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

Supplementary information:

Controllable electrostatic self-assembly of sub-3-nm graphene quantum dots incorporated into mesoporous Bi_2MoO_6 frameworks: efficient physical and chemical simultaneous co-catalysis for photocatalytic oxidation

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This SI file includes:

Figs. S1 to S14

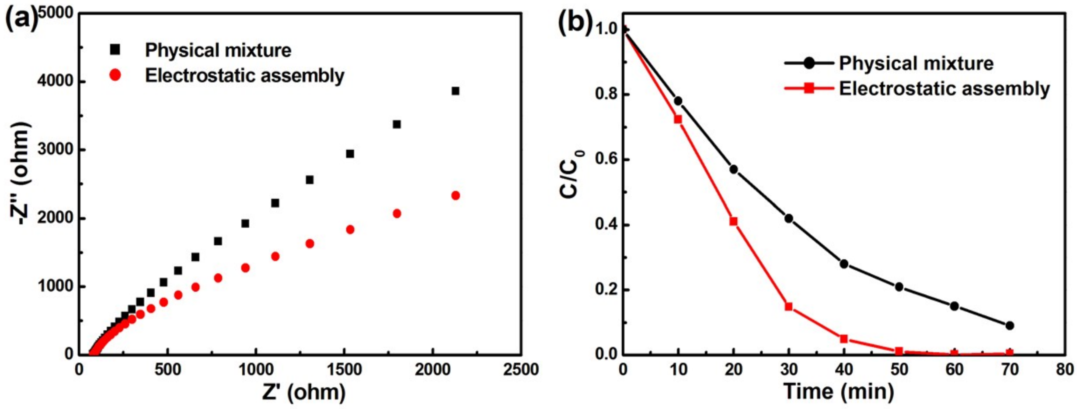


Fig. S1 EIS spectrum (a) and photodegradation curve (b) of as different samples prepared via physical mixture and electrostatic assembly.

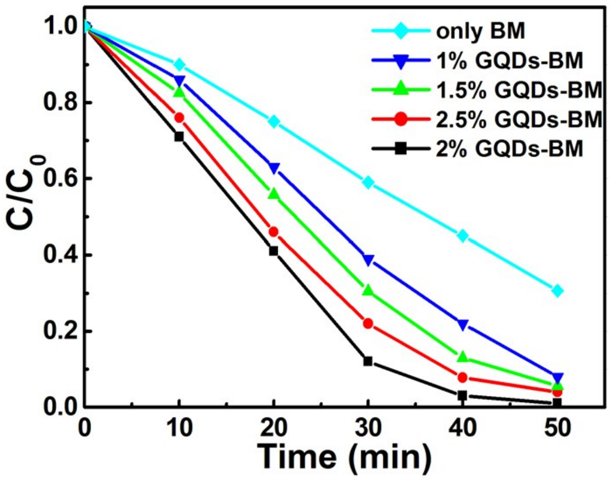


Fig. S2. Photocatalytic degradation of RhB in the presence of bare M-BM and CQD-BM hybrid with different weight ratios of GQDs under artificial solar light irradiation.

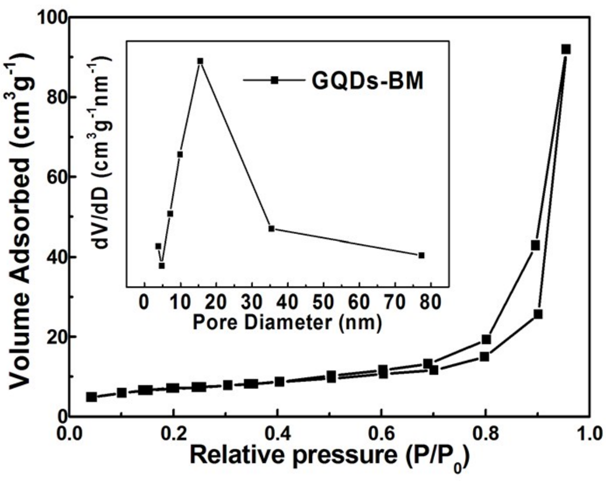


Fig. S3 Nitrogen adsorption-desorption isotherm and pore size distributions (inset) of GQDs-BM hybrid material.

The N_2 adsorption-desorption isotherms of GQDs-BM is type IV classification and H3 type hysteresis, reveals that the GQDs-BM hybrid material with a mesoporous structure.

