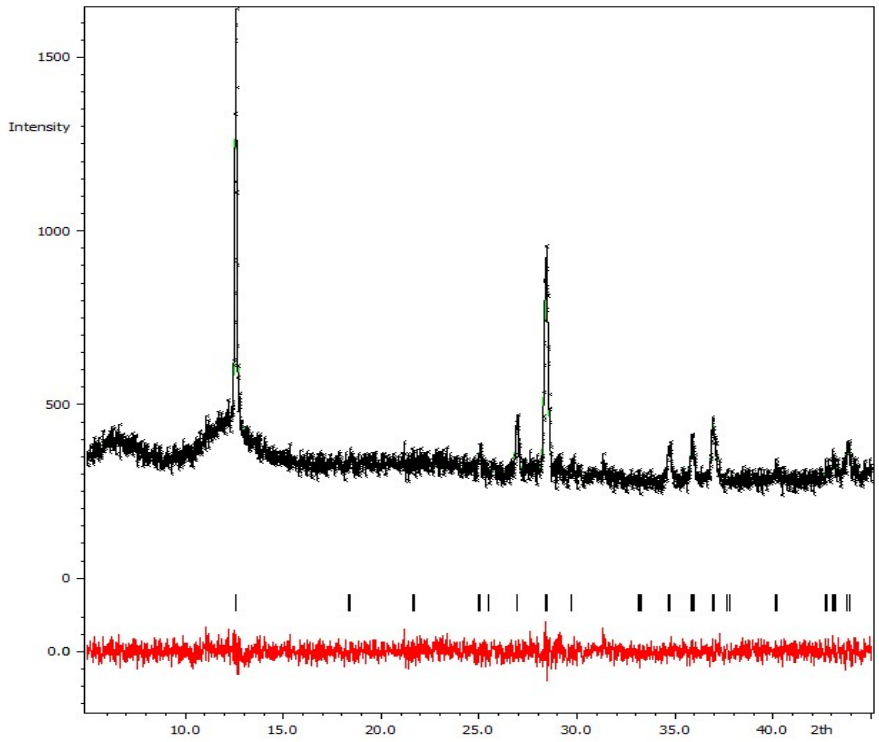

Figure S1. X-ray powder pattern fitting for $FAMnBr_3$. The observed and calculated patterns are shown by black dots and green solid line respectively. The vertical marks show positions calculated for Bragg

reflections. The red trace on the bottom is a plot of the difference between calculated and observed intensities.

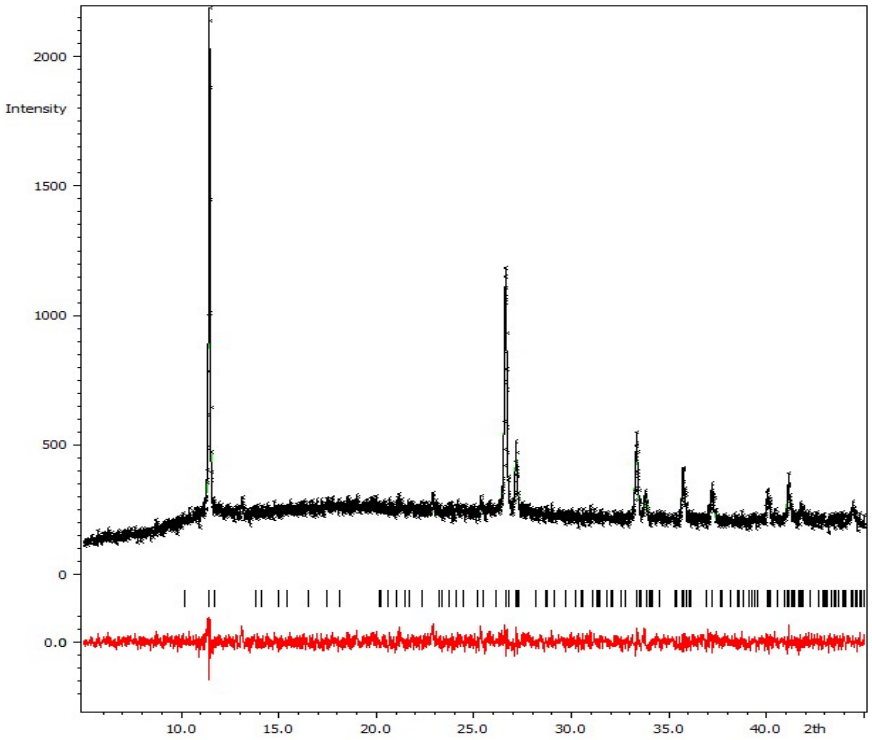

Figure S2. X-ray powder pattern fitting for $AcMnBr_3$. The observed and calculated patterns are shown by black dots and green solid line respectively. The vertical marks show positions calculated for Bragg reflections. The red trace on the bottom is a plot of the difference between calculated and observed intensities.

