Supporting Information

Modulation of anisotropic photoluminescence and photocurrent in PEA_2PbI_4 single crystal thin-films

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	PEA_2PbI_4	
Temperature:	RT	100 K
Crystal system:	Triclinic P	Triclinic P
Lattice parameters:	a = 8.725 Å, α = 95.00° b = 8.728 Å, β = 100.14° c = 16.591 Å, γ = 90.39°	a = 8.658 Å, α = 89.65° b = 8.665 Å, β = 85.26° c = 16.240 Å, γ = 89.54°
Unit cell volume:	1250 Å³	1213 Å³

Fig. S1: The lattice parameters of the crystal at room temperature and 100 K.

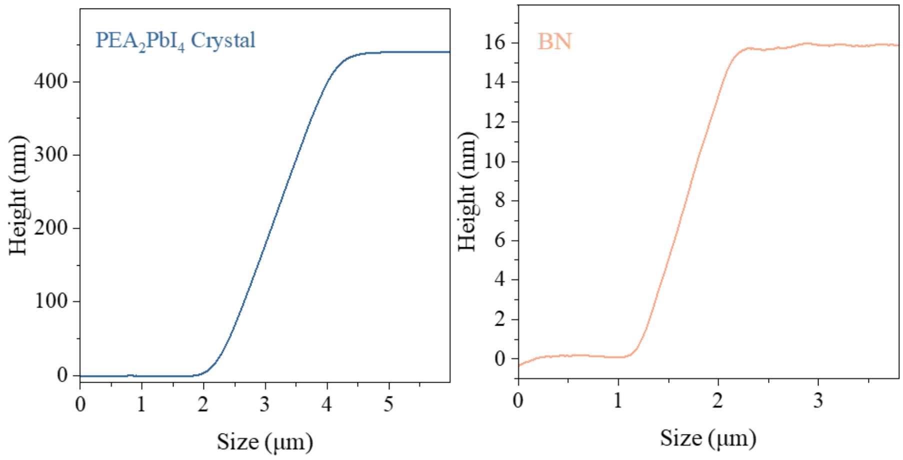

Fig. S2: The thicknesses of PEA_2PbI_4 and BN.

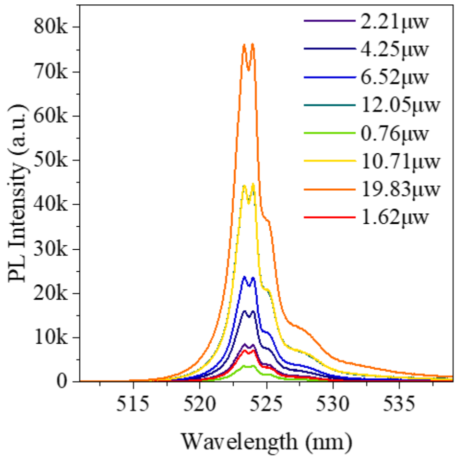

Fig. S3: The excitation power-dependent spectra of PEA_2PbI_4 crystal.

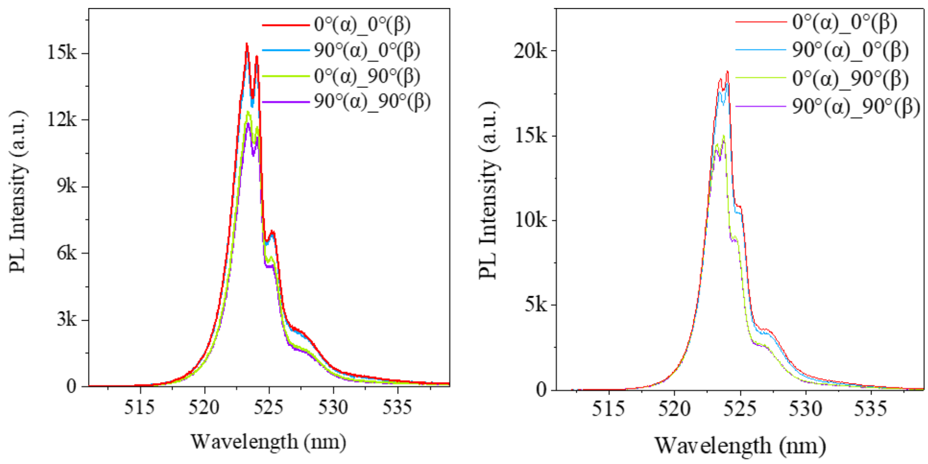

Fig. S4: Spectra of different samples at different excitation light angles (α) and detection angles (β).