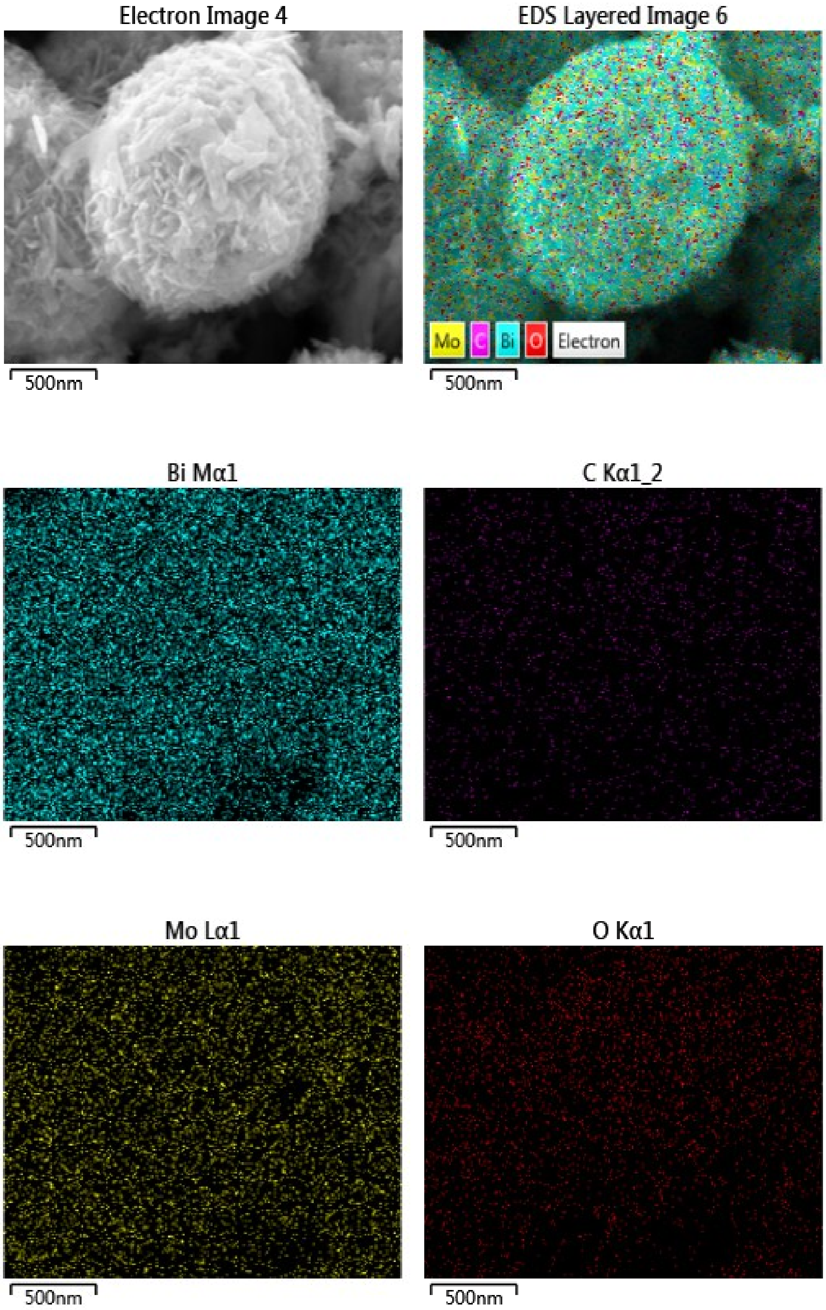


Fig. S4 FESEM image and corresponding elemental mappings of the GQDs-BM hybrid.

