Supplementary Materials

Morphologically controlled synthesis of Cs_2SnCl_6 perovskite crystals and their photoluminescence activity

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Characteristics

Powder X-ray diffraction (XRD) patterns were determined using a Bruker AXS D8 Advance diffractometer (Voltage 50 kV, current 40 mA, Cu-Ka) with a step of 0.02˚. High resolution transmission electron microscope (HR-TEM, JEM-2100) was employed to determine the size and morphology of nanoparticles. The XPS spectrum was measured using an ESCALAB 250Xi photoelectron spectrometer (Thermo Fisher, UK).

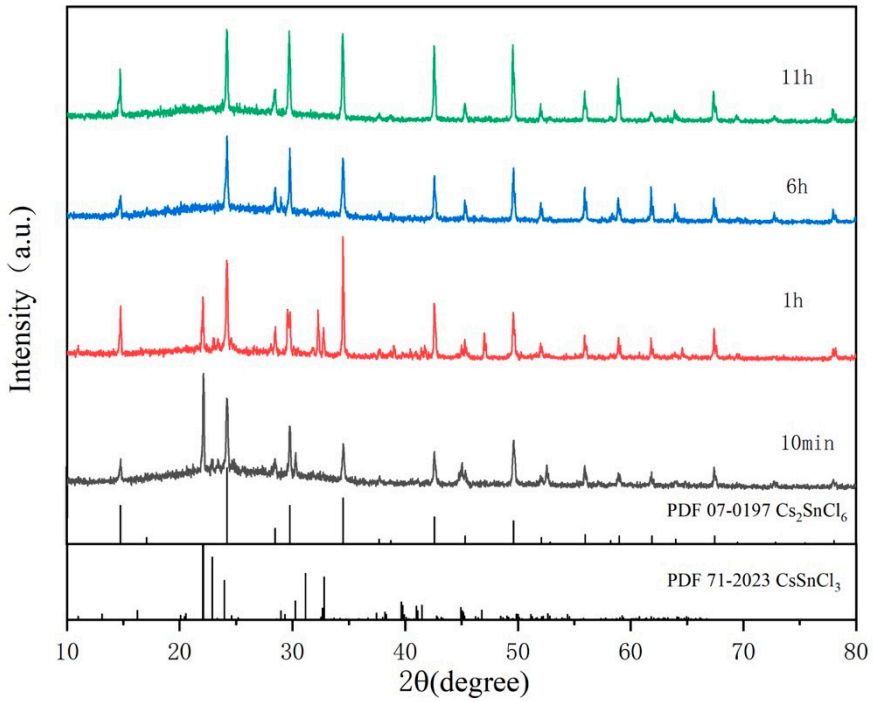

Figure S1. The XRD patterns of the Cs_2SnCl_6 crystals prepared at different time with 5 mol/L HCl and 0.083 mol/L $SnCl_2$ solution.