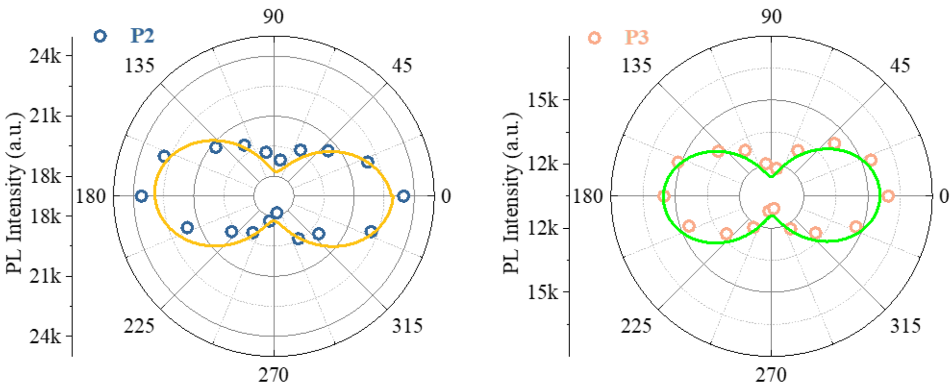

Fig. S5: Trend of P2 and P3 intensity as a function of detection angles (β).

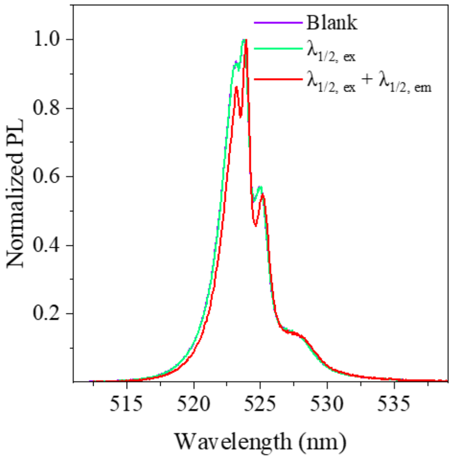

Fig. S6: PL spectrum without half-wave-plate (purple curve), PL spectrum with one half-wave-plate at the excitation light port (green curve), PL spectrum with one half-wave-plate at the excitation light port and one half-wave-plate before the emission collection system (green curve).

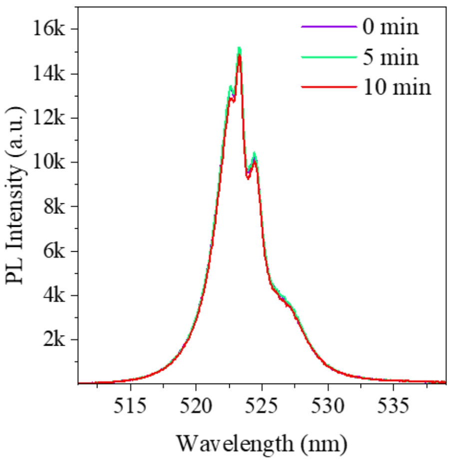

Fig. S7: The spectra changes of PEA_2PbI_4 crystal in 10 min at 78 K.

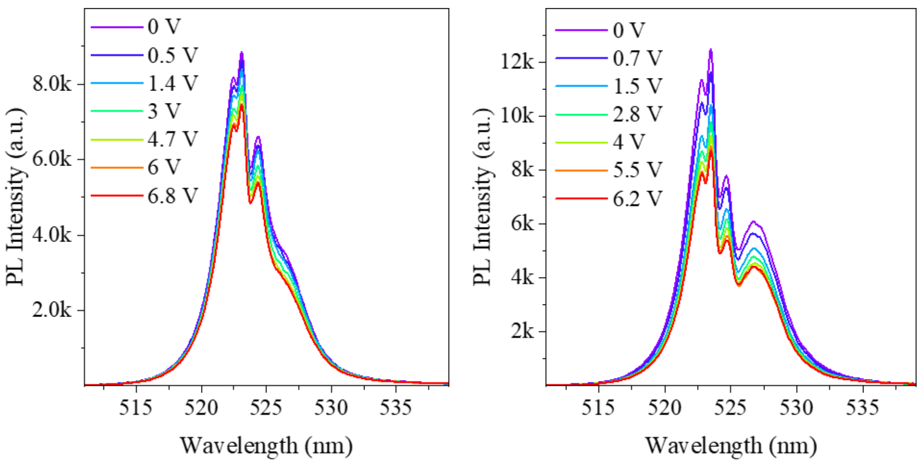

Fig. S8: Voltage-dependent PL spectra at selected detection angles $\beta = 90°$ (left) and $\beta = 0°$ (right).