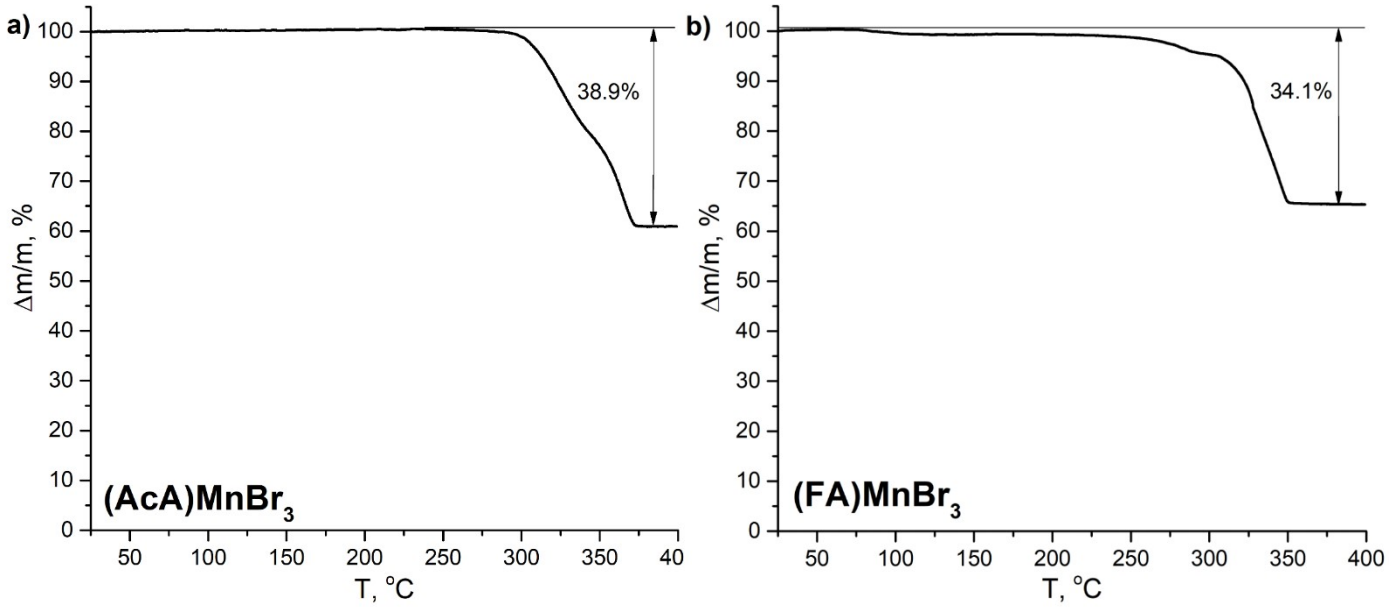

Figure S3. TG mass loss curve of the $(FA)MnBr_3$ and $(AcA)MnBr_3$.

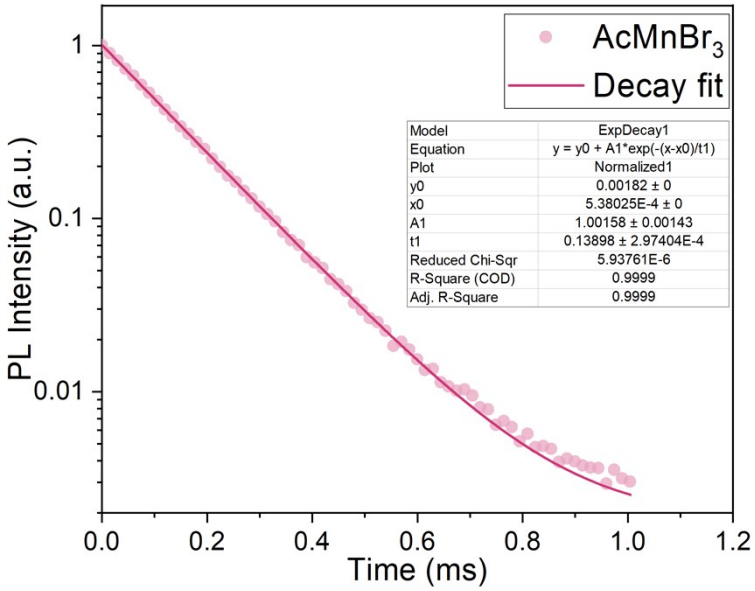

Figure S4. Fitted PL decay curve of the $AcMnBr_3$ powder.

