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Supporting information for article:

Study on the vertical Bridgman method of melt-grown CsPbBr3 single crystals for nuclear radiation detection

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Contents

Section S1. The experimental details for wafer treatment and detector fabrication

1.1 Wafer surface treatment

The diamond wire cutting machine STX-202A (*Shenyang Kejing Automation Equipment Co., LTD*) was used to cut the $CsPbBr_3$ single crystal. To remove the damage layer, a series of careful treatments were performed on the wafer surface. Al_2O_3 abrasives with 14 μm in diameter and then 7 μm, 1.5 μm and 0.5 μm were used to polish the surfaces of the wafer in turns. Then the polished wafers were immersed in a concentration of 5% bromine methanol solution for 30 s to remove the physical damage of the surface caused by the cutting and mechanical polishing processes. At last, a thin surface passivation layer about several nanometer was made using dilute hydrobromic acid, and covered uniformly on the wafer surface.

1.2 Detector fabrication

Planar circular symmetric composite Ni/Ti metal electrodes with 6mm in diameter and totally 100 nm thick were made by deposition on both side of the well-treated wafer surfaces. After electrode fabrication, the detector was annealed in vacuum drying box under 80 °C for 24h to strengthen the metal-semiconductor contact. Then the detectors were bonded by Au wire to connect with the charge collection circuit which was self-designed on a printed circuit board (PCB).

Section S2. The temperature curve with various temperature settings of the furnace

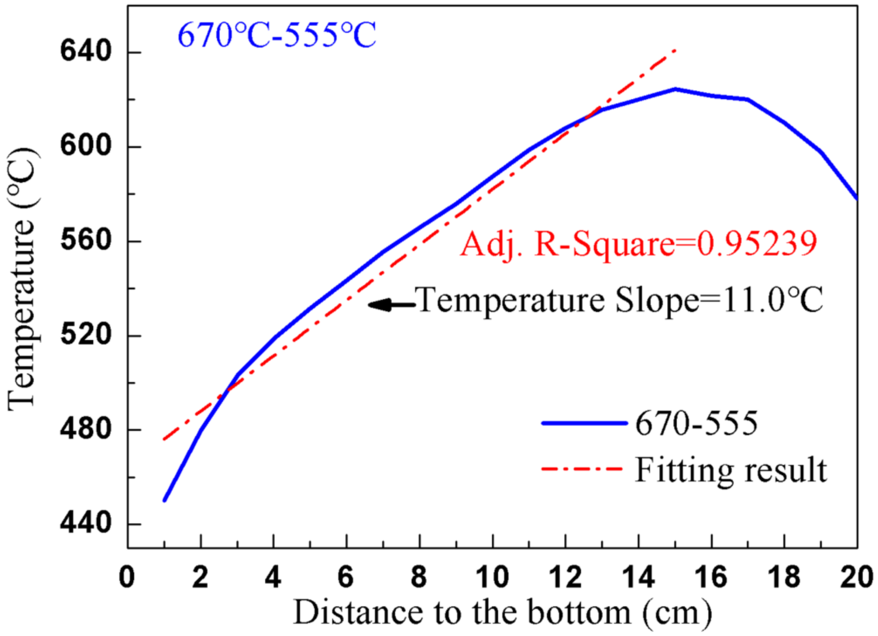

Figure S1. Temperature profile with 11.0°C/cm gradient of the Bridgman tube furnace

