Electronic Supplementary Material (ESI) for RSC Advances.

Stability study of halide perovskite and its enhanced X-ray scintillation from the incorporating of anodic TiO_2 nanotubes

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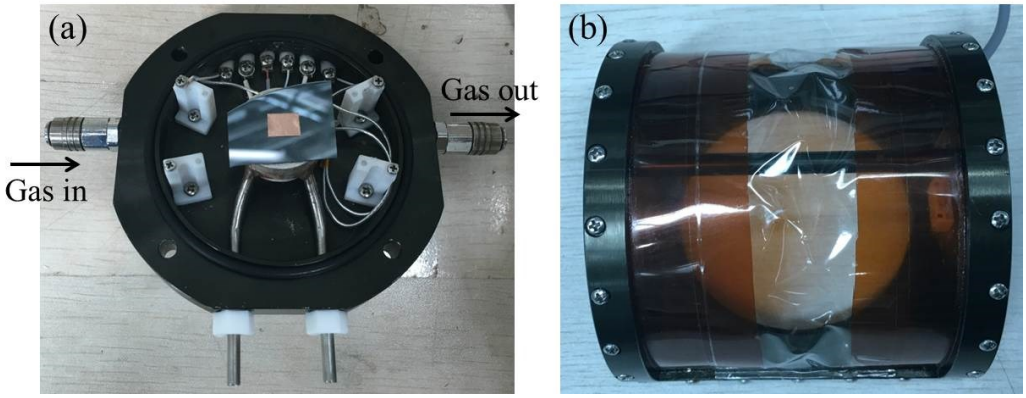

Figure S1. Schematic of the spectrometric measurement setup mounted on the BL14B beamline.

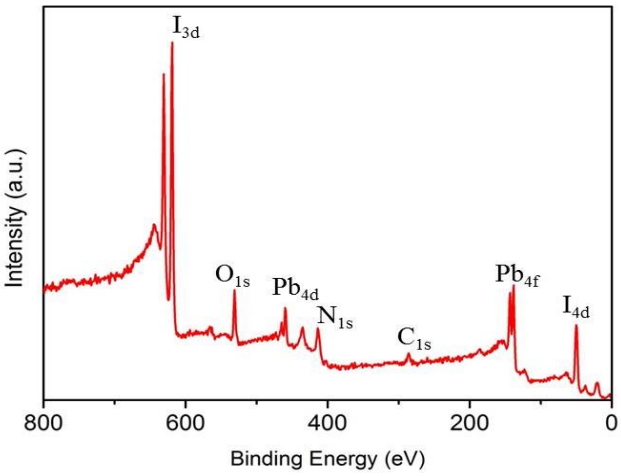

Figure S2. XPS measurements for perovskite $CH_3NH_3PbI_3$ film deposited on FTO glass.

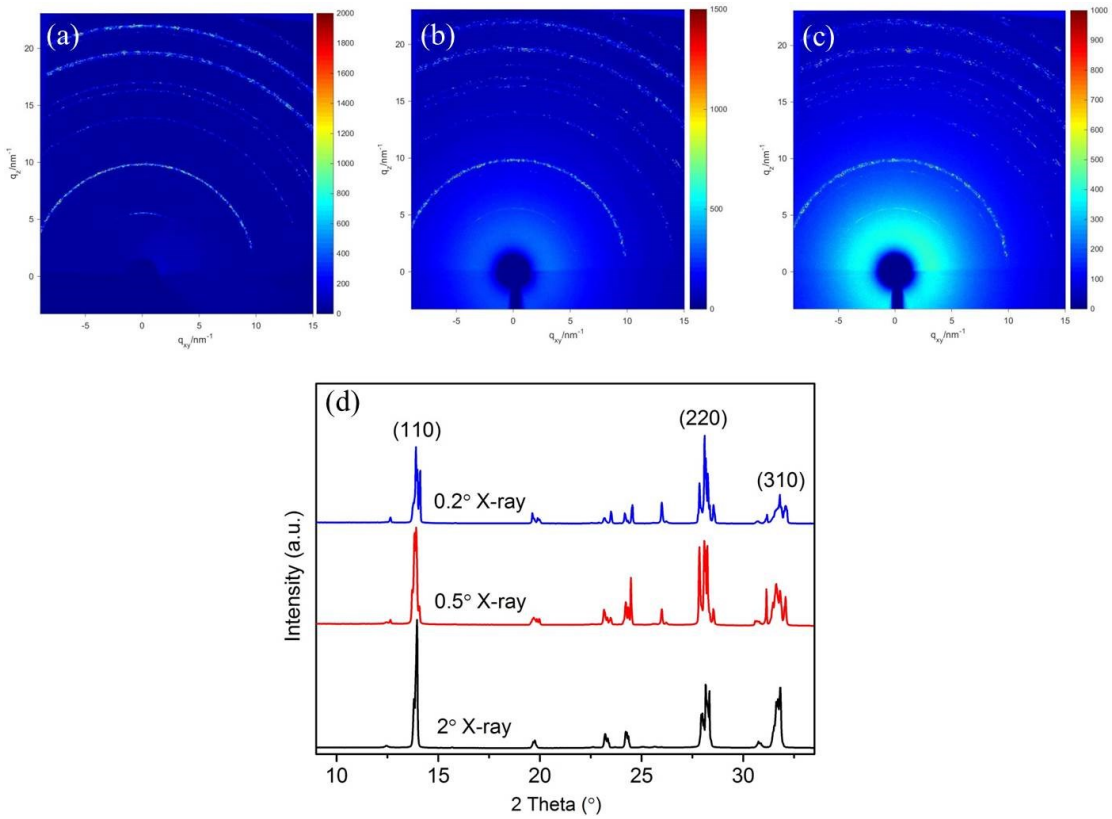

Figure S3. (a)-(c) The two-dimensional diffraction signals of the as prepared $CH_3NH_3PbI_3/TiO_2$ NP films using incident measurement grazing angles of 2°, 0.5°, and 0.2°. (d) The dimensional diffraction spectrum integrated from Figure S3a-3c in the out-of-plane direction.

