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

Supporting Information

Topological insulator bismuth selenide grown on black phosphorus for sensitive broadband photodetection

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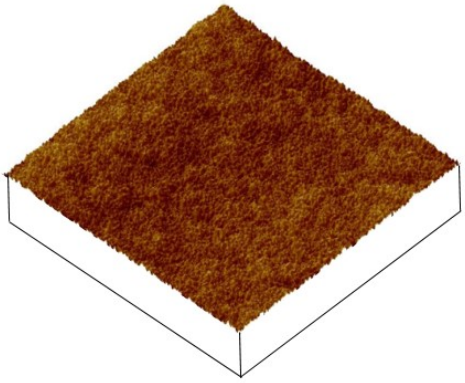

BiSe on BP flake as dep.

Process	RMS (Rq)
BS/BP	0.868nm

Fig. S1 Atomic force microscopy (AFM) image of the as-grown Bi_2Se_3 film on black phosphorus (BP) to a uniform and smooth surface with a small roughness of ~ 0.868 nm.

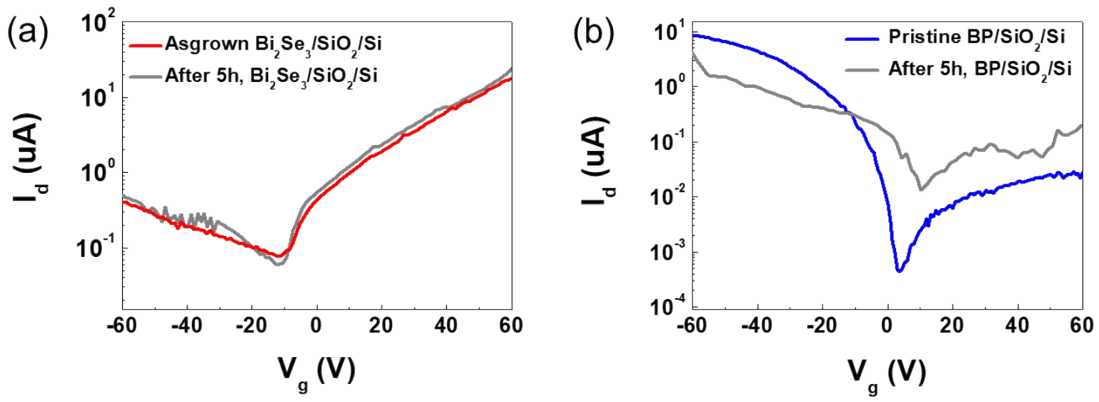

Fig. S2 Comparison of the transfer characteristics of back gate (field-effect transistor (FET) devices of (a) $Bi_2Se_3/SiO_2/Si$ and (b) $BP/SiO_2/Si$ structures) before and after exposure for 5 h in air. The results of cumulative electrical measurements before and after exposure in air indicate that the BP surface exhibits more unstable carrier transport characteristics than the Bi_2Se_3 surface.

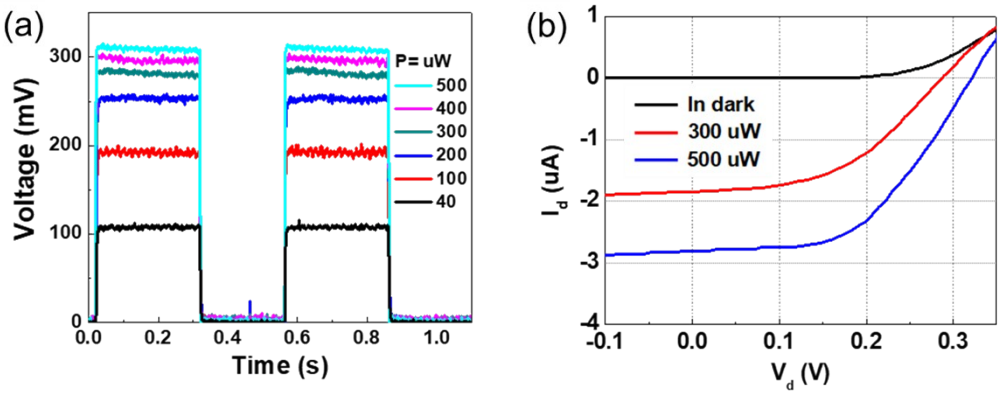

Fig. S3 (a) Open-circuit voltage (Voc) of the Bi_2Se_3/BP heterostructure photodetector versus incident power, indicating a good self-driven performance of the photovoltaic device. (b) I_d–V_d curves of the Bi_2Se_3/BP heterostructure under laser illumination at different incident power densities.

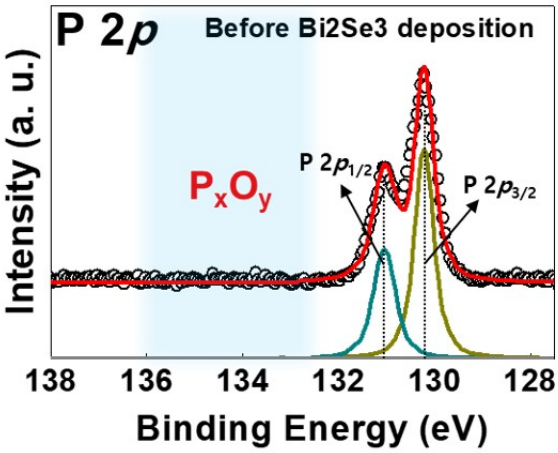

Fig. S4 The P 2*p* core-level spectra of BP surface region before the deposition of Bi_2Se_3. BP substrate was performed using a vacuum desiccator with a rapid process progress until Bi_2Se_3 deposition.