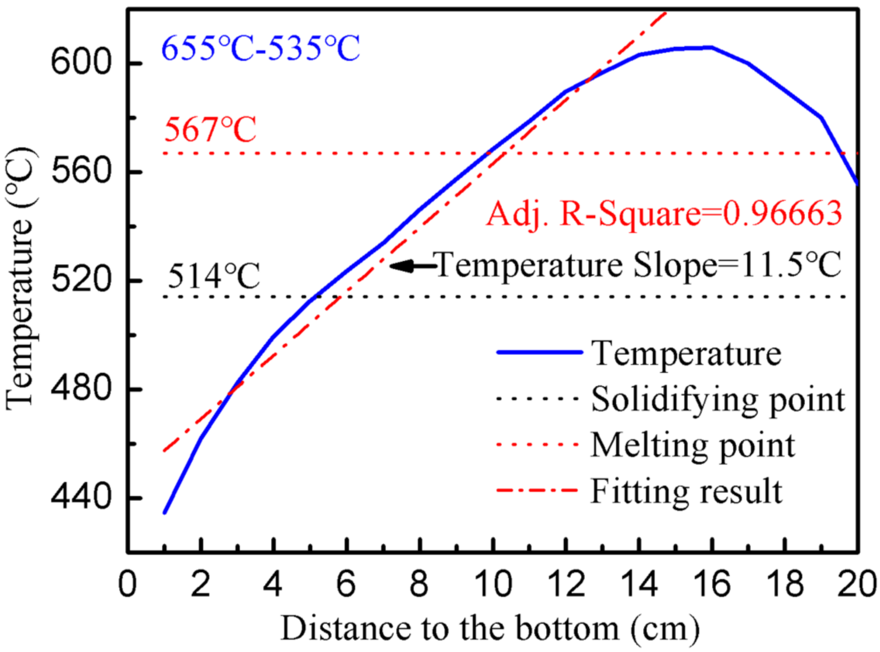

Figure S2. Temperature profile with 11.5°C/cm gradient of the Bridgman tube furnace

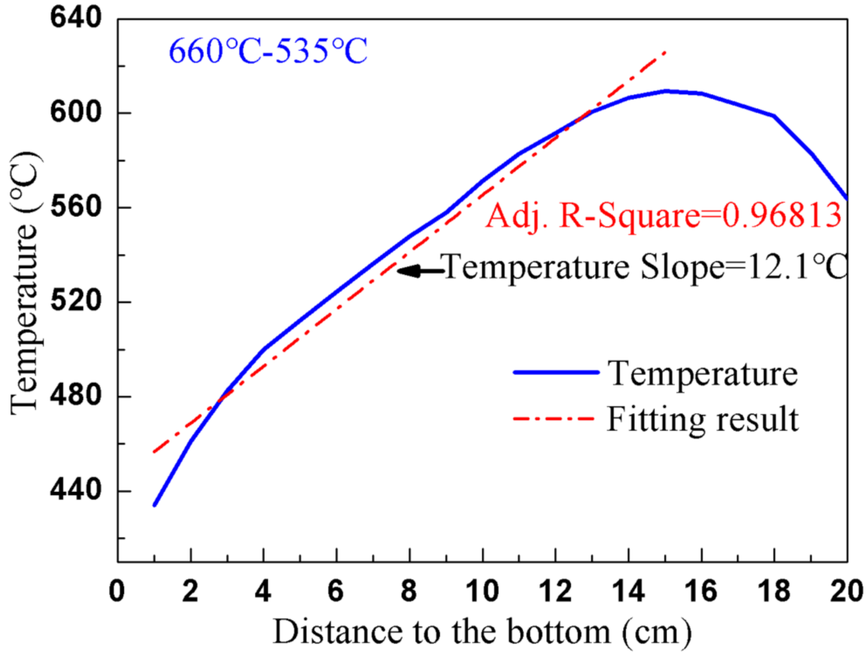

Figure S3. Temperature profile with 12.1°C/cm gradient of the Bridgman tube furnace