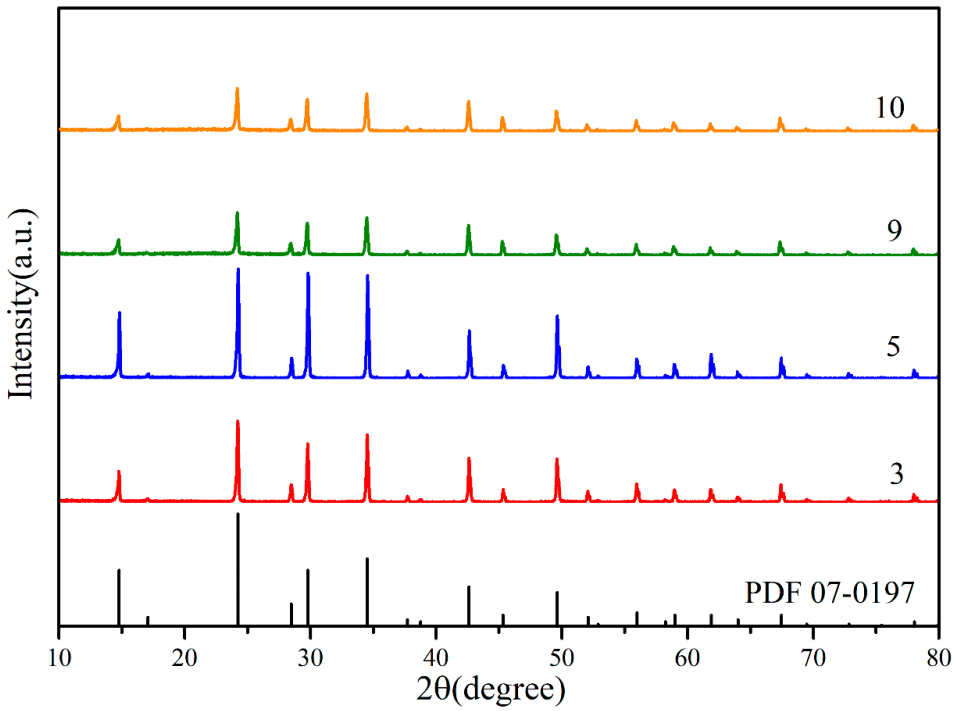

Figure S2. The XRD patterns of the Cs_2SnCl_6 crystals synthesized at different HCl concentrations (3, 5, 9, 10 mol/L) in the aqueous solution with 0.042 mol/L $SnCl_2$ solution.

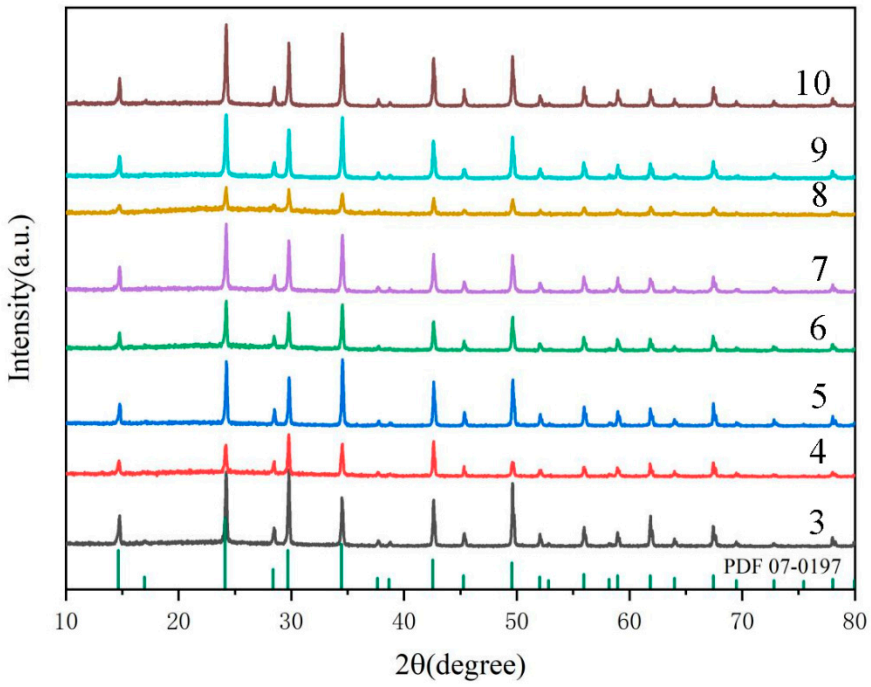

Figure S3. The XRD patterns of the Cs_2SnCl_6 crystals synthesized at different HCl concentrations in the aqueous solution with 0.083 mol/L $SnCl_2$ solution.

