Supporting Information

Facile passivation of black phosphorus nanosheets via silica coating for stable and efficient solar desalination

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Section S1. Preparation of BP nanosheets

The black phosphorus (BP) nanosheets were obtained by ultrasonic exfoliating bulk BP single crystals. Briefly, 50 mg of bulk BP was grounded into small pieces for 20 min using an agate mortar with a pestle. The black phosphorus powers were then transferred to 30 mL oxygen-free deionized (DI) water in a 40 mL sealed anaerobic vial. The suspension was sonicated with a ultrasonic cell disruption system (JY 88-11N) for 10 h at a power of 37.5 W. The ultrasound probe worked 2 s with the interval of 2 s. During the ultrasonication, the temperature of the sample solution was kept below 277 K by ice bath. The as-exfoliated BP dispersion was centrifuged at 1000 rpm for 20 min to remove the un-exfoliated BP crystals. Then the resulting supernatant was centrifuged at 4000 rpm for 30 min to obtain the precipitate of BP nanosheets. After that, the BP nanosheets were re-suspended in DI water.

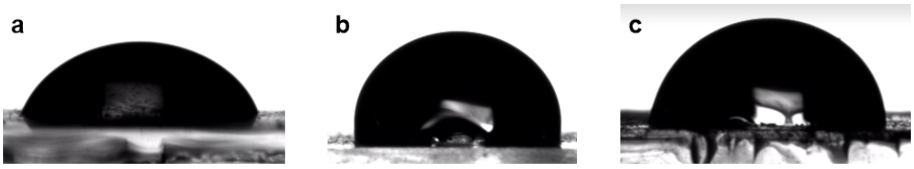

Figure S1. Screenshot images from movie M1-M3 for equilibrium state of BP (a), SiO_2/BP-M (b) and SiO_2/BP-MT (c).

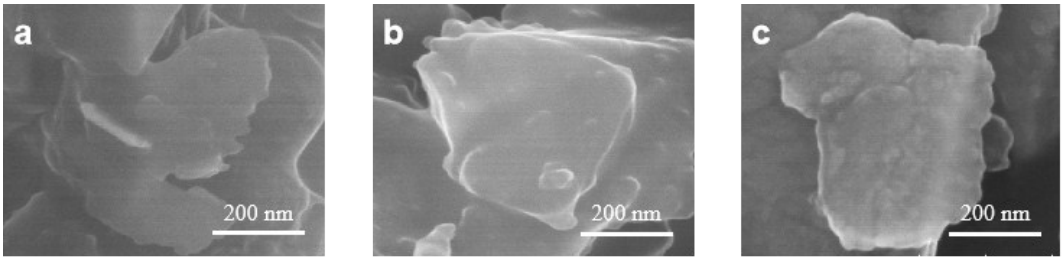

Figure S2. SEM images of BP (a), SiO_2/BP-M (b) and SiO_2/BP-MT (c).

