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Electronic Supplementary Information

TiO_2 Enhanced Ultraviolet Detection Based on Graphene/Si Schottky Diode

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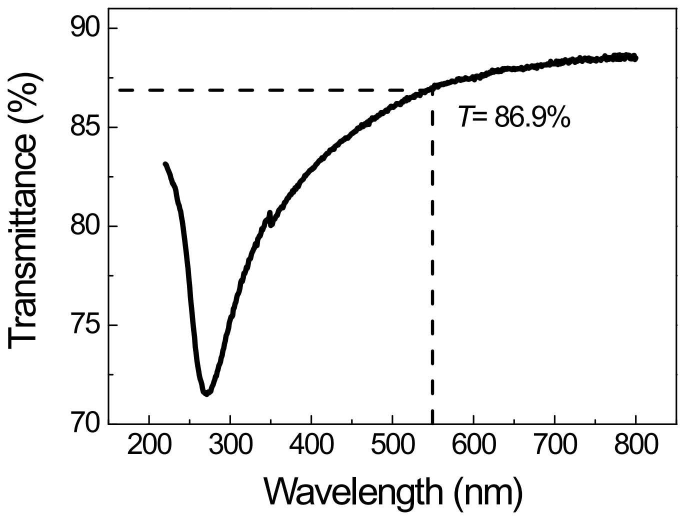

Figure S1. Transmittance of graphene. The transmittance is about 86.9% at 550 nm, corresponding to a thickness of ~2 nm (the number of layers is ~6).

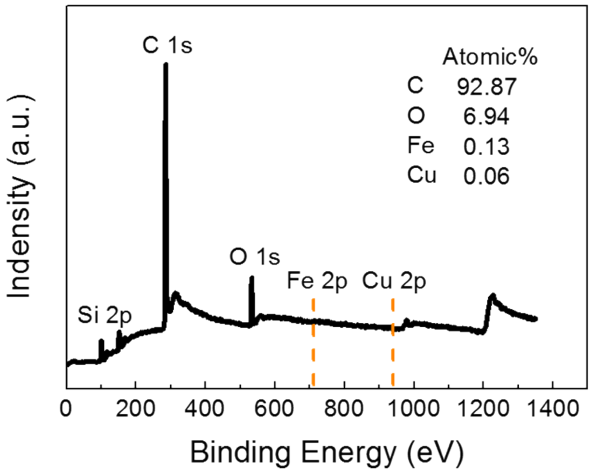

Figure S2. XPS of as-prepared graphene (on Si substrate). The contents of metallic impurities (*e.g.*, Fe, Cu) in graphene are quite low.

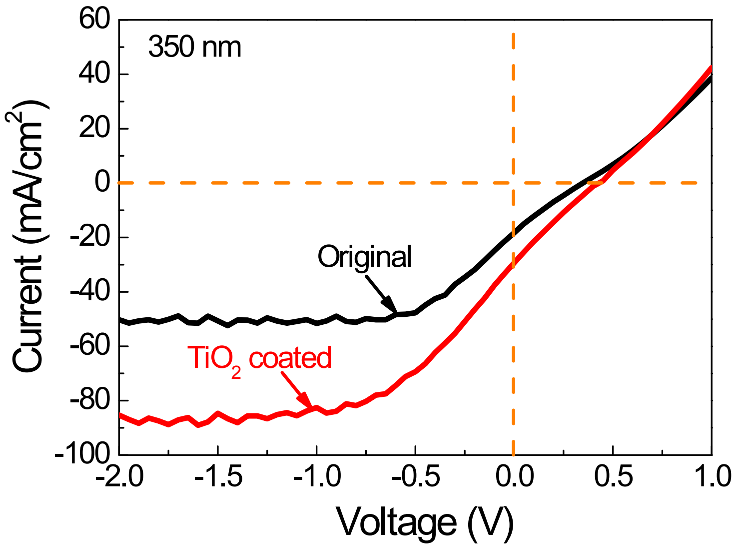

Figure S3. *I*-*V* characteristics of the device before and after TiO_2 coating, tested at 350 nm incident light.