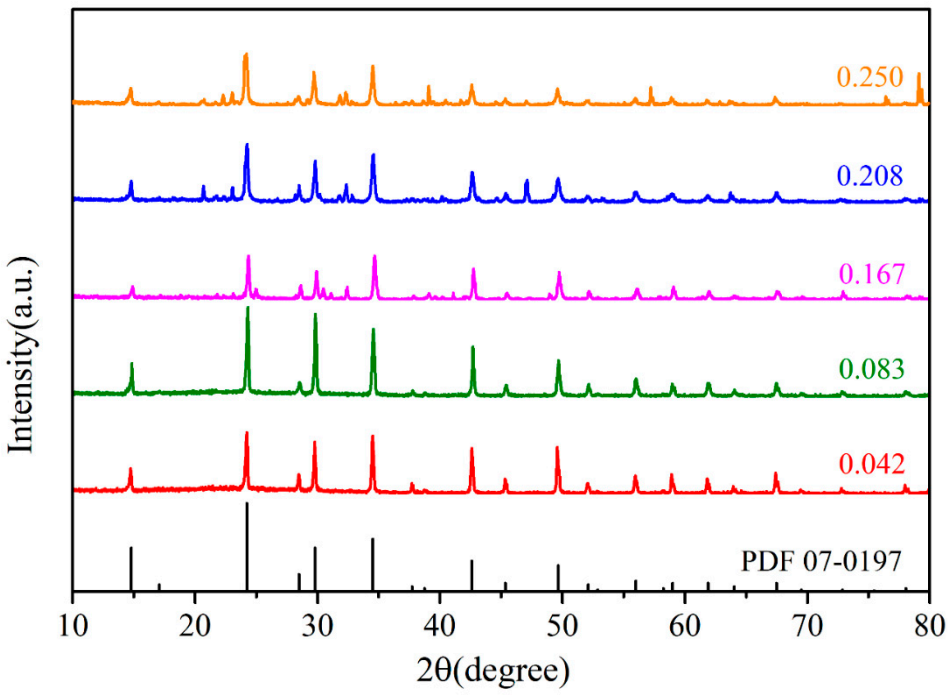

Figure S4. The XRD patterns of the Cs_2SnCl_6 crystals synthesized at different $SnCl_2$ concentration in the aqueous solution with 5 mol/L HCl .

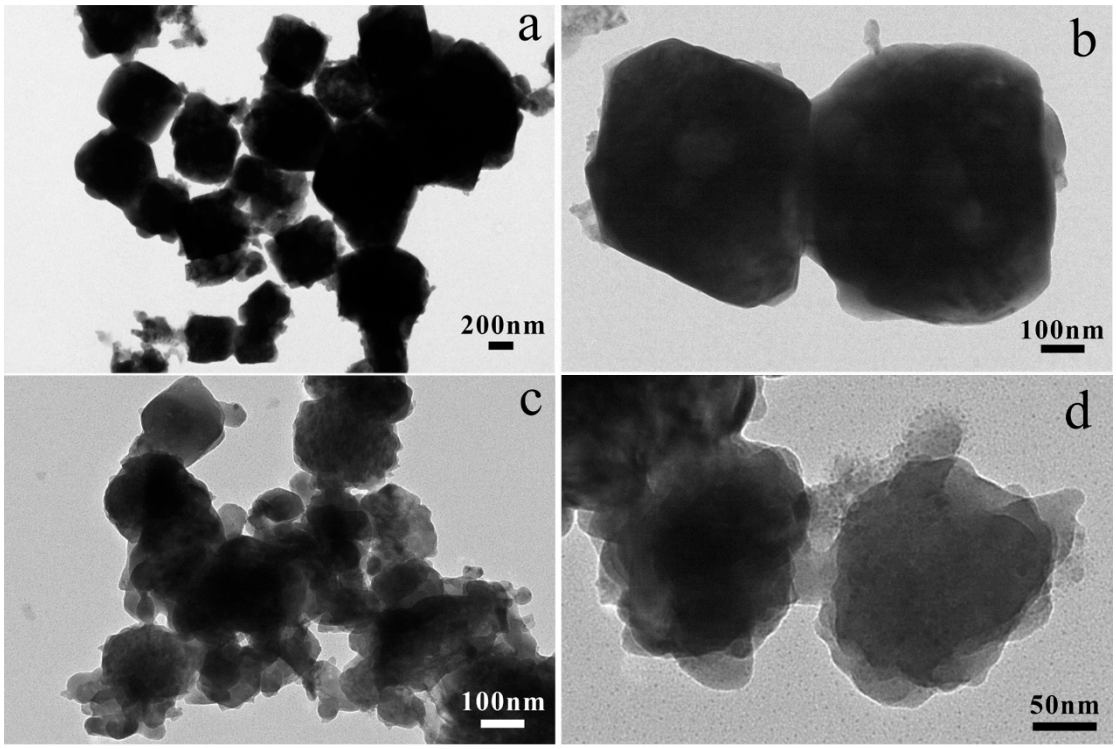

Figure S5. HR-TEM images of the Cs_2SnCl_6 crystals prepared at normal temperature in the aqueous solution with 5 mol/L HCl and $SnCl_2$ concentration of (**a**, **b**) 0.208 mol/L, (**c**, **d**) 0.250 mol/L.