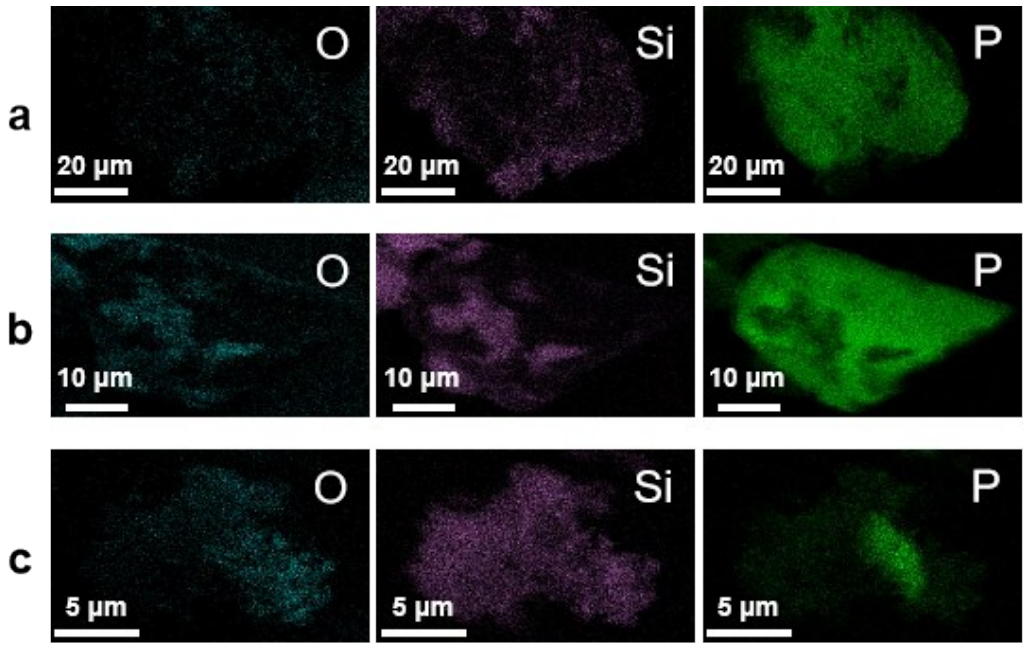

Figure S3. The EDX mappings of BP (a), SiO_2/BP-M (b), and SiO_2/BP-MT (c).

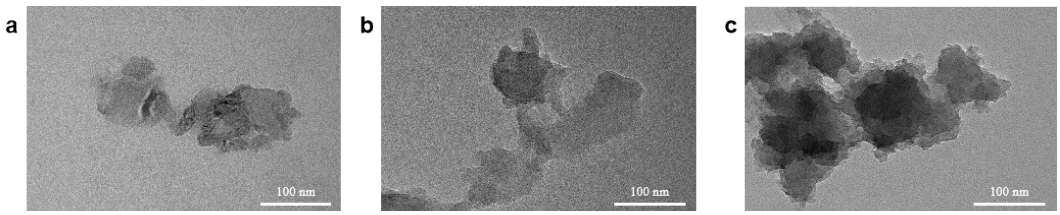

Figure S4. The TEM images of BP (a), SiO_2/BP-M (b), and SiO_2/BP-MT (c).

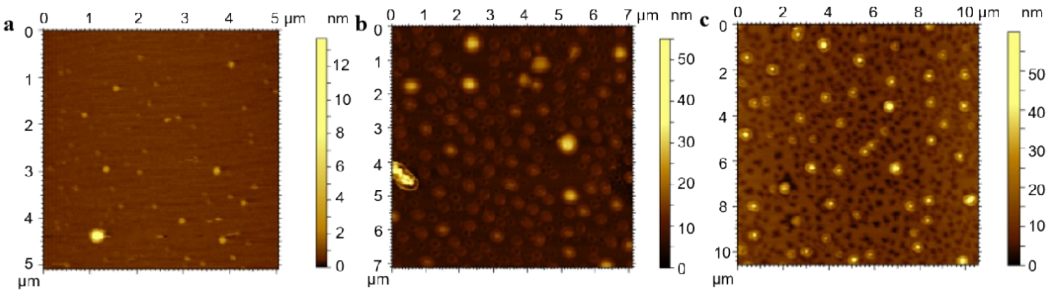

Figure S5. The AFM images of BP (a), SiO_2/BP-M (b), and SiO_2/BP-MT (c).

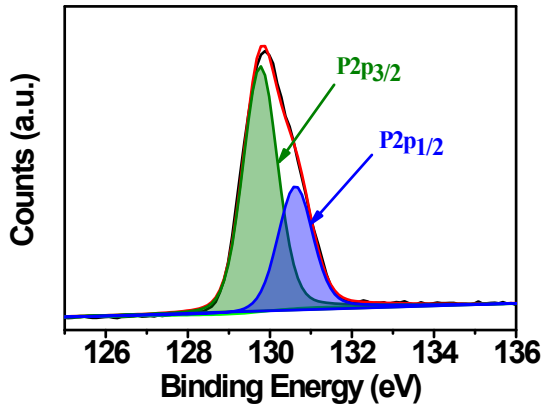

Figure S6. High resolution XPS spectrum of BP.