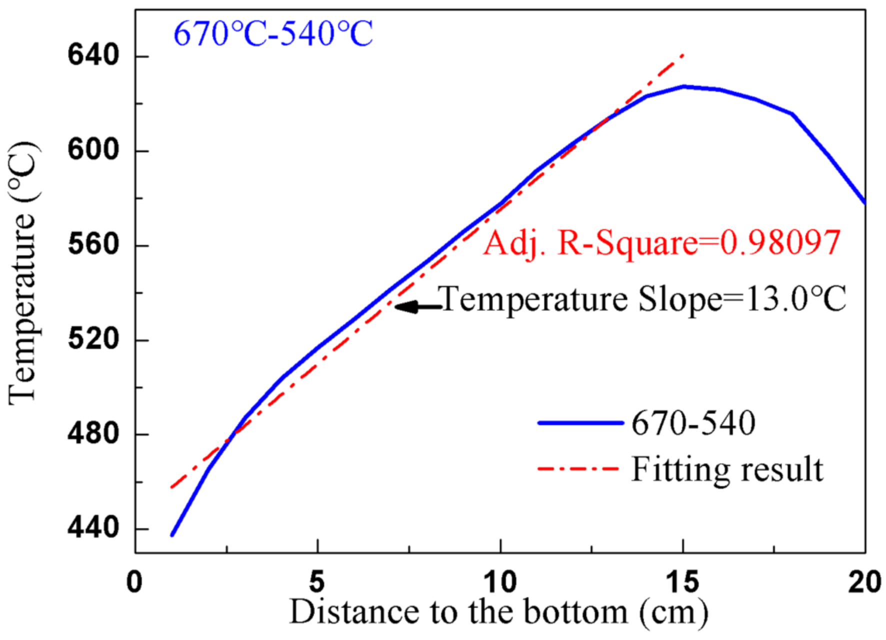

Figure S4. Temperature profile with 13.0°C/cm gradient of the Bridgman tube furnace

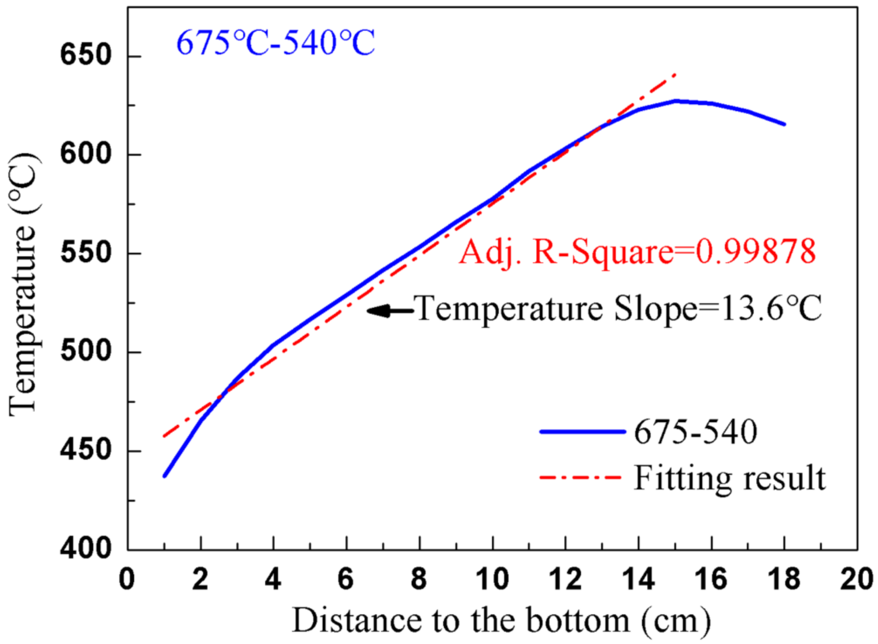

Figure S5. Temperature profile with 13.6°C/cm gradient of the Bridgman tube furnace