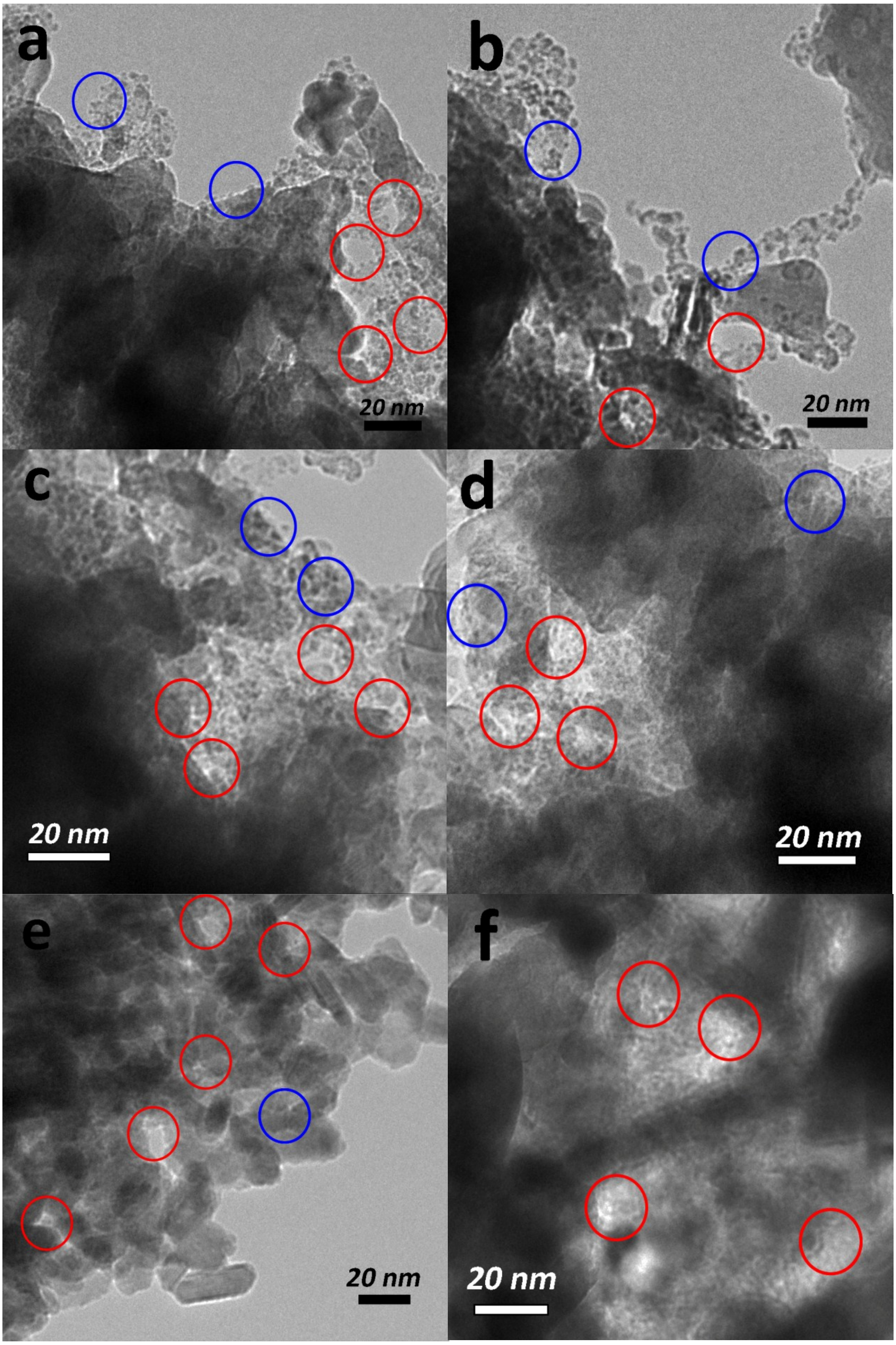
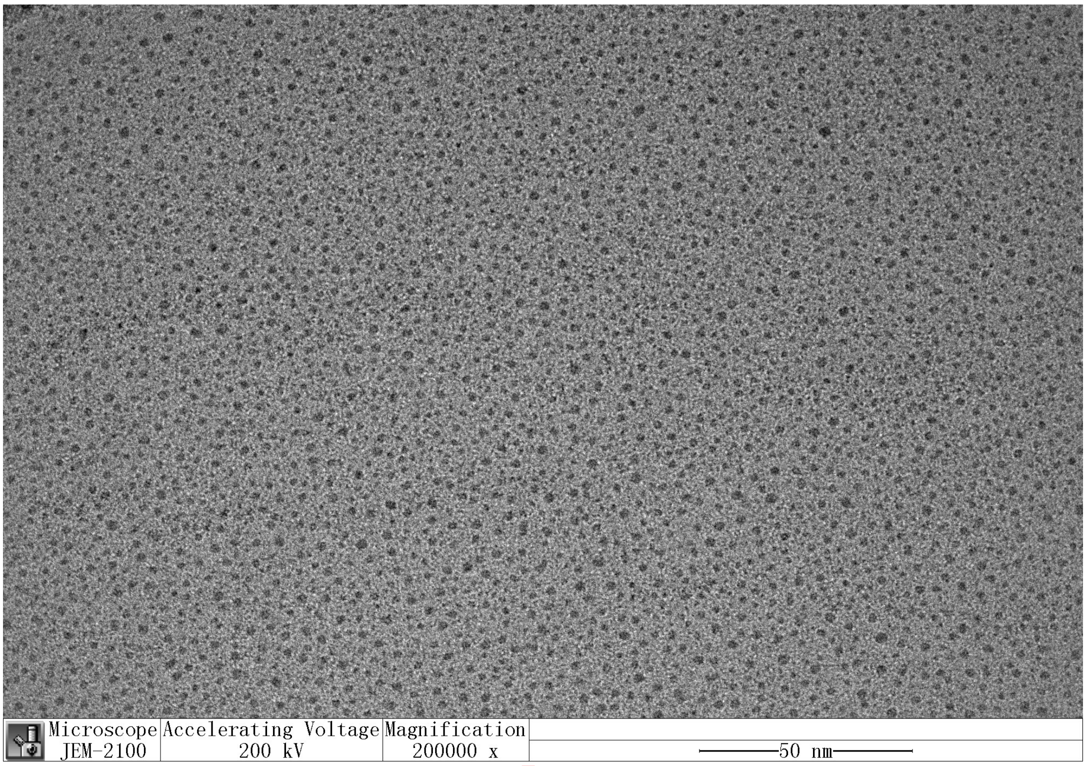
