Electronic Supplementary Material (ESI) for Journal of Materials Chemistry C.

Electronic Supporting Information

Controllable Bandgap-Gradient Halide Perovskite Films via Dip-Coating and Halide Anion Exchange for Multispectral Photodiodes with High Performance

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1. Figures

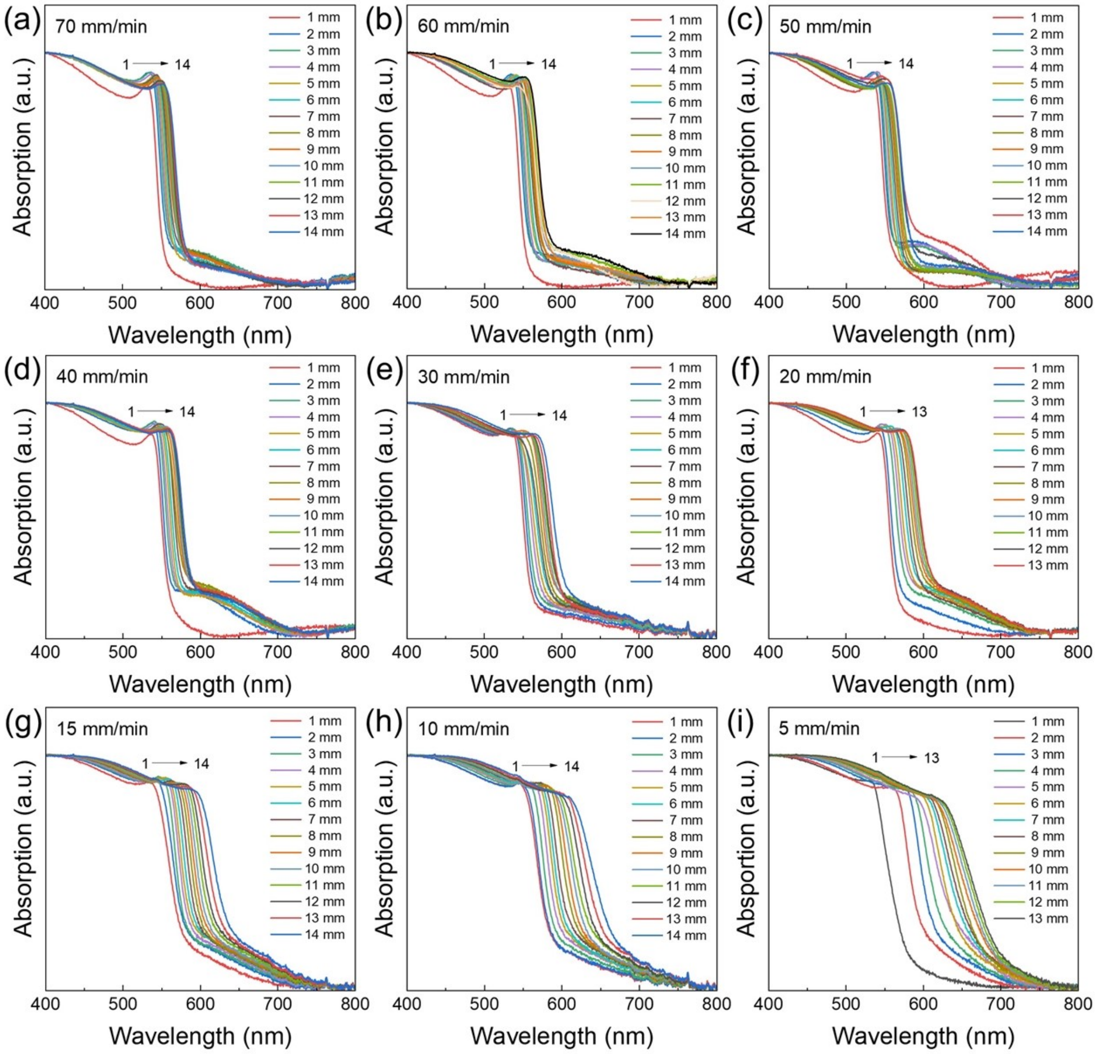

Fig. S1 The absorption spectra of each position on the bandgap-gradient perovskite films pulled at different speeds (70, 60, 50, 40, 30, 20, 15, 10, and 5 mm/min) in the MAI solution

