Supplementary Information for:

Oxygen induced abnormal photoelectric property of MoO$_3$/graphene heterocomposite

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NO.   **Description**

1. XRD

The XRD patterns of the synthesized MoO_3 nanoflakes, the MoO_3/graphene heterocomposite and the graphene are shown the figure S1. The pattern of MoO_3 nanoflakes is consistent with the standard profile (JCPDS 05-0508; a=3.962 Å, b=13.85 Å and c=3.697 Å) which indicates the orthorhombic structure (α-MoO_3). The four strongest peak: (020), (040), (021) and (060) peaks all present sharp shape and strong intensity which indicate the synthesized MoO_3 nanoflakes have good crystallinity and a preferred growth orientation. In addition, the (040) peak shows the strongest intensity among all peaks in the MoO_3 nanoflakes pattern. However, for the pattern of the heterocomposite, the (021) peak shows the strongest intensity. Combined with the intensity increase of the (110) peak, it is easy to get that the graphene has great impact on the growth orientation of MoO_3 nanoflakes during the formation of the heterocomposite. The characteristic (002) diffraction peak of graphene appears at about 26° in the pattern of graphene.
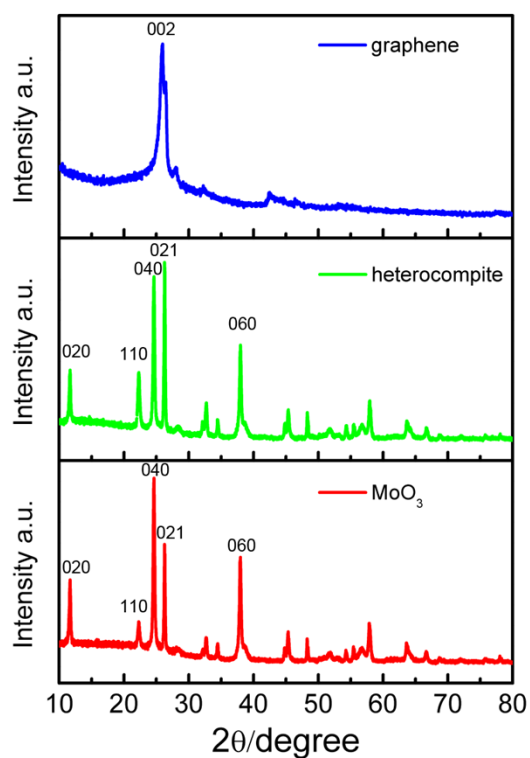

Figure S1. XRD patterns of graphene, MoO_3/graphene heterocomposite and MoO_3 nanoflakes

2. XPS

The XPS (X-ray photoelectron spectra) C1s line scan of graphene and the heterocomposite are shown in the figure S2. Corresponding to the graphene related C1s peak, the heterocomposite related C1s peak shifts to lower binding energy, which means hole doping in graphene caused by the electron injection from graphene to MoO_3 nanoflakes, which is in accordance with the analysis in the main text.
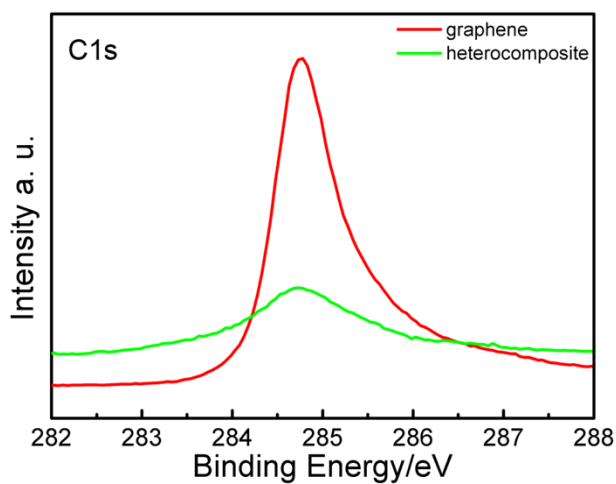

Figure S2. XPS C1s line scan of grahene and MoO_3/graphene heterocomposite.

3. TGA

The TGA (Thermo-gravimetric analysis) of graphene, heterocomposite and MoO_3 nanofalkes are shown in figure S3. From 25 °C to 900 °C, the weight losing of graphene is within 6%, the heterocomposite is about 15% and the MoO_3 nanoflakes is about 40%.
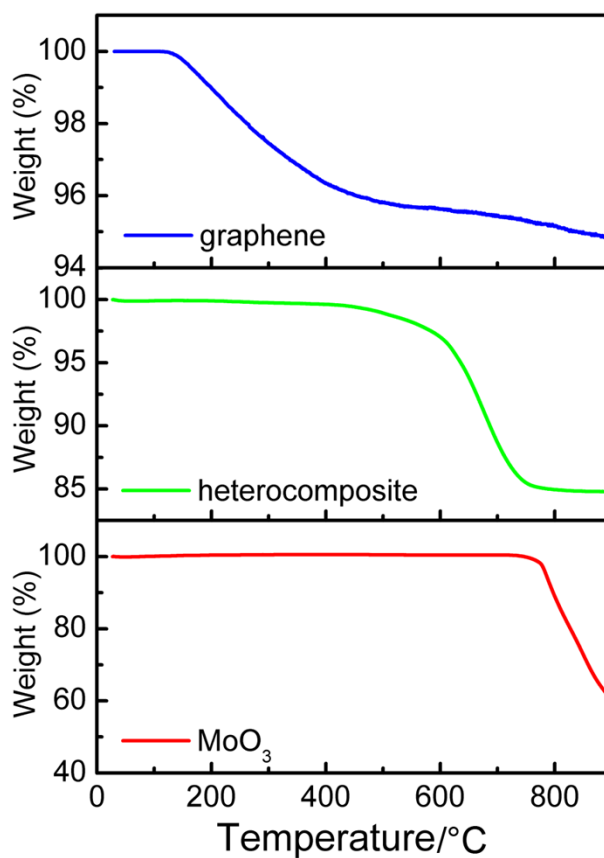

Figure S3. TGA curves of graphene, MoO_3/graphene heterocomposite and MoO_3 nanoflakes.