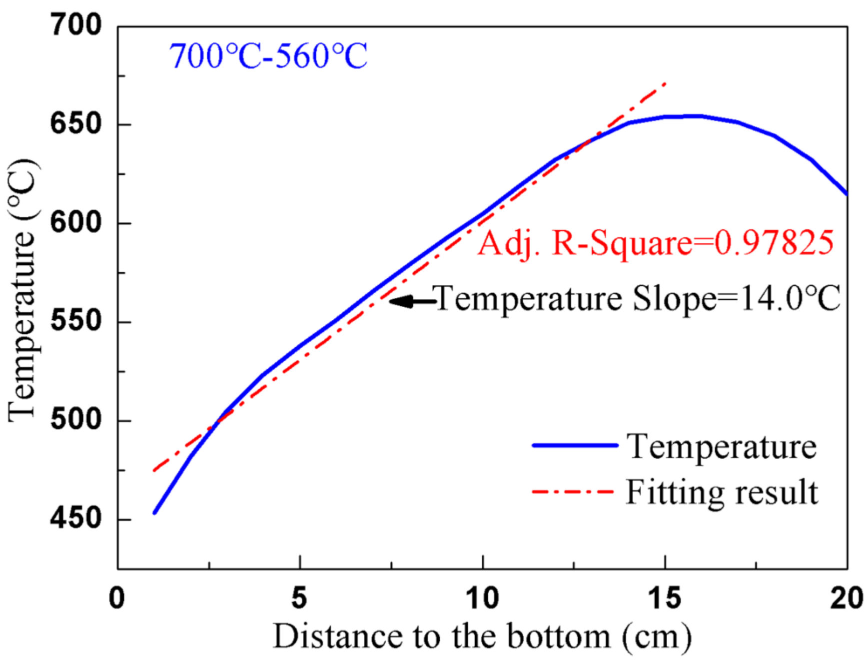

Figure S6. Temperature profile with 14.0°C/cm gradient of the Bridgman tube furnace

