

**High-performance X-ray detector based on large-size perovskite
MAPbI₃ single crystal grown by environmentally friendly
solvents and advanced systems**

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Chemicals and reagents:

Chemical reagents lead iodide (PbI_2 , 99%), γ -valerolactone (GVL, 98 %), and hydroiodic acid (HI) (57 wt% in water) were purchased from Adamas Reagent Co., Ltd Aladdin Reagent Co., Ltd., and methyl bromide (CH_3NH_2 , 25 wt%) was purchased from Sinopharm Chemical Reagent Ltd., China, All chemicals were used as received without further purification.

Synthesis of $\text{CH}_3\text{NH}_3\text{I}$

$\text{CH}_3\text{NH}_3\text{I}$ was synthesized by reacting CH_3NH_2 and HI with the molar ratio of 2:1. The HI was added dropwise into the CH_3NH_2 in a flask under a nitrogen atmosphere in an iced bath for 6 h, and the resulting solution was evaporated at 50 °C in a rotary evaporator for about 10 h to remove the solvent. The snow-white $\text{CH}_3\text{NH}_3\text{I}$ crystalline powder was collected using Büchner funnel filtration after being washed three times with anhydrous ethanol and recrystallized in anhydrous diethyl ether, then dried in a vacuum oven at 60 °C overnight. The purity of the $\text{CH}_3\text{NH}_3\text{I}$ powder was characterized using XRD (Figure S1 Supporting Information). The synthesized $\text{CH}_3\text{NH}_3\text{I}$ product is shown in Figure S2.