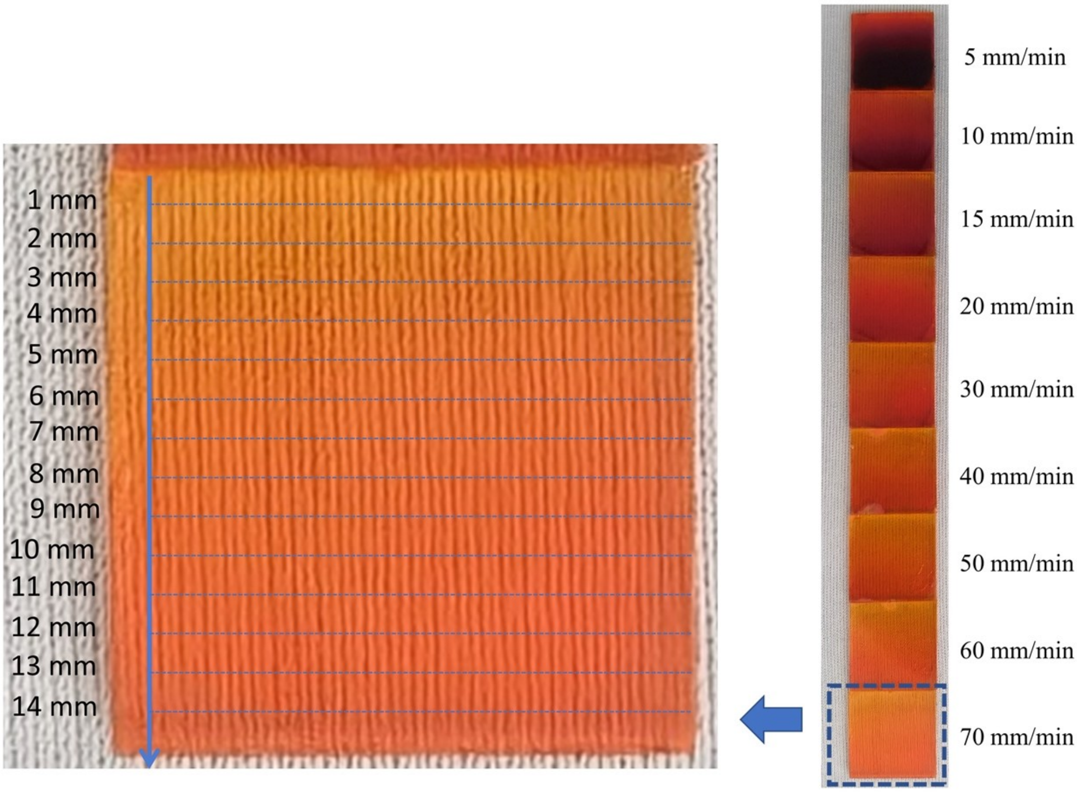

Fig. S2 The physical picture of bandgap-gradient perovskite films at various pulling speeds (70, 60, 50, 40, 30, 20, 15, 10, and 5 mm/min) in the MAI solution.