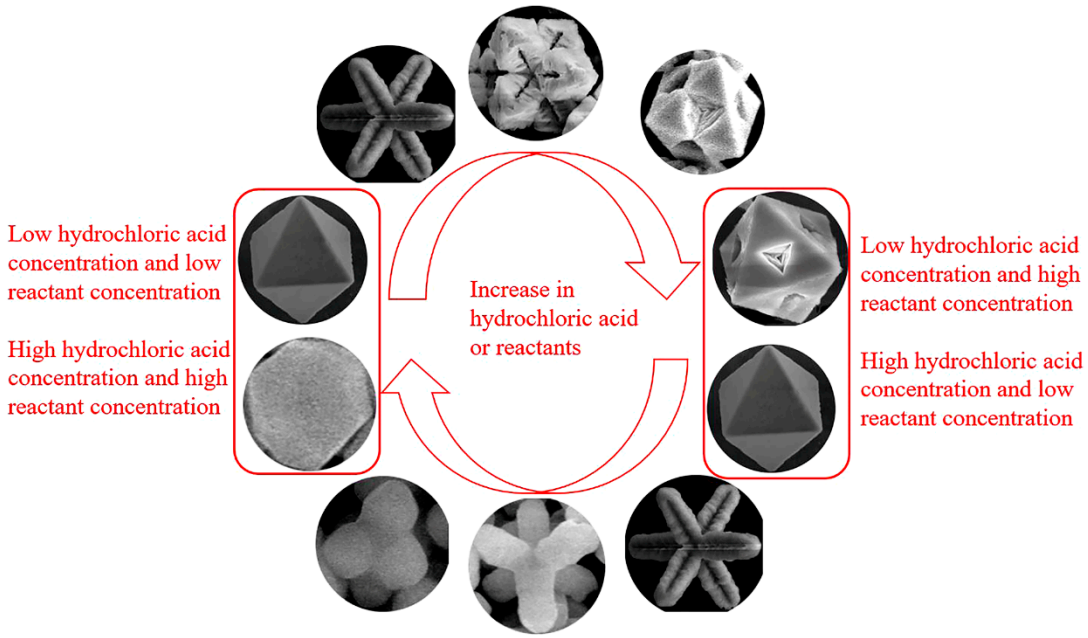

Figure S6. Summary of the crystal morphology and synthesis conditions (the crystal in the figure only represents its own morphology and does not represent a certain synthetic process).