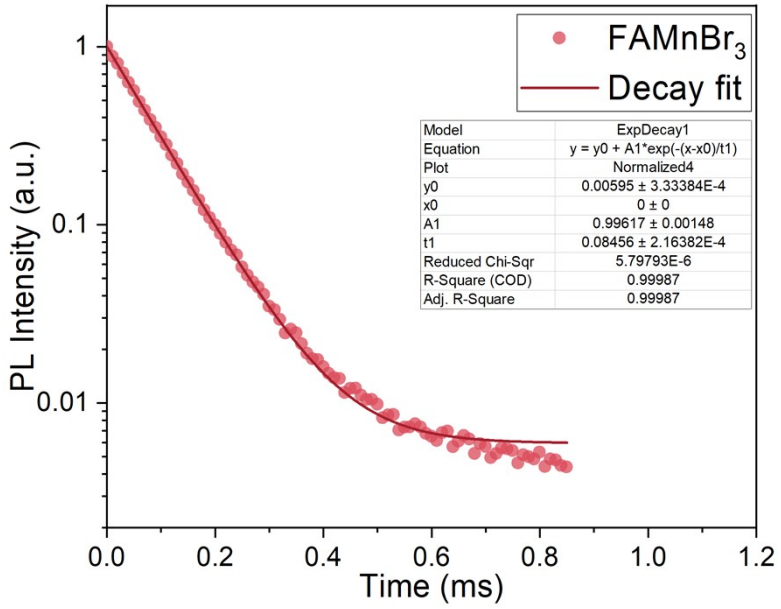

Figure S5. Fitted PL decay curve of the $FAMnBr_3$ powder.

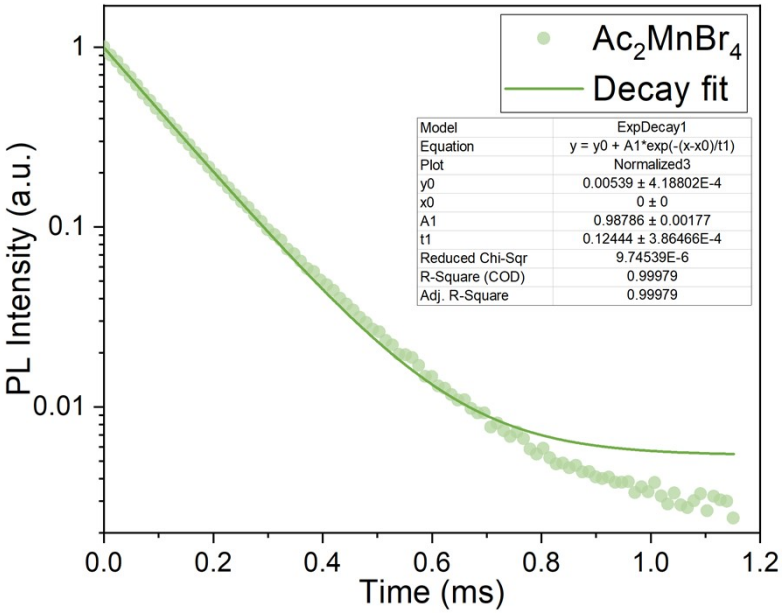

Figure S6. Fitted PL decay curve of the Ac_2MnBr_4 powder.

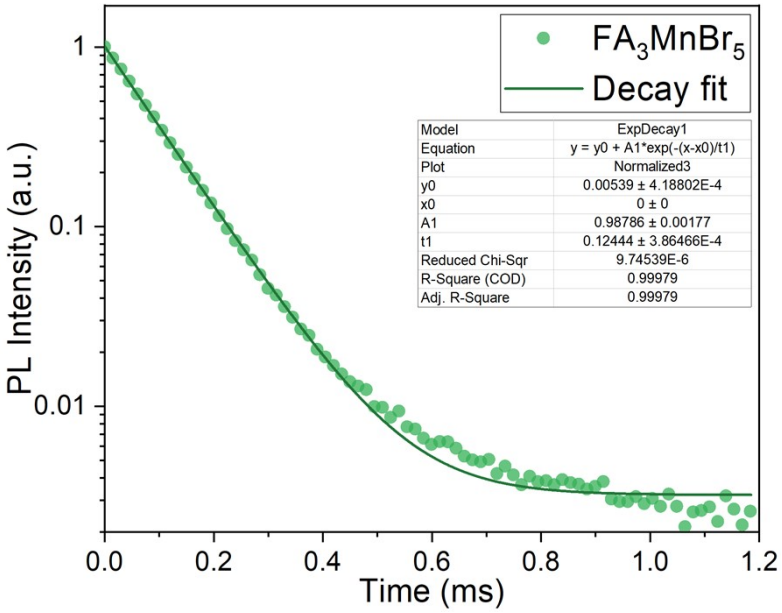

Figure S7. Fitted PL decay curve of the FA_3MnBr_5 powder.

Table S2. Optical properties of the studied phases: photoluminescence excitation maxima (PLE_{max}), photoluminescence maxima (PL_{max}), fullwidth at half maximum (FWHM), Stokes shift, photoluminescence quantum yields (PLQY) and photoluminescence decay times (τ).

Phase	**PLE_{max}, nm/eV**	**PL_{max}, nm/eV**	**FWHM, nm/meV**	**Stokes Shift, nm/eV**	**PLQY, %**	**τ, µs**
$AcMnBr_3$	372/3.33	660/1.88	97/279	120/1.45	43	139.0
$FAMnBr_3$	373/3.32	654/1.90	94/262	118/1.42	4	84.6
Ac_2MnBr_4	272/4.56	525/2.36	52/249	72/2.2	21	126.4
FA_3MnBr_5	277/4.48	518/2.39	53/264	63/2.09	7	96.7