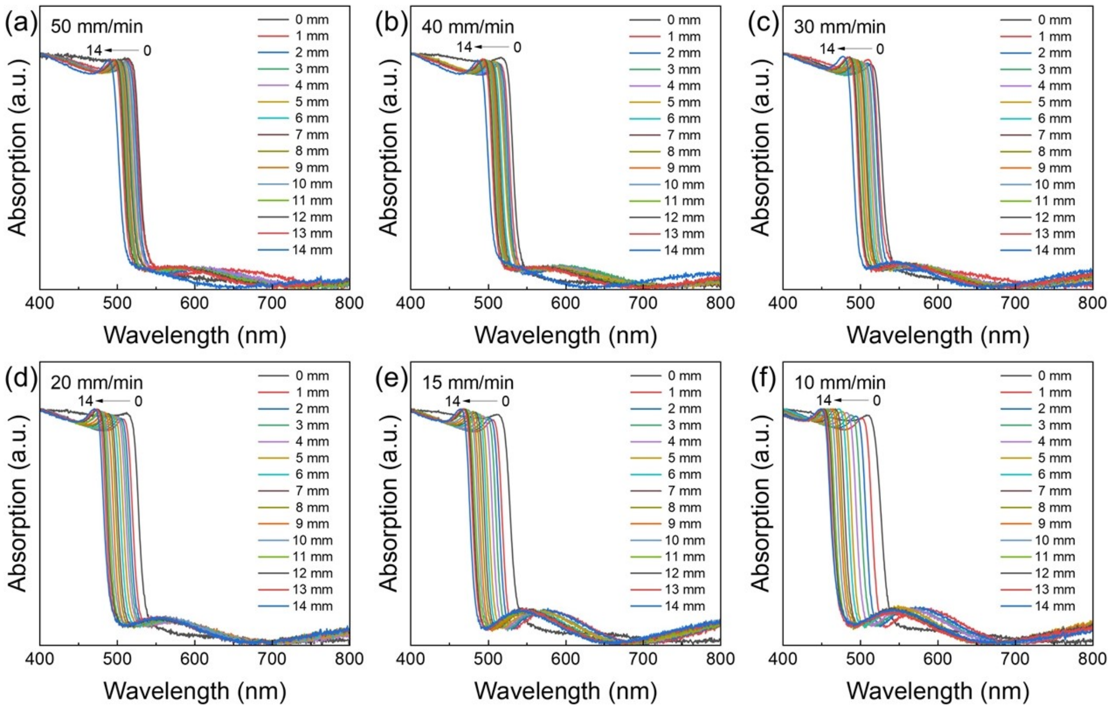

Fig. S3 The absorption spectra of each position on the bandgap-gradient perovskite films pulled at different speeds (50, 40, 30, 20, 15, and 10 mm/min) in the MACl solution.

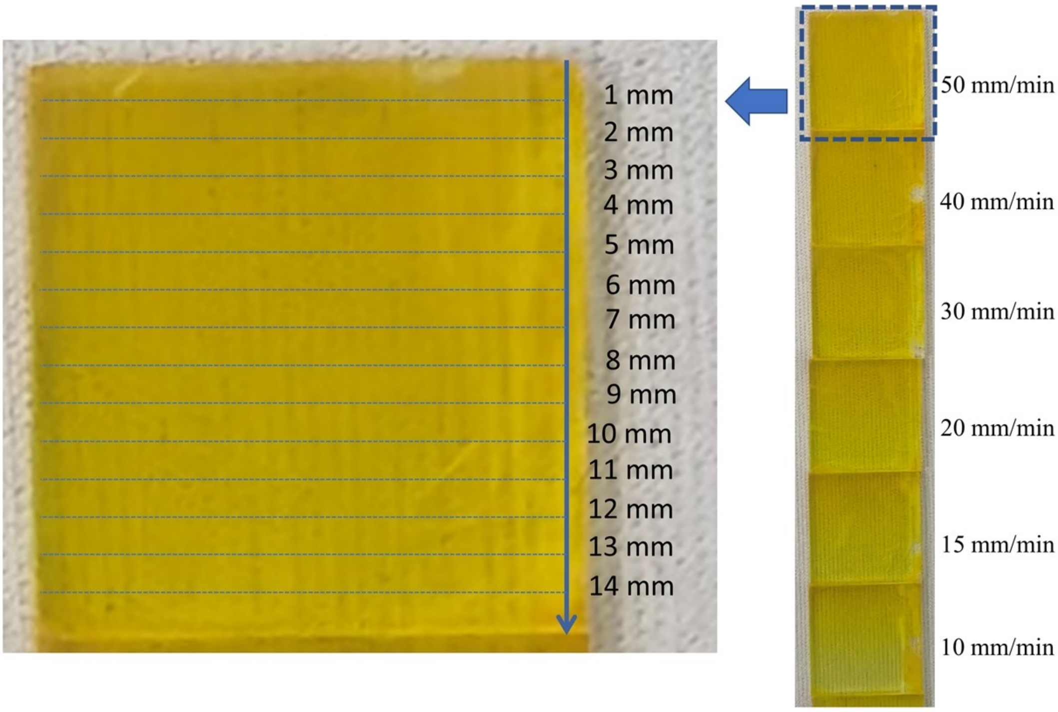

Fig. S4 The physical picture of bandgap-gradient perovskite films at various pulling speeds (50, 40, 30, 20, 15, and 10 mm/min) in the MACl solution.