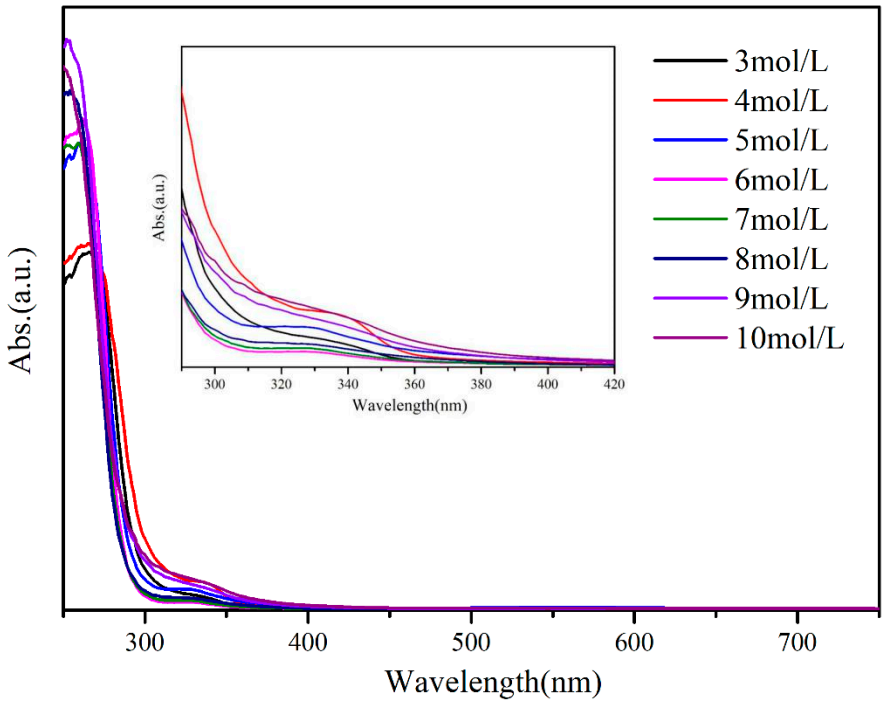

Figure S7. UV-vis absorption spectroscopy of the Cs_2SnCl_6 crystals prepared with 0.083 mol/mL $SnCl_2$ and different concentration of HCl. The inset is the partial magnification between 300–400 nm.

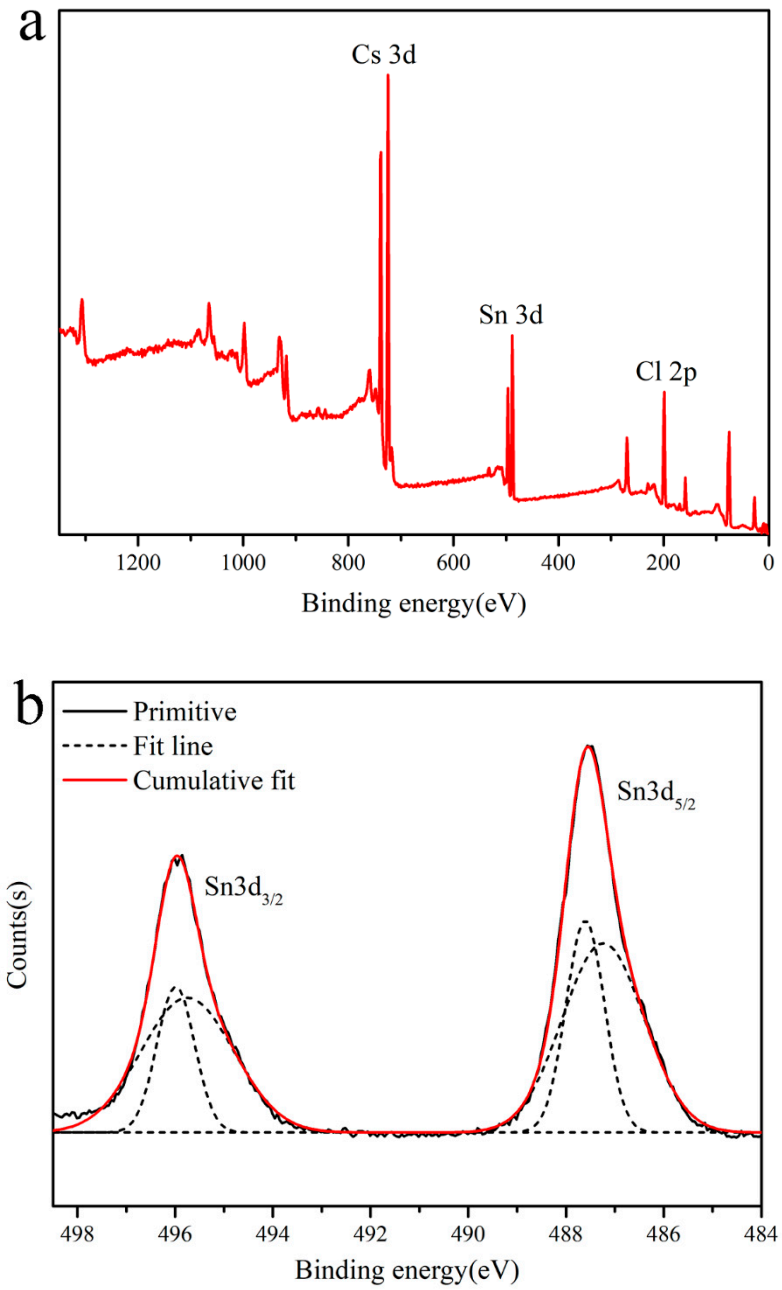

Figure S8. (**a**) XPS survey spectrum of Cs_2SnCl_6 crystals in Figure 8b. (**b**) High-resolution XPS spectra and peak fitting for Sn 3d