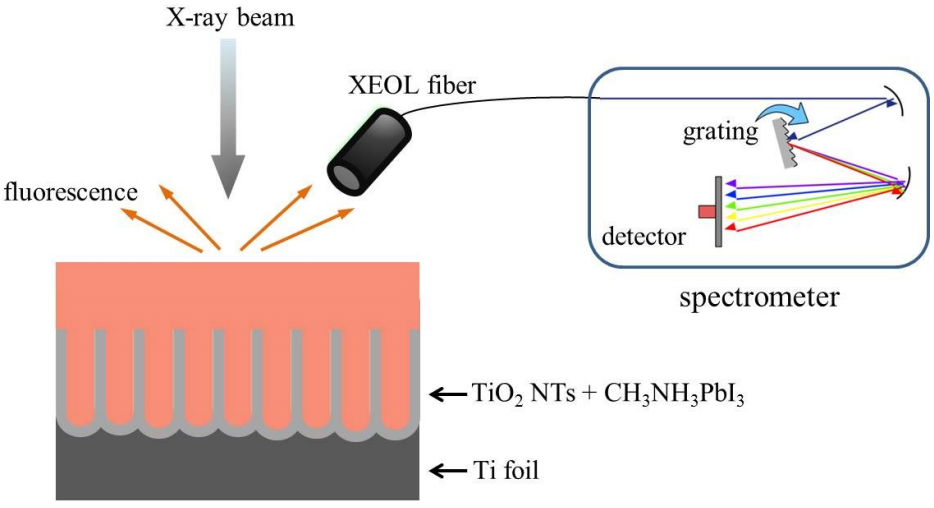

Figure S4. Schematic of the spectrometric measurement setup mounted on the BL13W beamline at SSRF.

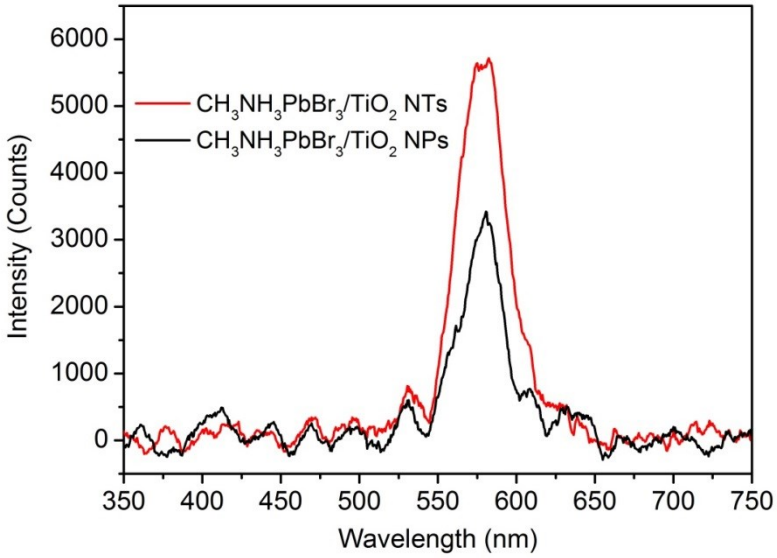

Figure S5. XEOL spectra of $CH_3NH_3PbBr_3/TiO_2$ NPs and $CH_3NH_3PbBr_3/TiO_2$ NTs with 40 keV X-ray excitation.

Table S1. Parameters obtained from fitting the Pb L3 EXAFS by scattering from a single coordination shell of iodine.

Sample	Atomic number, N[a]	Amplitude damping factor, S_0^2	Debye-Waller factor, σ^2 (Å^2)	Bond length, Pb-I_2, *r* (Å)	R factor
$CH_3NH_3PbI_3$	6	0.6777	0.0165	3.1415	0.0089
$CH_3NH_3PbI_3$, 80%RH	6	0.7037	0.0176	3.1858	0.0037

Table S2. Fitted parameters for $CH_3NH_3PbI_3$ samples prepared on TiO_2 nanotubes or TiO_2 nanoparticles.

Fluorescence decay profiles were fitted by exponential function equation: $I(t)=A_0+A_1*exp(-t/\tau_1)+A_2*exp(-t/\tau_2)$. τ_1 and τ_2 denote the decay time for the faster and the slower components, and A_1 and A_2 are the fluorescence amplitudes.

Sample	A_0	τ_1 (ns)	τ_2 (ns)	A_1	A_2
$CH_3NH_3PbI_3/TiO_2$ nanotubes at (790 nm)	0.14	12.9	220	40	1
$CH_3NH_3PbI_3/TiO_2$ nanoparticles at (790 nm)	0.26	12	170	80	0.9