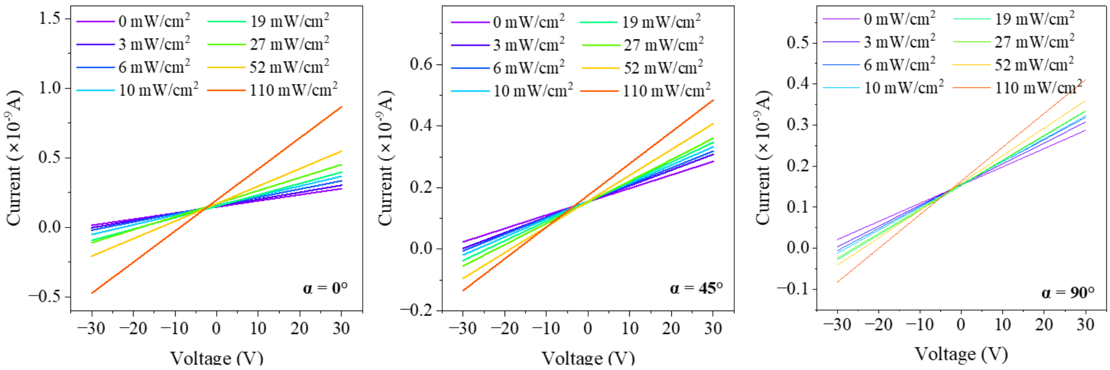

Fig. S9: Under different light intensities, the changes in photocurrent at different voltages when changing the polarization angle (α) of the excitation laser from 0° to 90°.

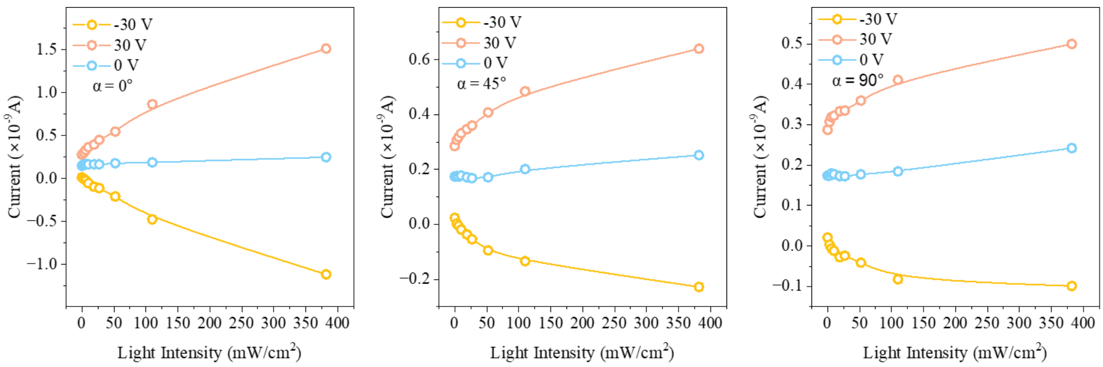

Fig. S10: Under selected voltages (-30 V, 30 V, 0 V), the changes in photocurrent at different light intensities with the detection angles set as 0°, 45°, and 90° (from left to right).

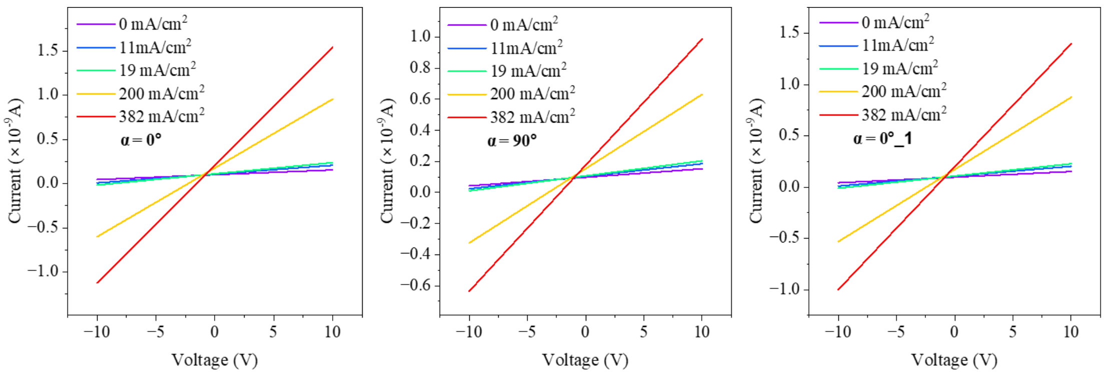

Fig. S11: Under different light intensities, the changes in photocurrent at different voltages with the detection angles set as 0°, 90°, and 0° in turn (from left to right).