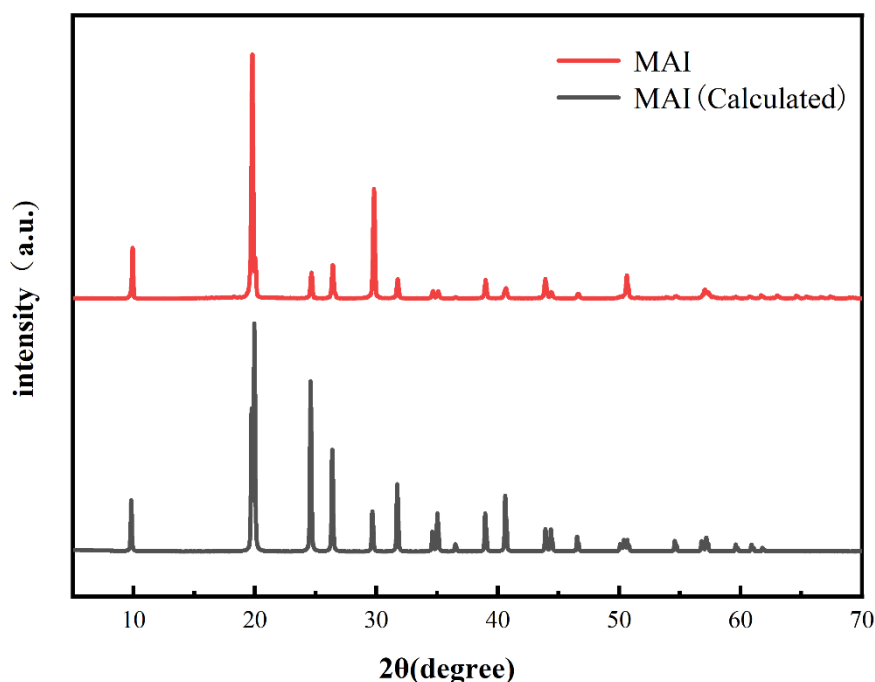


Figure S1. Powder XRD of $\text{CH}_3\text{NH}_3\text{I}$

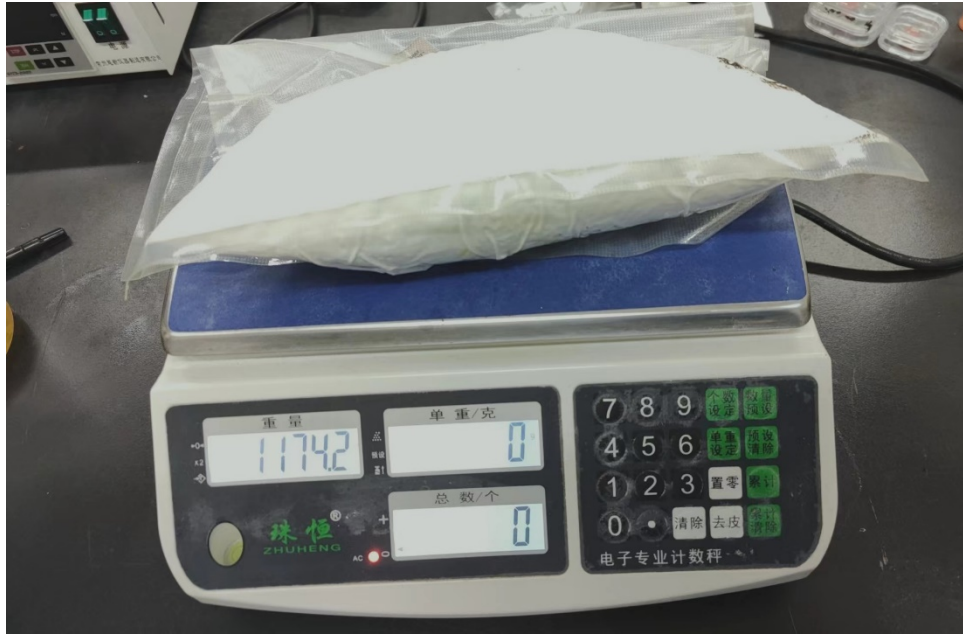


Figure S2. Product of $\text{CH}_3\text{NH}_3\text{I}$

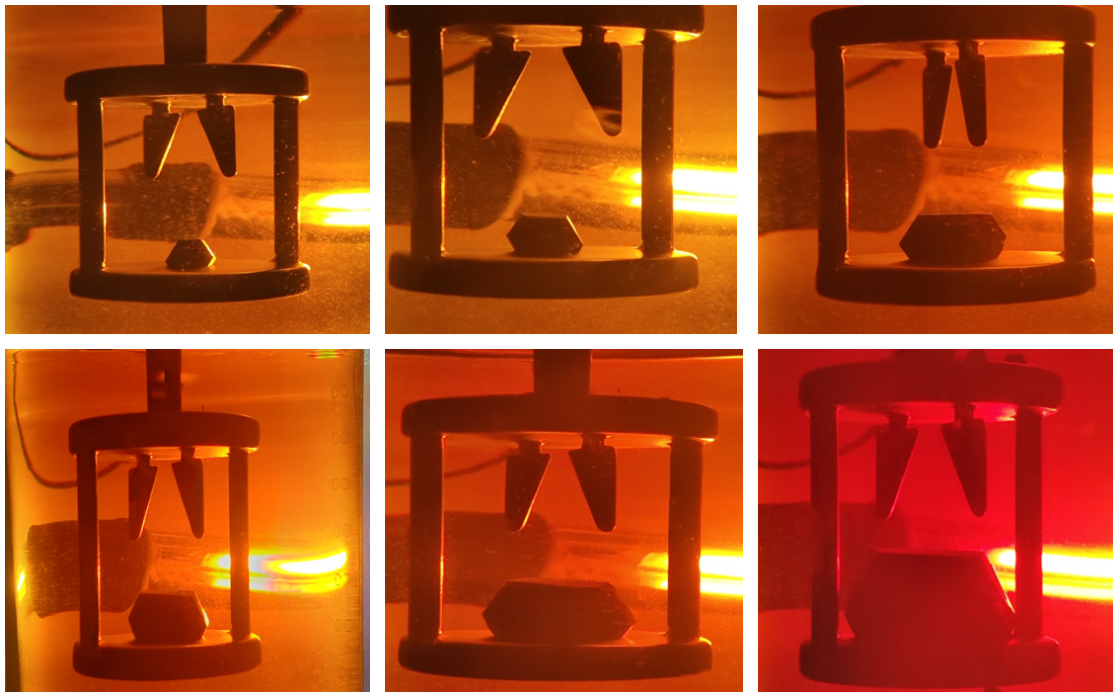


Figure S3. Evolution of the MAPbI_3 crystals growth at different stages