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Supporting Information for

Nucleation management for ambient fabrication of high-performance perovskite photodetectors with eco-friendly tert-butanol anti-solvent

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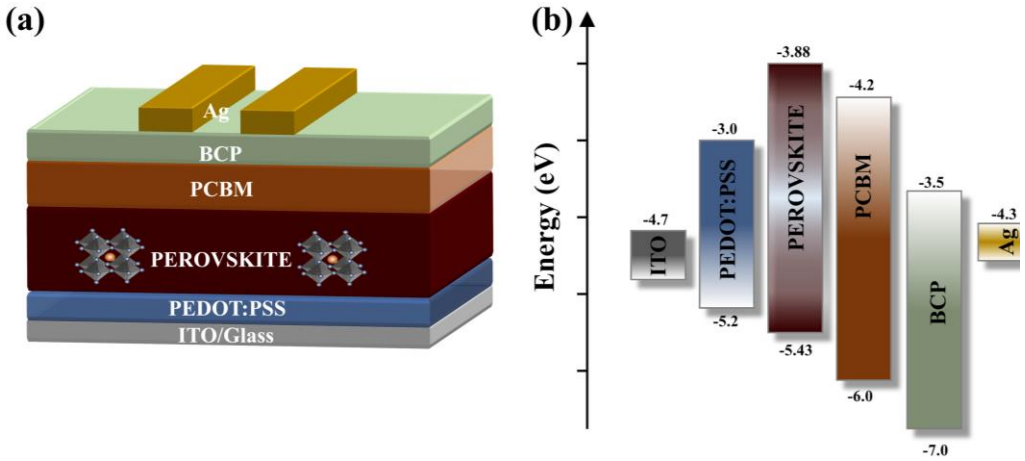

Figure S1 (a) Schematic device structure of PPDs. (b) The schematic energy level diagram of PPDs.