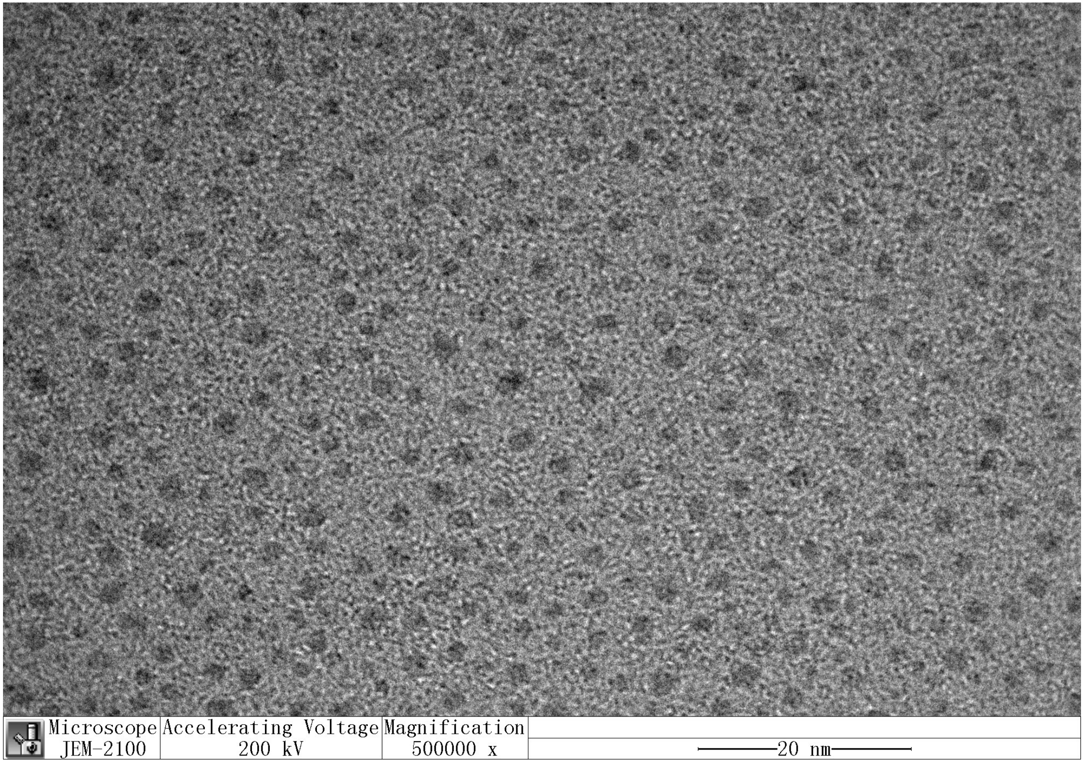