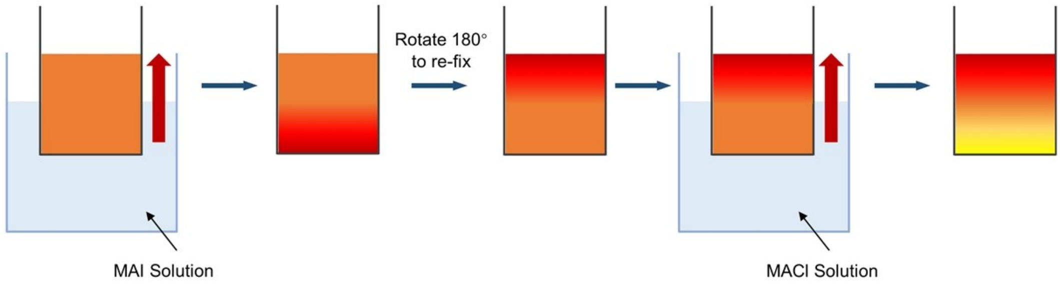

Fig. S5 The schematic diagram for preparing one-dimensional bandgap-gradient perovskite films.

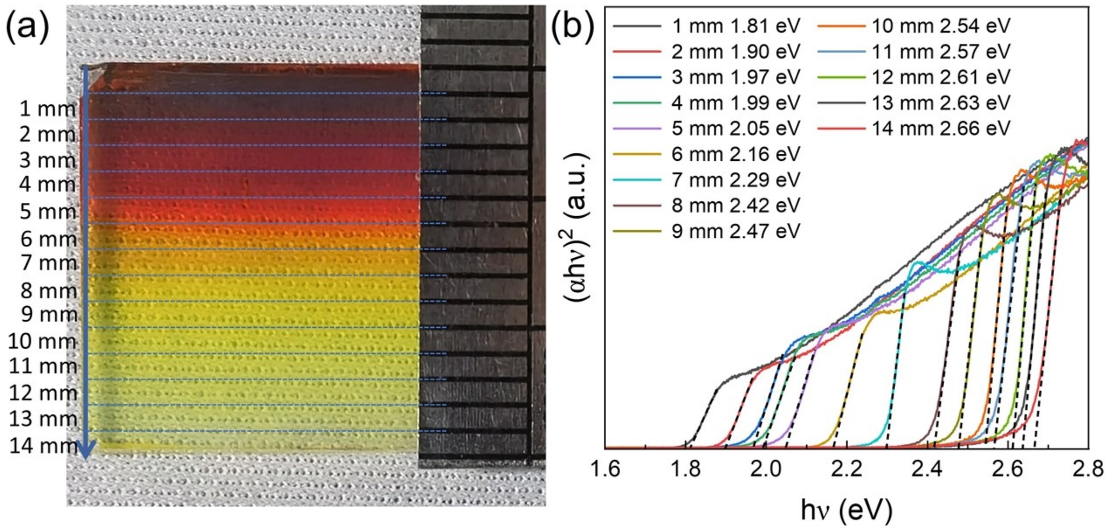

Fig. S6 (a) The physical picture of the fabricated one-dimensional bandgap-gradient perovskite films. (b) The bandgaps of each position were calculated using the Tauc plot.

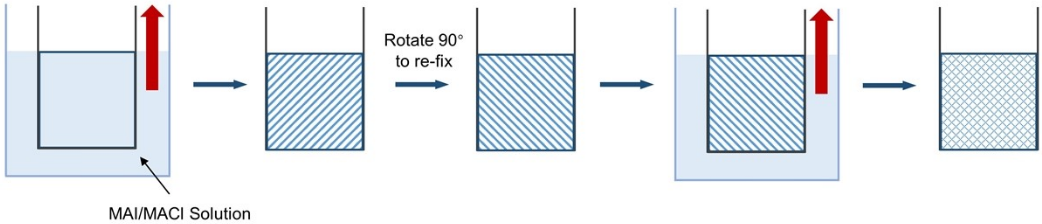

Fig. S7 The schematic diagram for preparing two-dimensional bandgap-gradient perovskite films.