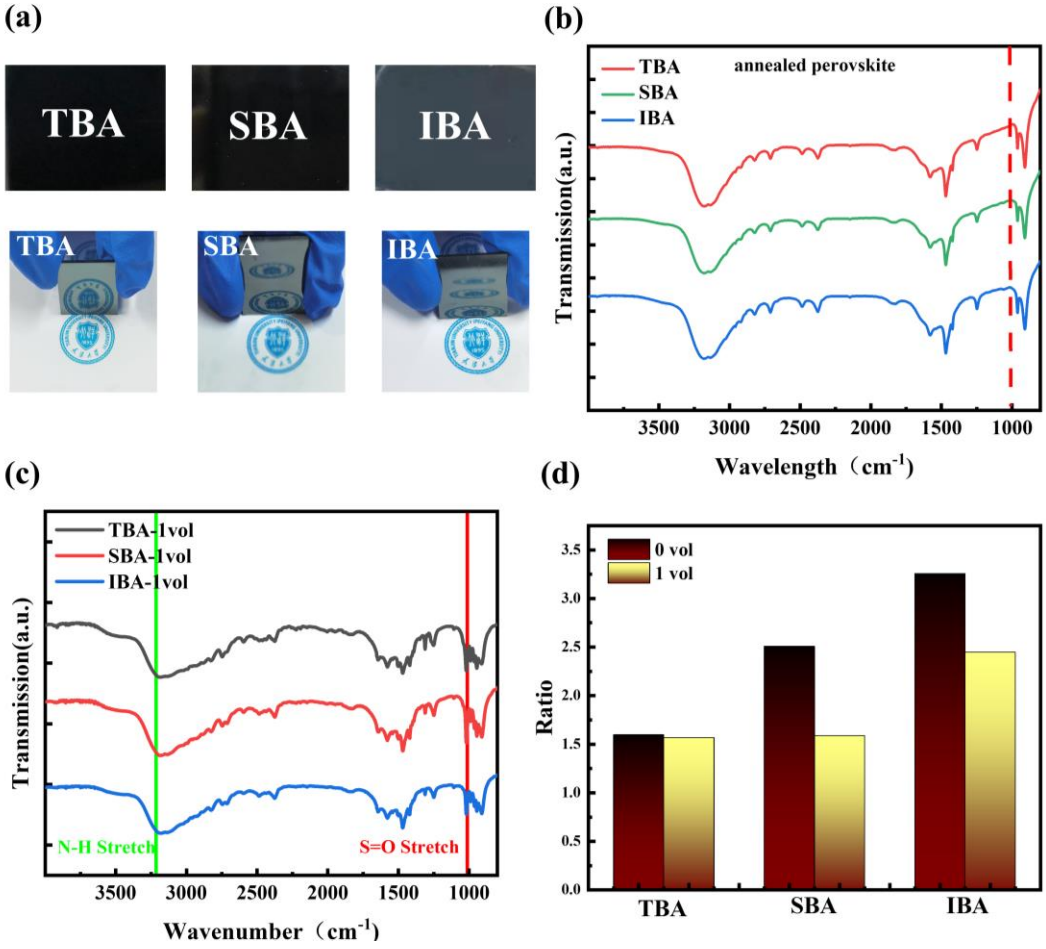

Figure S2. (a) The direct view and corresponding mirror-like effect image of perovskite films prepared by different anti-solvent after annealing. (b) FTIR spectra of $MAPbI_3$ perovskite prepared by TBA, SBA, and IBA with annealing; (c) FTIR spectra of $MAPbI_3$ perovskite prepared by the water-doped antisolvents without annealing; (d) The ratio of the absorbance intensity of the unannealed perovskite films with pure

anti-solvents and water-doped antisolvents at 1020 and 3200 cm^{-1} (1020 cm^{-1}:3200 cm^{-1}).

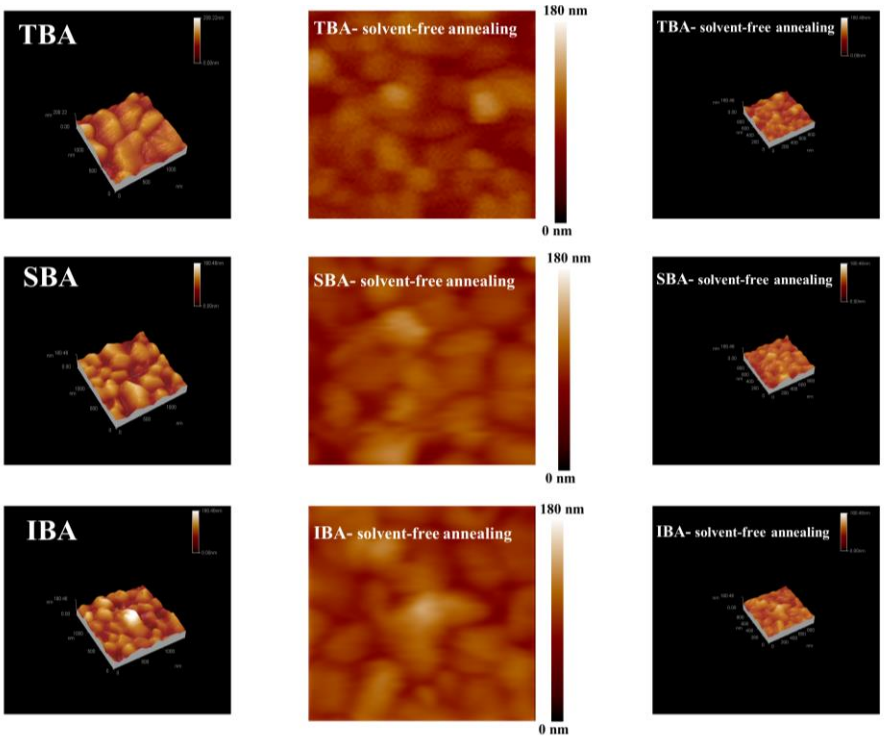

Figure S3. (a) 3D-AFM images obtained from TBA-PVK, SBA-PVK, and IBA-PVK; (b) AFM images corresponding to TBA-PVK, SBA-PVK, and IBA-PVK with solvent-free annealing. The scanning range of the images is 1 μm × 1 μm; (c) 3D-AFM images obtained from TBA-PVK, SBA-PVK, and IBA-PVK with solvent-free annealing.