Fig. S5 TEM images of GQDs-BM hybrid.

The sub-3-nm GQDs not only deposited on the external surface of mesoporous Bi_2MoO_6 (blue circles), but also inner the mesoporous channels (red circles).


Microscope
JEM-2100
Accelerating Voltage
200 kV
Magnification
200000 x
50 nm


Microscope
JEM-2100
Accelerating Voltage
200 kV
Magnification
500000 x
20 nm

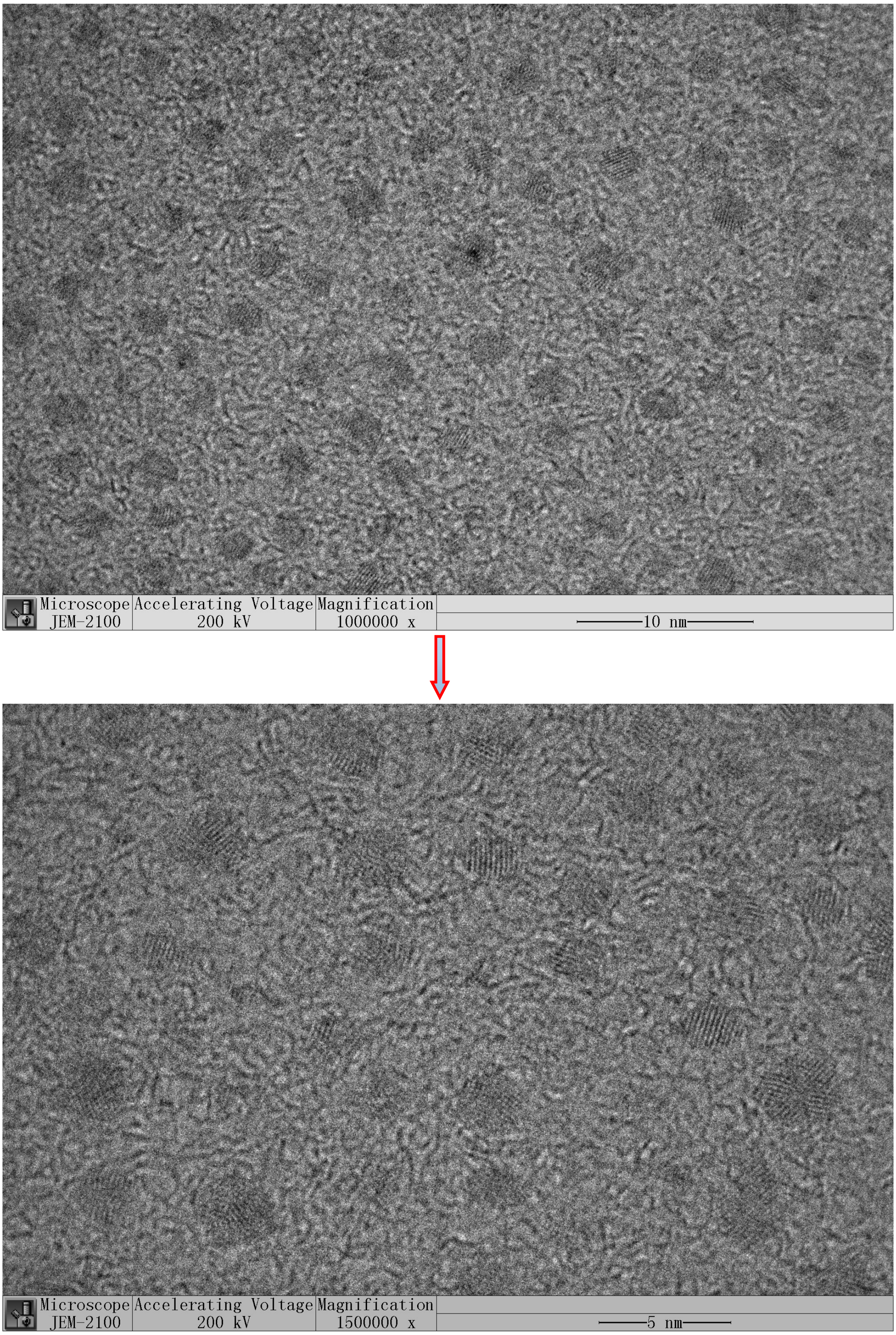


Fig. S6 The TEM images of as-prepared GQDs.

Note that through the hydrothermal process (synthesis GQDs-BM hybrid), the size of GQDs would further reduce by the hydrothermal shearing effect.