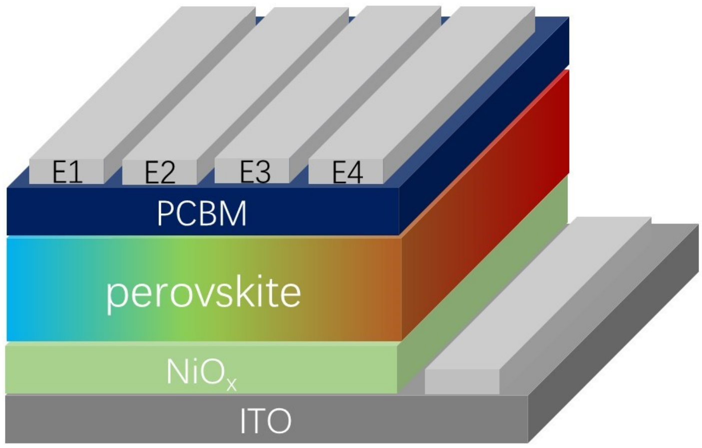

Fig. S8 The schematic diagram of multispectral PD.

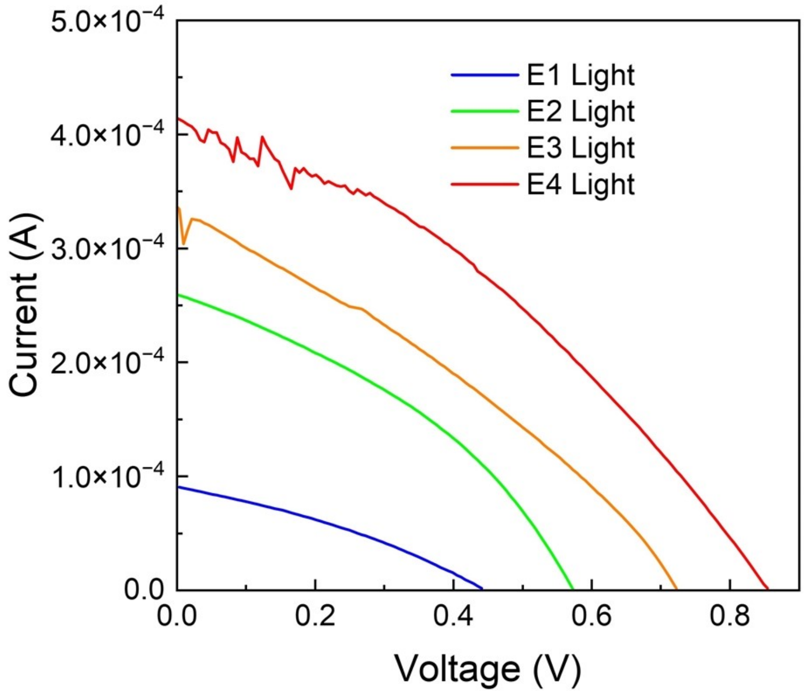

Fig. S9 The *I-V* characteristics of E1, E2, E3, and E4 under AM 1.5 light.