Section S3. The influence of crystal parameters for crystal growth

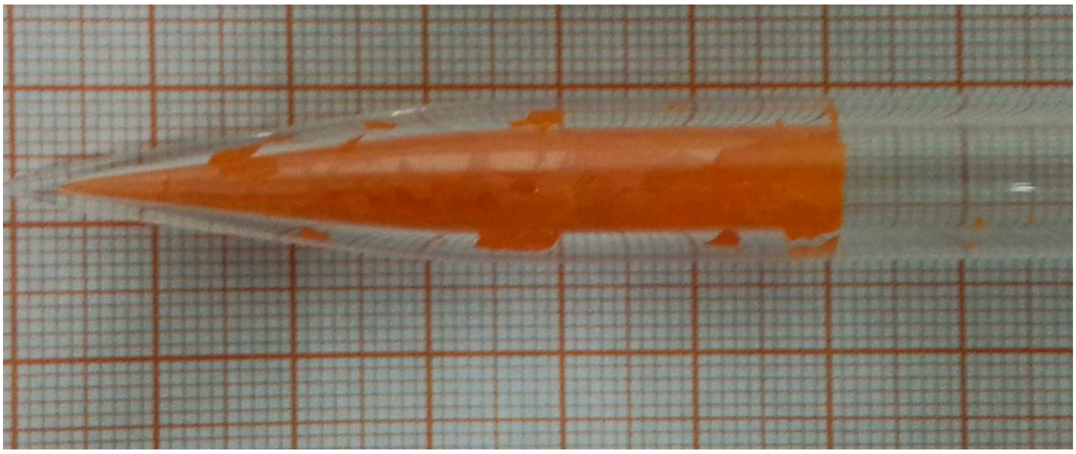

Figure S7. Crystal growth with temperature gradient 3.5°C/cm

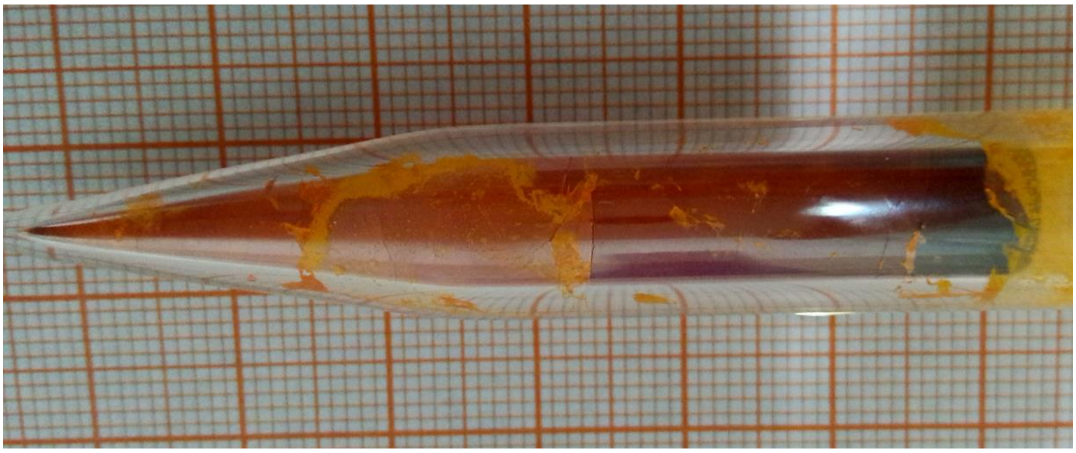

Figure S8. Crystal growth with temperature gradient 5.0°C/cm

Figure S9. Crystal growth with temperature gradient 8.0°C/cm

Figure S10. Crystal growth with a growth rate of 1.0 mm/hr.

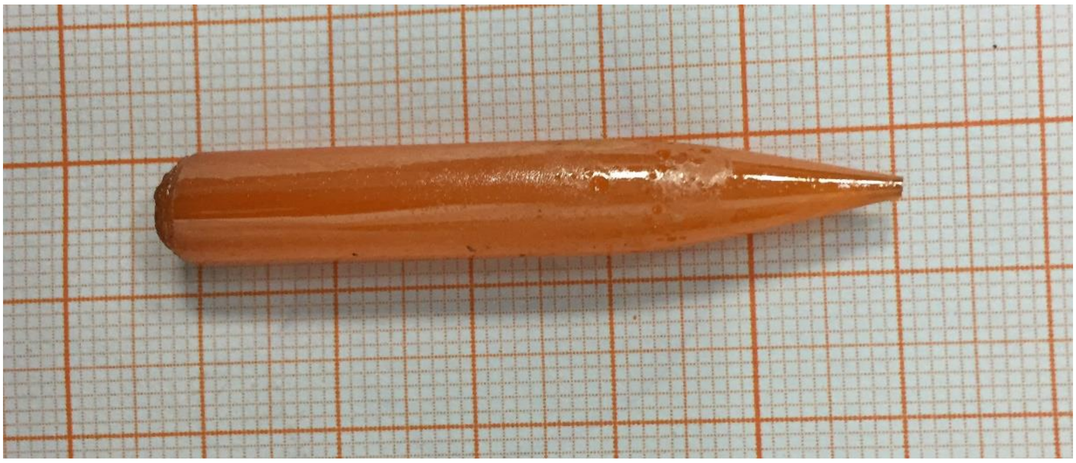

Figure S11. Crystal growth with a growth rate of 0.2 mm/hr.

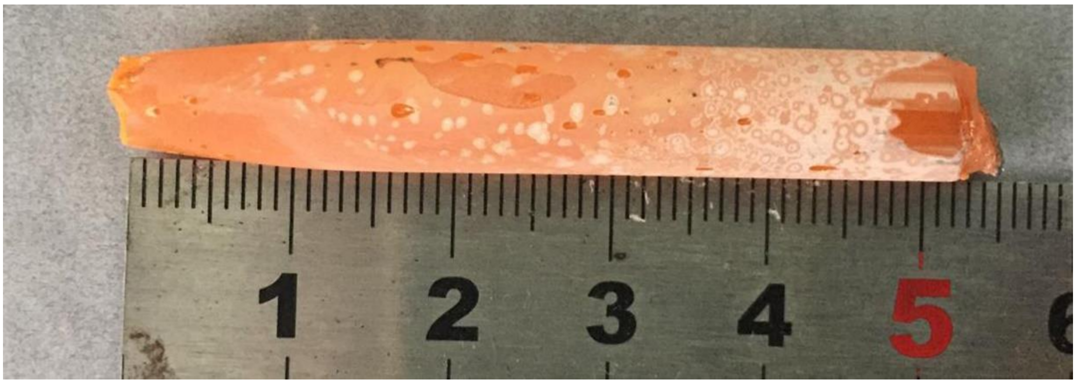

Figure S12. Crystal growth with a growth rate of 0.18 mm/hr.

Reference

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