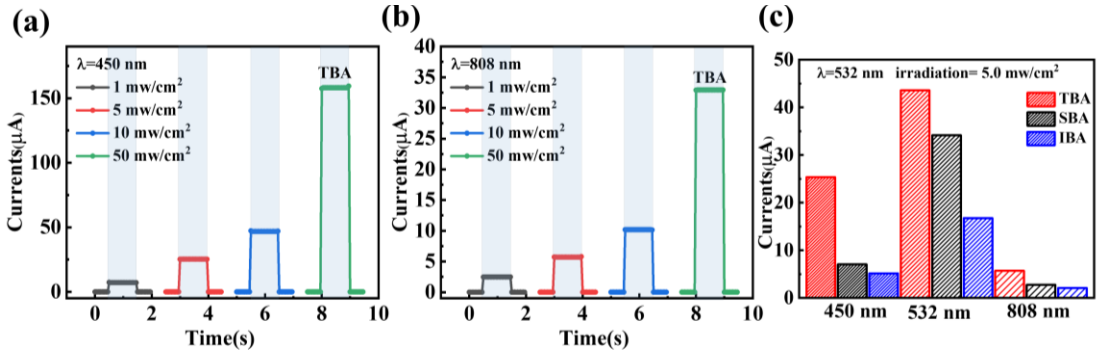

Figure S4. Part electrical and optical switching characteristics of TBA-PD. (a) Photoswitching characteristics under 450 nm laser illumination with different power densities (V_{Bias} = 0 V); (b) Photoswitching characteristics under 808nm laser illumination with different power densities (V_{Bias} = 0 V). (c) Photocurrent distribution

histogram corresponding to the results in Figure 5f.

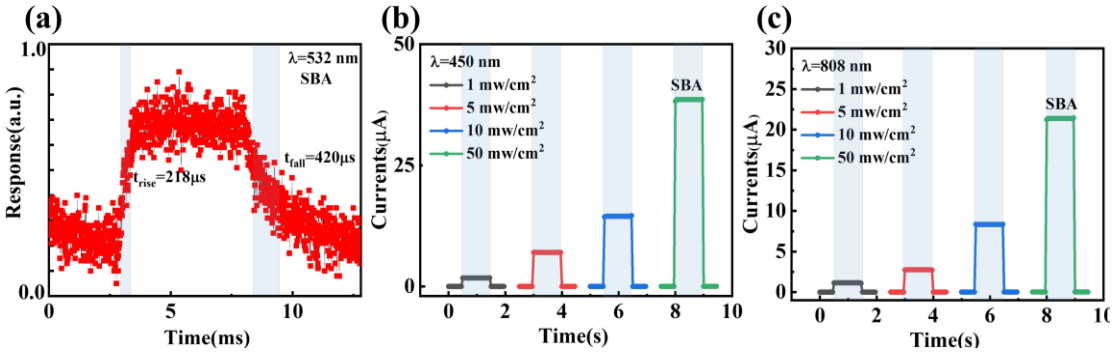

Figure S5. Part electrical and optical switching characteristics of SBA-PD. (a) Response time measurement under one on-off illumination cycle of the 532 nm laser with a pulse frequency of 100 Hz.; (b) Photoswitching characteristics under 450 nm laser illumination with different power densities (V_{Bias} = 0 V); (c) Photoswitching characteristics under 808nm laser illumination with different power densities (V_{Bias} = 0 V).

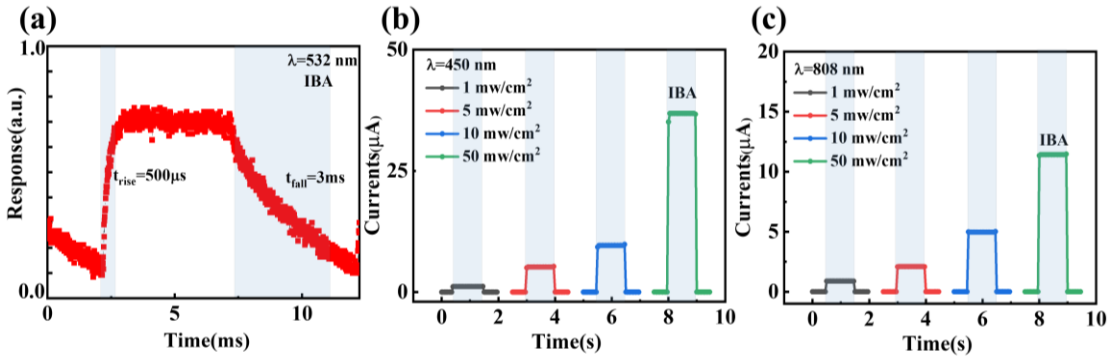

Figure S6 Part electrical and optical switching characteristics of IBA-PD. (a) Response time measurement under one on-off illumination cycle of the 532 nm laser with a pulse frequency of 100 Hz; (b) Photoswitching characteristics under 450 nm laser illumination with different power densities (V_{Bias} = 0 V); (c) Photoswitching characteristics under 808nm laser illumination with different power densities (V_{Bias} = 0 V).