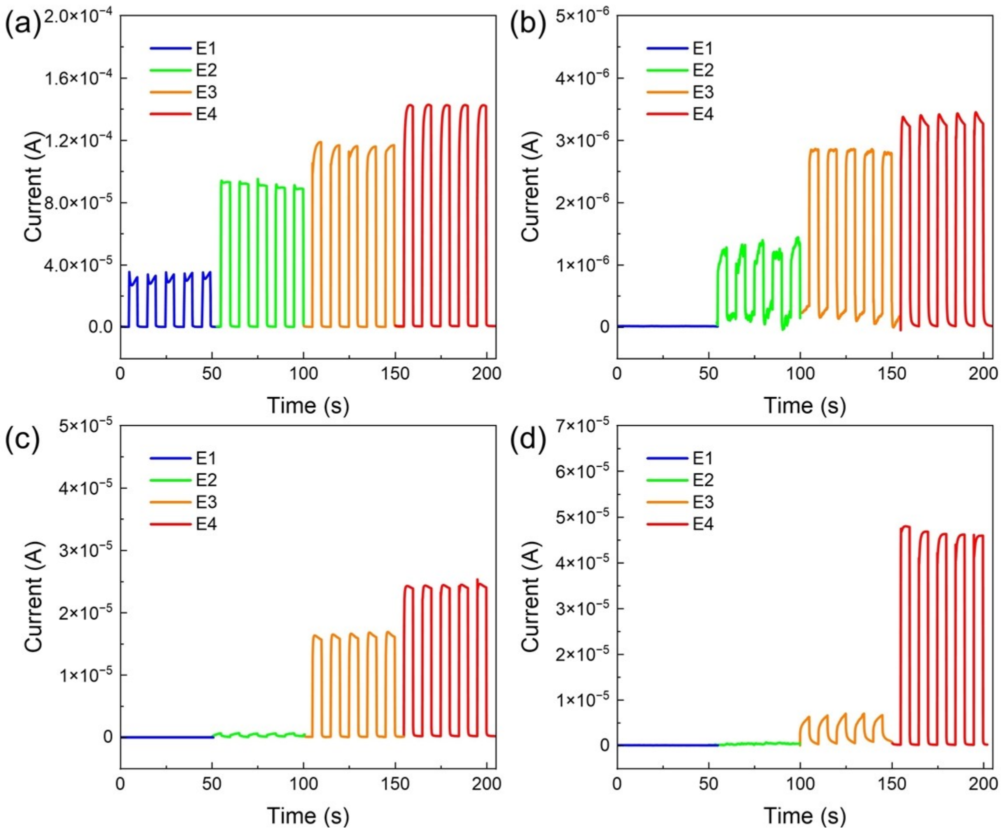

Fig. S10 The I-t curves of the multispectral PD at E1, E2, E3, and E4 when exposed to blue (460 nm), green (530 nm), yellow (570 nm), and red (620 nm) LEDs, with a switching frequency of 0.1 Hz.

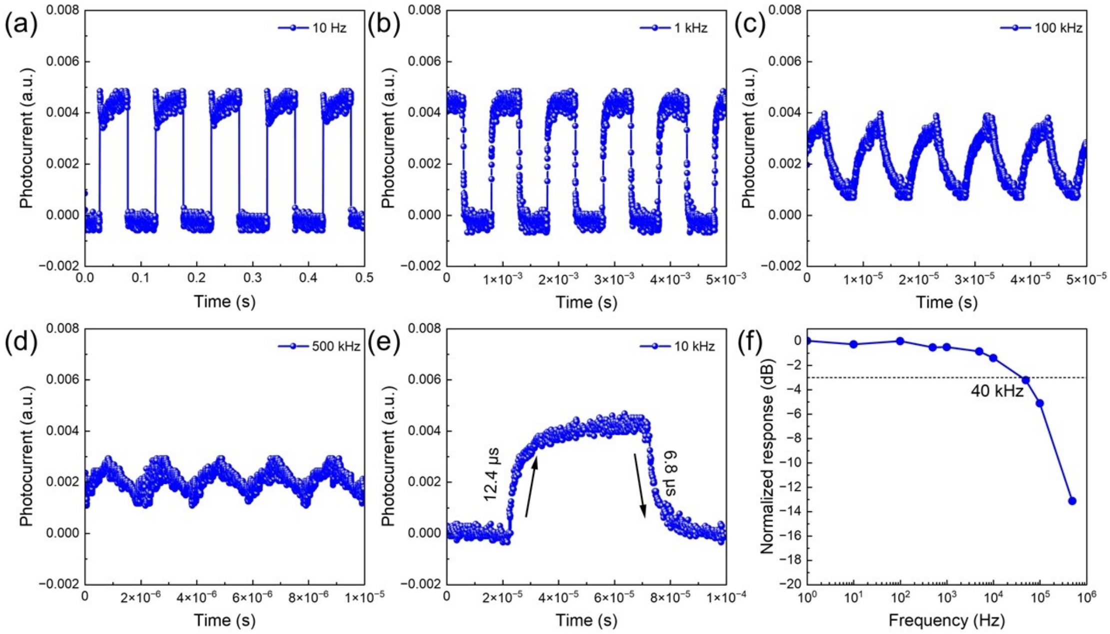

Fig. S11 The normalized temporal response and -3 dB bandwidth for E1 using blue LED as light sources across a frequency range of 1 Hz to 500 kHz.

