# Water vapor recovery device designed with interface local heating principle and its application in clean water production

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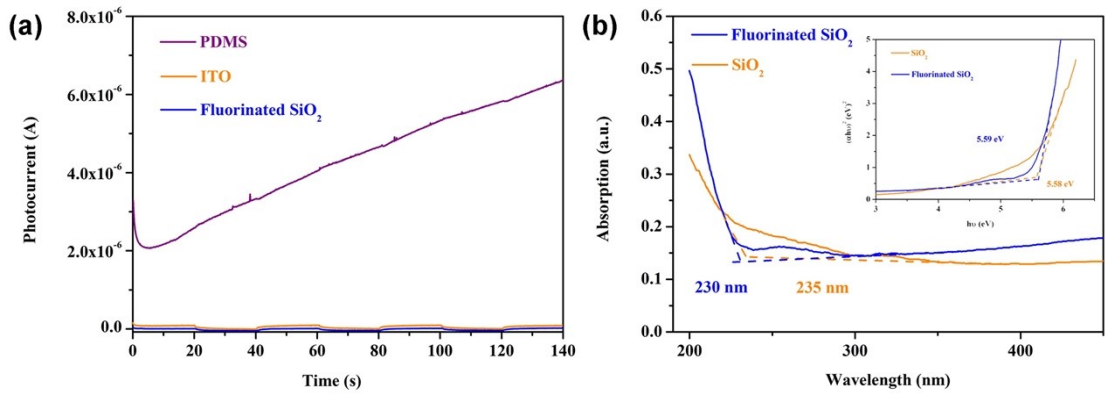


**Fig. S1** Photocurrent analysis of ITO, PDMS and fluorinated $SiO_2$ (a). Band-gap analysis of $SiO_2$ before and after modification (b).

The role of PDMS is simply to bond fluorinated $SiO_2$ and BiOBr to melamine sponge. Besides, the PDMS electrode was prepared to explore the photoelectric response of PDMS. 0.07 g PDMS and 0.0223 g curing agent were dissolved in 1 ml ethyl acetate. Then, 100 μl of the above solution was added to the surface of ITO

conductive glass and solidified at 120 °C for 4 h. The electrode of fluorinated $SiO_2$ was prepared by dispersing 6 mg of fluorinated $SiO_2$ into Nafion ethanol solution and ultrasonic treatment for 5 min. Next, 100 μl of the above solution was added to the conductive glass and solidified at 40 °C for 12 h. It can be seen from the Fig. S1a that the PDMS electrode does not exhibit the steps of the photocurrent, confirming that the carrier cannot be transferred to the PDMS surface. The fluorinated $SiO_2$ electrode has a weak photoelectric response; however, its photoelectric response is less than that of ITO glass. This is because the white silica surface hinders partial light absorption, resulting in a weak photoelectric response. It is also verified that the fluorinated $SiO_2$ has no photoelectric response. DRS of $SiO_2$ before and after fluorination were analyzed to explore the band structure of $SiO_2$ more intuitively. As shown in Fig. S1b, the absorption band edge value before and after fluorination is reduced from 235 nm to 230 nm. Furthermore, $(\alpha h\upsilon)^2$ and $h\upsilon$ are taken as the vertical coordinate and the horizontal coordinate, respectively. The band gap of $SiO_2$ increased from 5.58 eV to 5.59 eV.

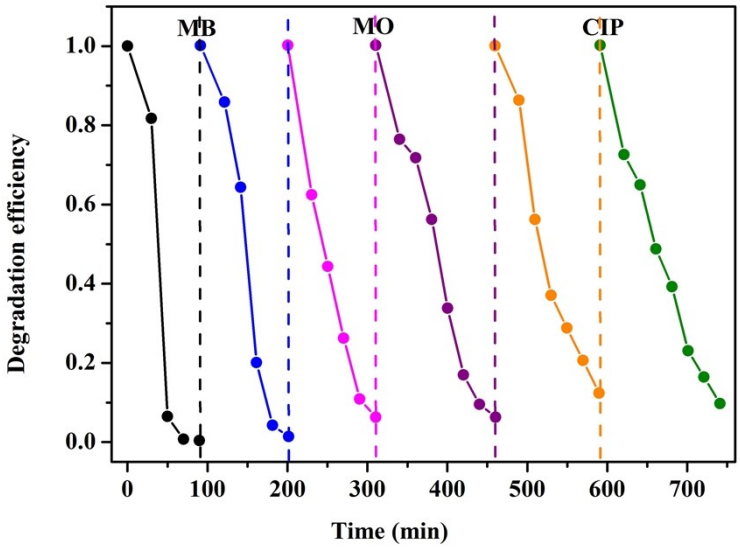


**Fig. S2** Photodegradation curves of SH-Bi sponge for various pollutants (MB, MO and CIP).