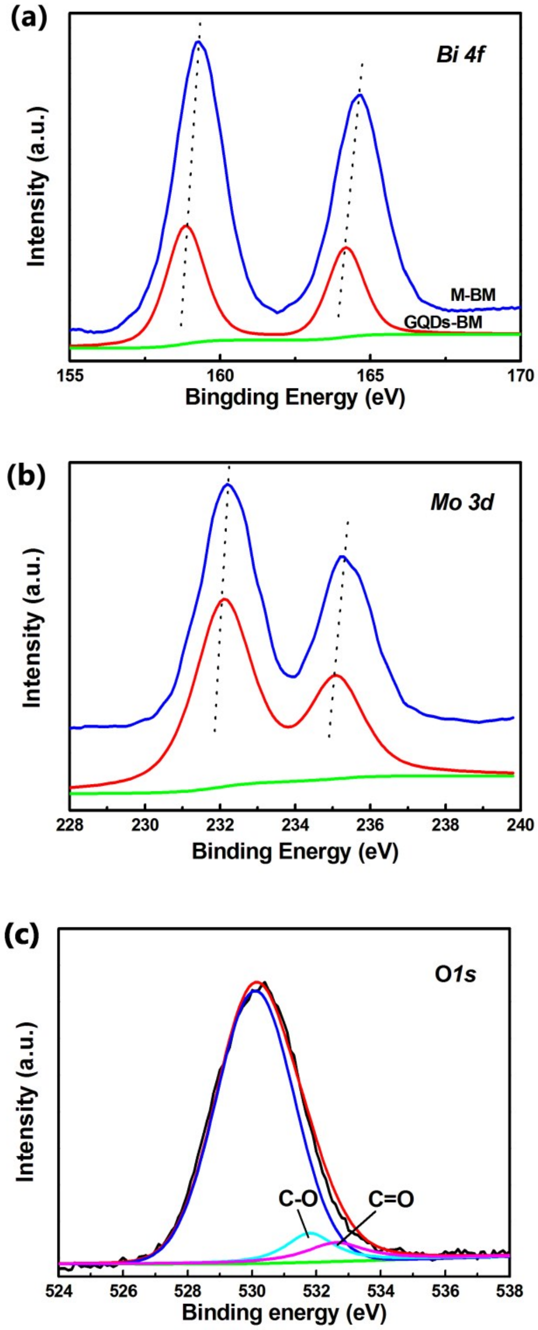


Fig. S7 High-resolution (a) Bi 4f (b) Mo 3d (c)O 1s XPS spectra of GQDs-BM hybrid material.

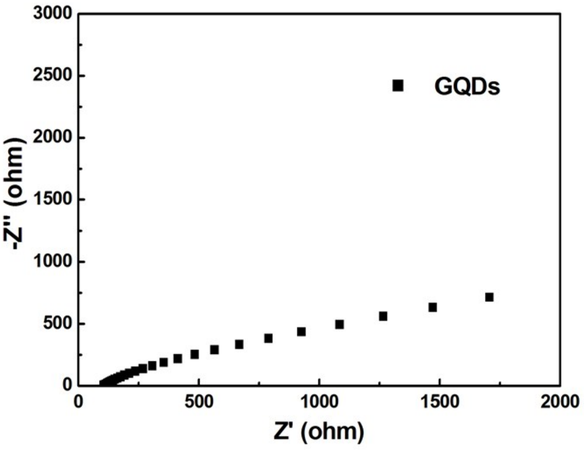


Fig. S8 EIS Nyquist plot of as-prepared bare GQDs.

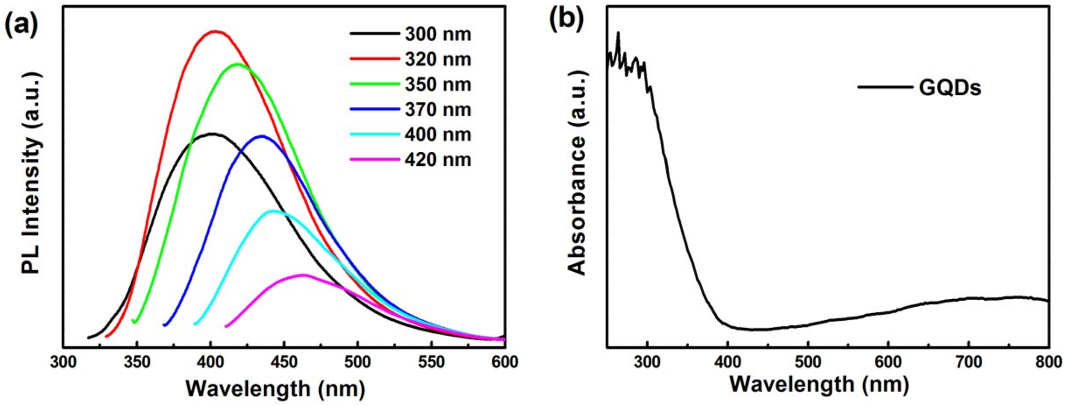


Fig. S9 (a) PL spectra of as-prepared GQDs at different excitation wavelengths ranging from 300 nm to 420 nm; (b) UV-vis spectrum of as-prepared GQDs.

