Supporting Information

**All-inorganic Mn$^{2+}$-doped metal halide perovskite crystals toward late-time detection of X-ray afterglow imaging**

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Figure S1. PLE/PL spectra of undoped CCCP crystal.
Figure S2. a) PLE and b) PL spectra of CCCP:x%Mn (x=0-30) crystals.
Figure S3. Tamable-Sugano diagram for the illustration of Mn$^{2+}$ fluorescence in CCCP crystals.
**Figure S4.** Fluorescence decay curves of CCCP:0%Mn ($\lambda_{ex}=255$ nm, $\lambda_{em}=596$ nm).
Figure S5. a) Temperature-dependent PL spectra of CCCP:10%Mn. b) Fitting diagram of FWHM and temperature.
Figure S6. TL curves of CCCP:2%Mn crystals collected after 254 nm UV light excitation for different times (1-180 s).
**Figure S7.** TL curves of CCCP:2%Mn crystals collected after X-ray irradiation for different times (1 s-3 min).
Figure S8. MTF curve of the CCCP:2%Mn flexible film, measured by the slanted-edge method (inset).