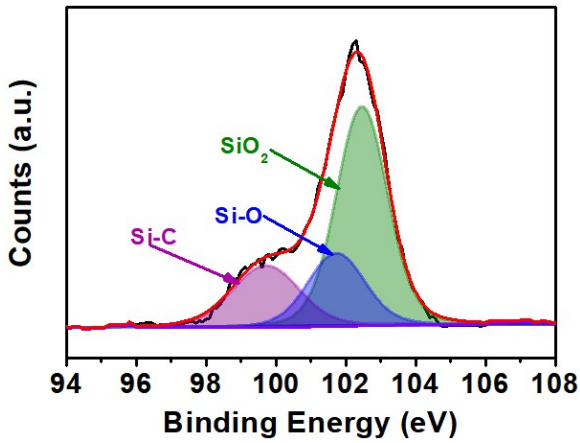

Figure S7. High resolution XPS spectrum of SiO_2/BP-M.

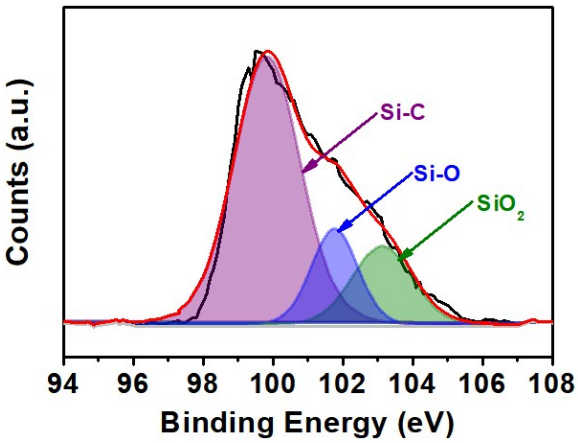

Figure S8. High resolution XPS spectrum of SiO_2/BP-MT.

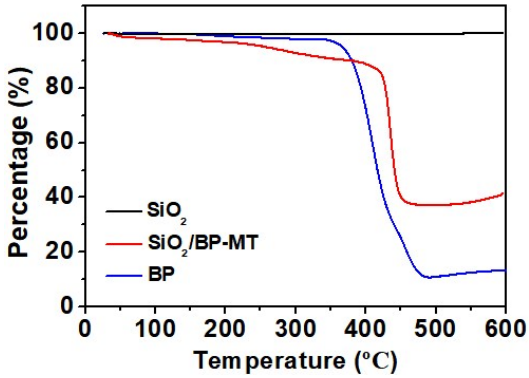

Figure S9. TGA curves of SiO_2, BP and SiO_2/BP-MT.

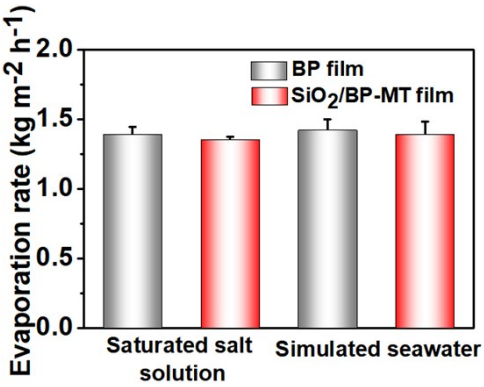

Figure S10. The evaporation rates of BP film- and SiO_2/BP-MT film-based evaporators for saturated salt solution and simulated seawater.

Table S1. The evaporation rates of different solar absorbers under irradiation.

Solar absorber	Optical power density	Evaporation rate	Reference
GO film with a 2D water path	1 kW m^{-2}	1.45 kg m^{-2} h^{-1}	[1]
carbon-black-based superhydrophobic	1 kW m^{-2}	0.1 L h^{-1}	[2]

paper-based gold-nanoparticle film	4.5 kW m^{-2}	1.71 mg s^{-1}	[3]
Au/D-NPT	1 kW m^{-2}	1 kg m^{-2} h^{-1}	[4]
wood−GO composite	12 kW m^{-2}	14.02 kg m^{-2} h^{-1}	[5]
SiO_2/BP-MT film	**1 kW m^{-2}**	**1.63 kg m^{-2} h^{-1}**	**Our study**

References:

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