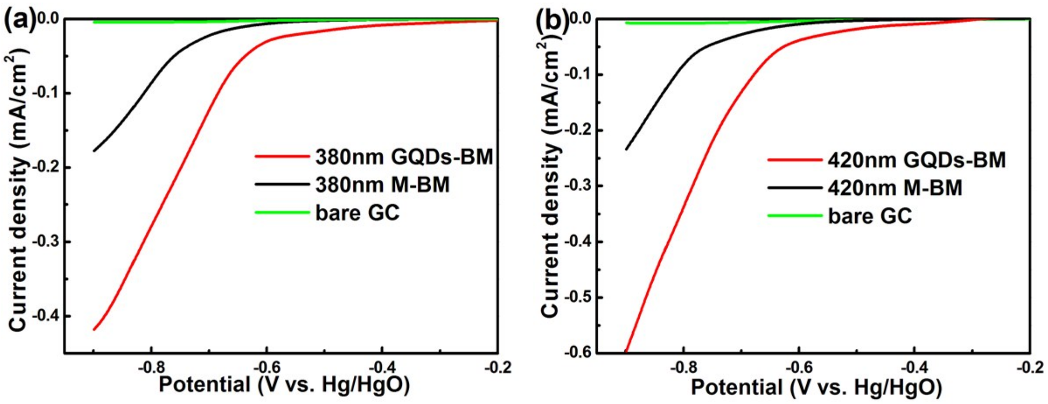


Fig. S10 Current-potential (J-V) curves of GQDs-BM and M-BMin ultrapure water without any other to add under 380 and 420nm monochromatic light. The relative current density was obtained by dividing the current density by the IPCE (in Na_2SO_4; Figure3d).

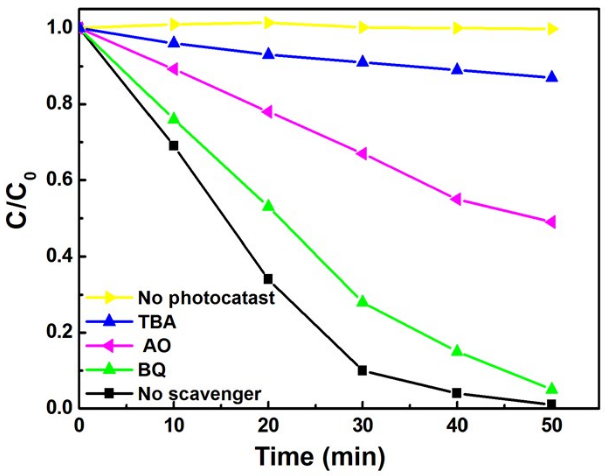


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Fig. S11 Trapping experiments of active species during the photocatalytic degradation of RhB by GQDs-BM under the simulated sunlight irradiation.

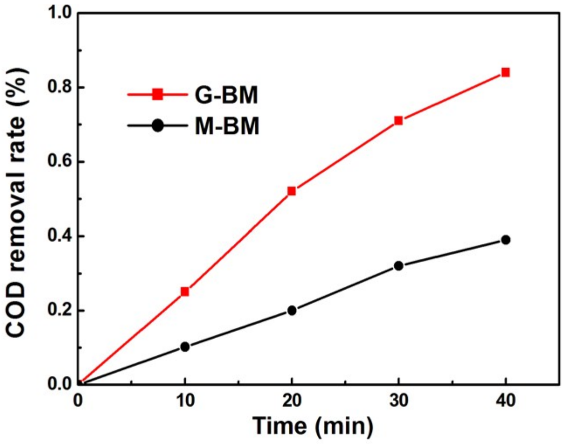

Fig. S12 COD removal rate of the RhB solution

Chemical oxygen demand (COD) is the oxygen equivalent to form H_2O and CO_2 during the photooxidation process (mineralization) of organic pollutants. It has been considered as one of importantwater pollution parameters. The COD was determined by using potassium dichromate oxidation method.The COD removal rate was estimatedby: $\eta(\%)=(C_0-C_t)/C_0\times100\%$,where$\eta$is the COD removal rate, C_0 (mg/L) is the concentration of COD before the photocatalytic reaction, and C_t (mg/L) is the concentration of COD after the photocatalytic reaction[2-3]. Fig. S12 clearly reveals that the COD removal rate of G-BM is much higher than that of M-BM, which indicates that the organic substance mineralization rate of GQDs-BM during the photooxidation process is much higher than that of M-BM.

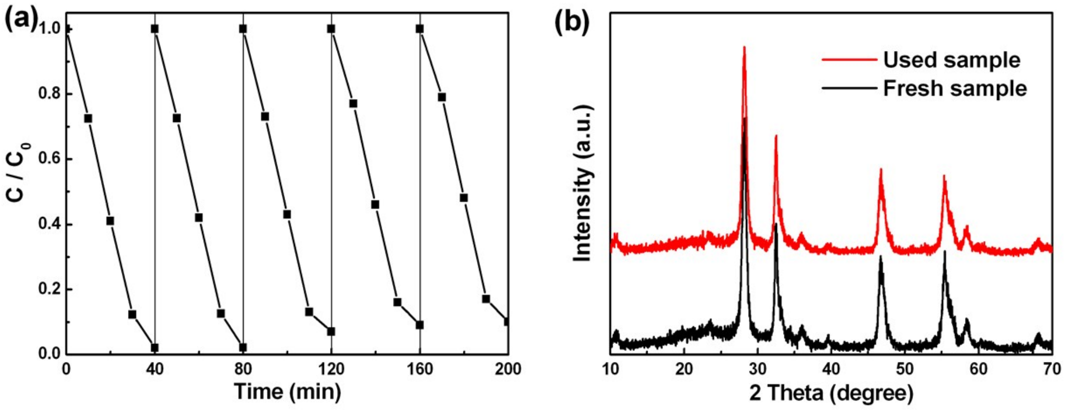

Fig. S13 (a) Recycling runs of the GQDs-BM hybrid under simulated sunlight irradiation, (b) XRD patterns of GQDs-BM hybrid before and after photo-degradation of RhB.