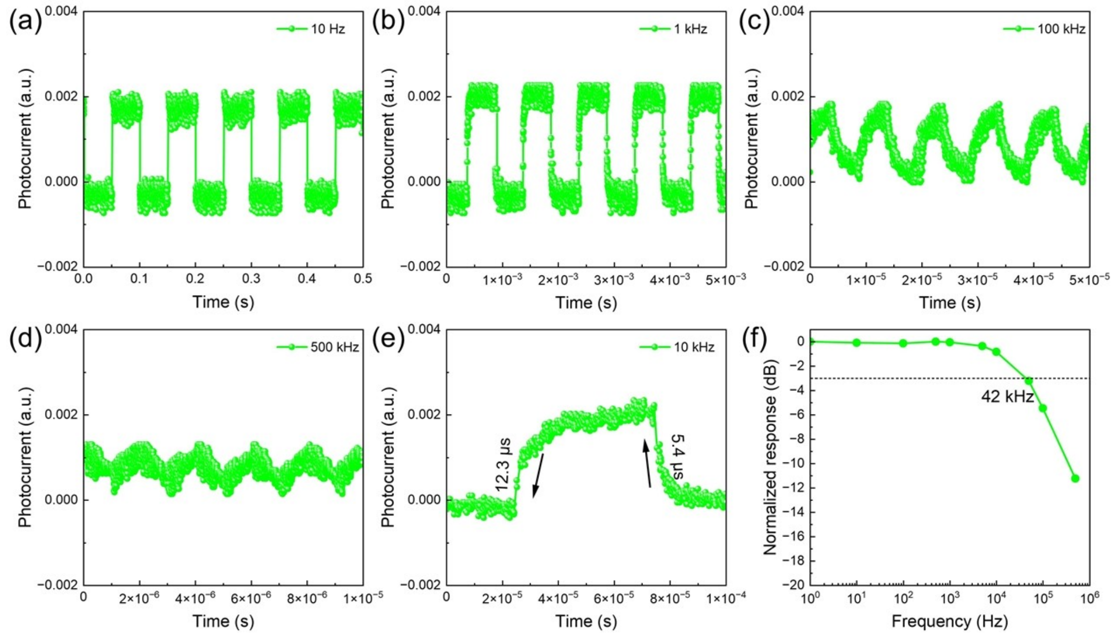

Fig. S12 The normalized temporal response and -3 dB bandwidth for E2 using green LED as light sources across a frequency range of 1 Hz to 500 kHz.

