Supporting Information

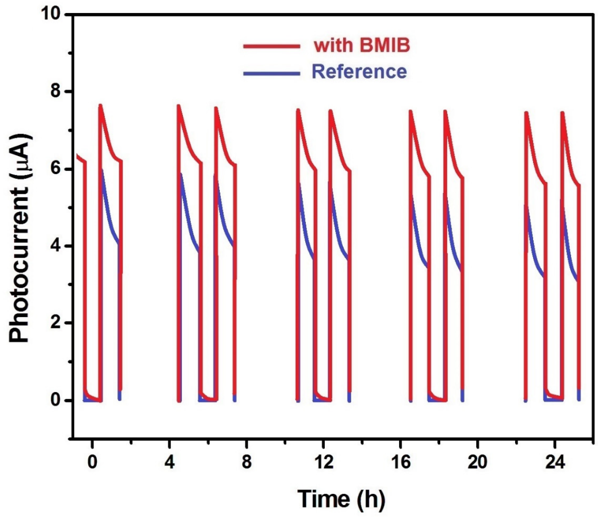

Figure S1. Photodetector stability under green light in CsPbBr3 with/without BMIB (2 V).

Supplementary Note 1. Lattice strain in the $CsPbBr_3$ single crystals was determined using X-ray diffraction (XRD) data. The calculation employed the tangent method, which relates the peak shift in the XRD pattern to the lattice strain.

$$L_s = \frac{B_s}{4\tan\theta}\text{(S1)} \qquad \text{(S1)}$$

B_s reflects structural expansion in the material. This parameter is calculated by analyzing the difference in the integral breadth (full width at half maximum) of the X-ray diffraction peaks between a standard reference sample (std) and the sample of interest (obs). A larger Bs value indicates a greater deviation in the crystal lattice compared to the standard, potentially signifying an expansion in the unit cell.

$$B_{struct} = \sqrt{B_{obs}^2 - B_{std}^2} \text{ (S2)}$$

The term "B_{obs}" refers to the breadth obtained from the substance being examined, while "B_{std}" denotes the breadth obtained from the reference material, which is not influenced by any factors causing broadening in its structure.

Supplementary Note 2. To evaluate the performance of a photodetector, several key parameters are considered, including responsivity, specific detectivity, and external quantum efficiency. This work focuses on the photoresponse (R) of the photodetector, which can be calculated using the following equations:

$$\mathrm{R} = (\mathrm{J_{ph}} - \mathrm{J_d})/\mathrm{P} \qquad \text{(S3)}$$

Where J_{ph} represents the current density generated upon illumination (photocurrent), J_d represents the current density in the absence of light (dark current), and P represents the incident light power density.

$$\mathrm{D}^* = \frac{\mathrm{R}}{(2\mathrm{q}\times\mathrm{J_d})^{1/2}} \qquad \text{(S4)}$$

In this equation, q represents the elementary charge of an electron.

$$EQE = Rhc/e\lambda \qquad \text{(S5)}$$

The photodetector's response speed is characterized by its rise time and fall time. These are determined by analyzing the normalized photocurrent transients. The rise time is defined as the time taken for the photocurrent to increase from 10% to 90% of its maximum value after light is switched on. Conversely, the fall time is the time taken for the photocurrent to decay from 90% to 10% of its maximum value after light is switched off.