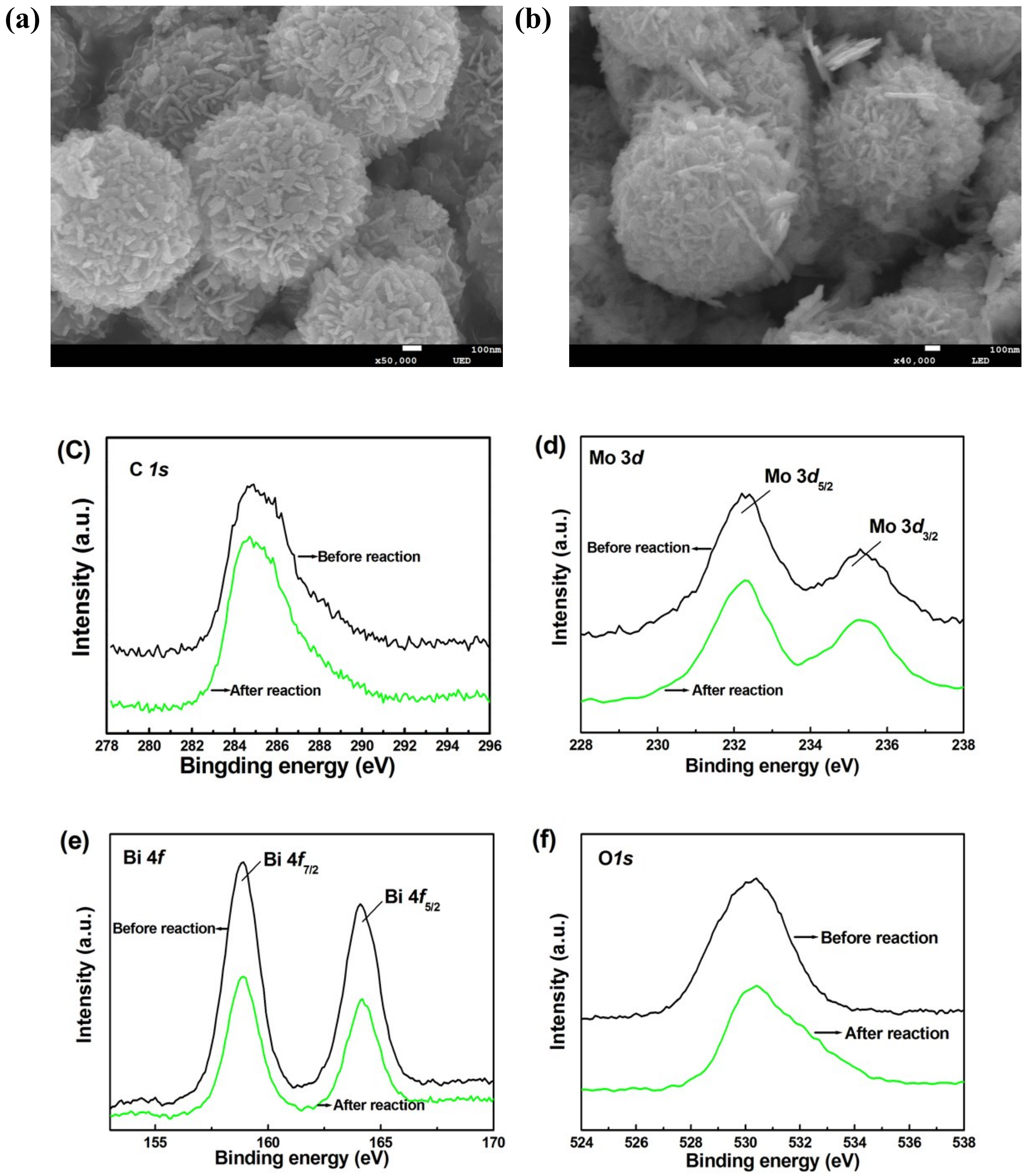

Fig. S14 SEM images of GQDs-BM hybrid before (a) and after (b) photo-degradation; high-resolution XPS spectra (c-f) of GQDs-BM hybrid before and after photo-degradation.