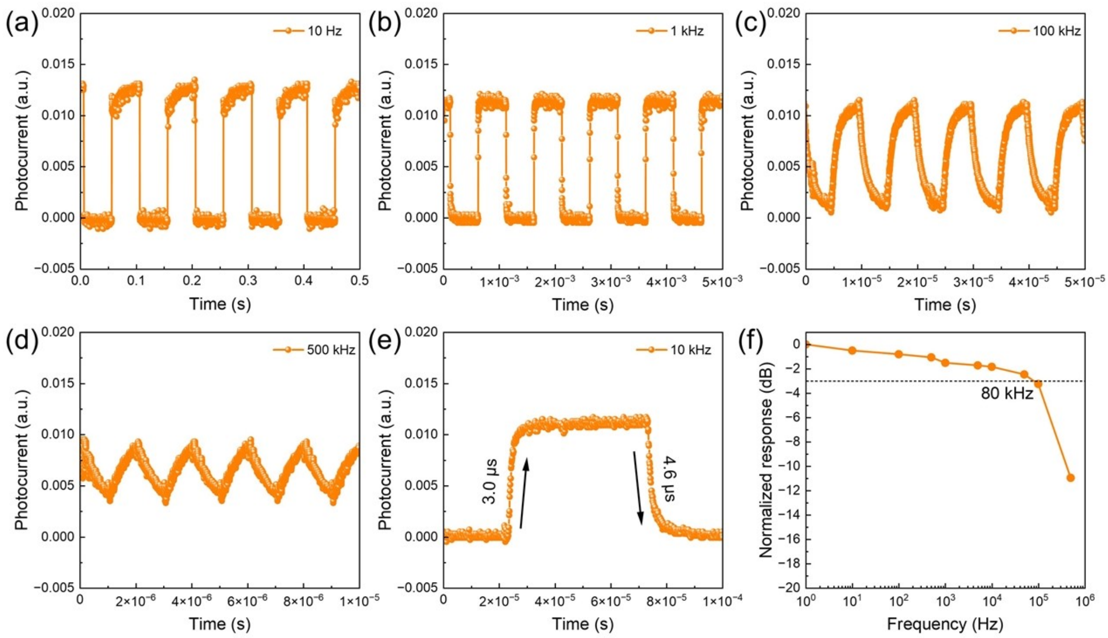

Fig. S13 The normalized temporal response and -3 dB bandwidth for E3 using yellow LED as light sources across a frequency range of 1 Hz to 500 kHz.

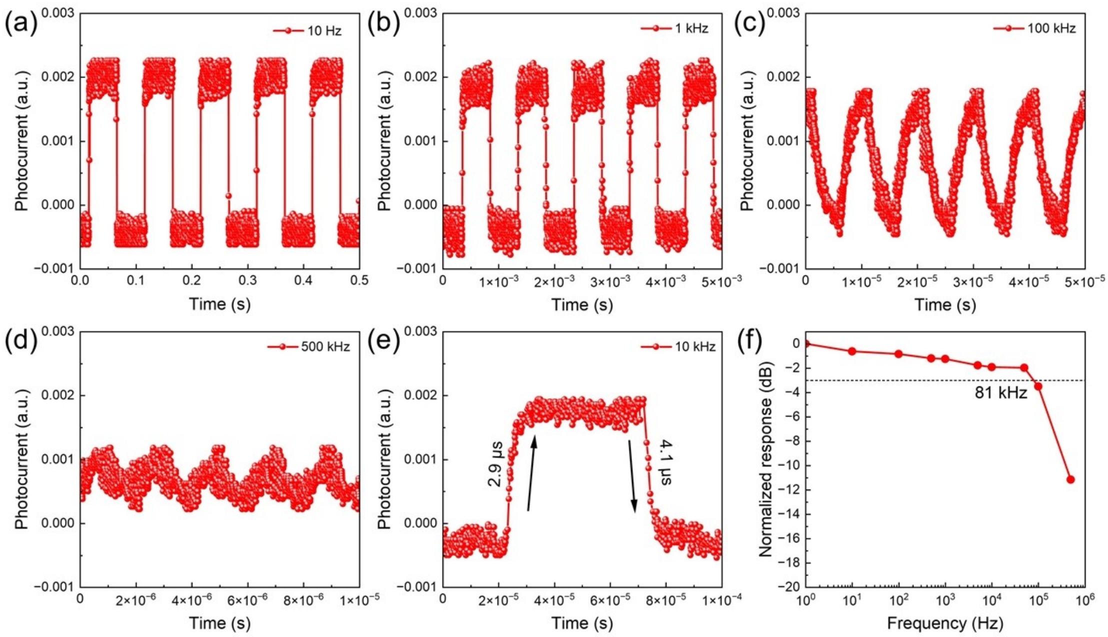

Fig. S14 The normalized temporal response and -3 dB bandwidth for E4 using red LED as light sources across a frequency range of 1 Hz to 500 kHz.

2. The main program instruction of Matlab for the RGB multispectral image:

```
clc;clear all;

R = imread('D:\XX\R.jpg');
imagesc(R);cmap1 = colormap;

G = imread('D:\XX\G.jpg');
imagesc(G);cmap2 = colormap;

B = imread('D:\XX\B.jpg');
imagesc(B);cmap3 = colormap;

image(:,:,1) = R(:,:,1);
image(:,:,2) = G(:,:,2);
image(:,:,3) = B(:,:,3);

imagesc(image);
```