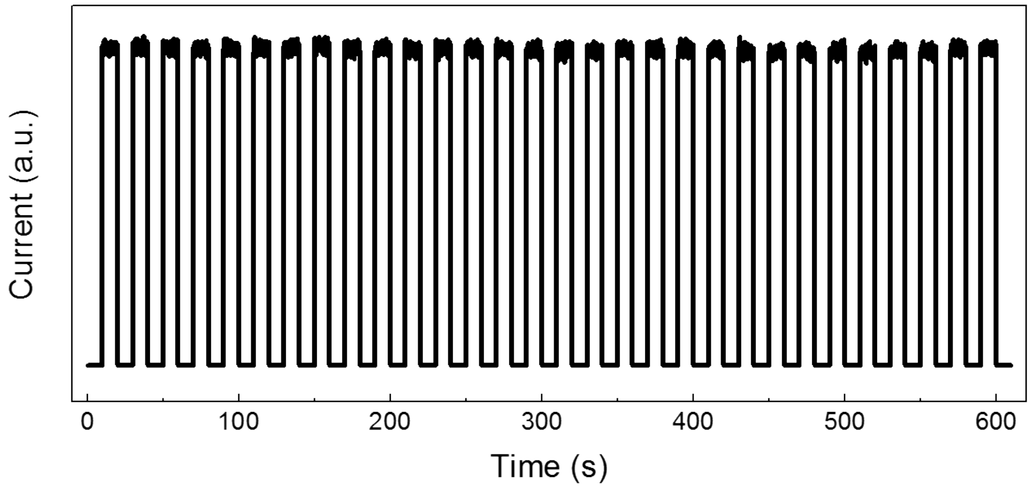

Figure S4. Response repeatability of the switching behavior of TiO_2/graphene/Si device in 10 min.

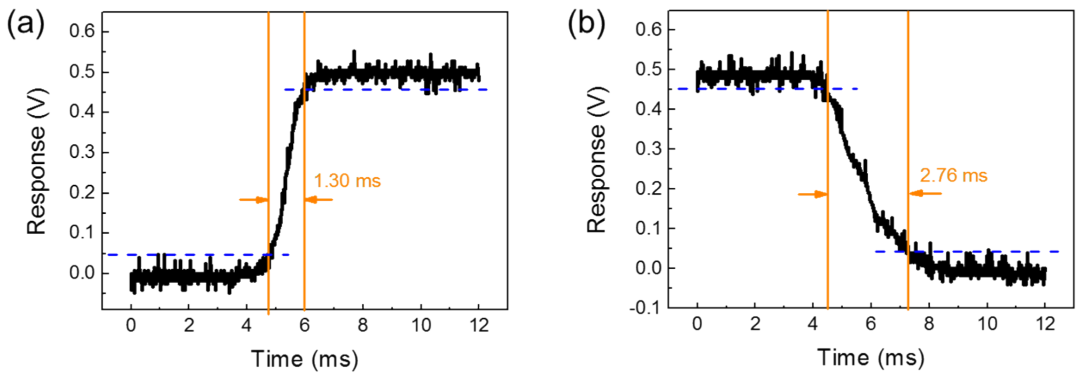

Figure S5. (a) Response and (b) recovery of the TiO_2/graphene/Si device. The response and recovery times are confirmed as the time interval from 10% to 90% (90% to 10%) of its peak value.[1,2]

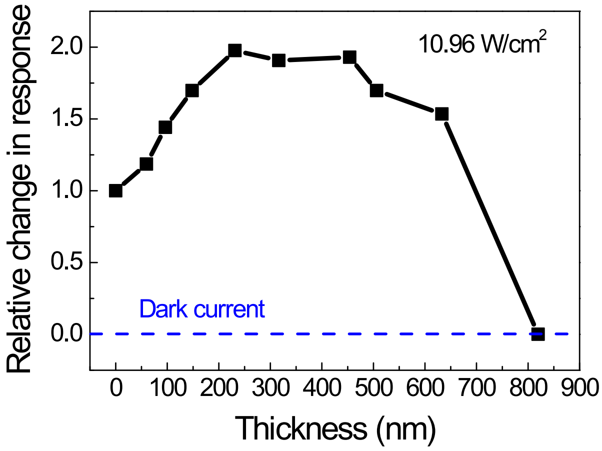

Figure S6. Relative change of the response current versus the thickness of TiO_2 layer.

The thickness of the TiO_2 layer was tuned by repeatedly spin-coating the TiO_2 NPs on a same device. An ultraviolet source with stronger intensity was used to guarantee enough photons penetrate the TiO_2 layer and therefore enable investigation for a wider range of thicknesses of the TiO_2 layers. The response current increased along with the thickness of TiO_2 at beginning, after a stable region, the response decayed and then sharply decreased to the level of dark current. One possible reason was that thick TiO_2 layer within certain range may provide more excitons beneficial to reduce the tunneling recombination of the charge layers. Thicker TiO_2 layer might lead to severe energy loss of the incident ultraviolet, therefore resulted in negative effects.

References:

[1] D. Wu, Y. Jiang, Y. Zhang, J. Li, Y. Yu, Y. Zhang, Z. Zhu, L. Wang, C. Wu, L. Luo and J. Jie, *J. Mater. Chem.*, 2012, **22**, 6206.

[2] P. Wu, Y. Dai, T. Sun, Y. Ye, H. Meng, X. Fang, B. Yu and L. Dai, *ACS Appl. Mater. Interfaces*, 2011, **3**, 1859.