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Supporting Information

Oxidative etching MoS_2/WS_2 nanosheets to their QDs by facile UV irradiation

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1. Raman analysis of the nanosheets and QDs

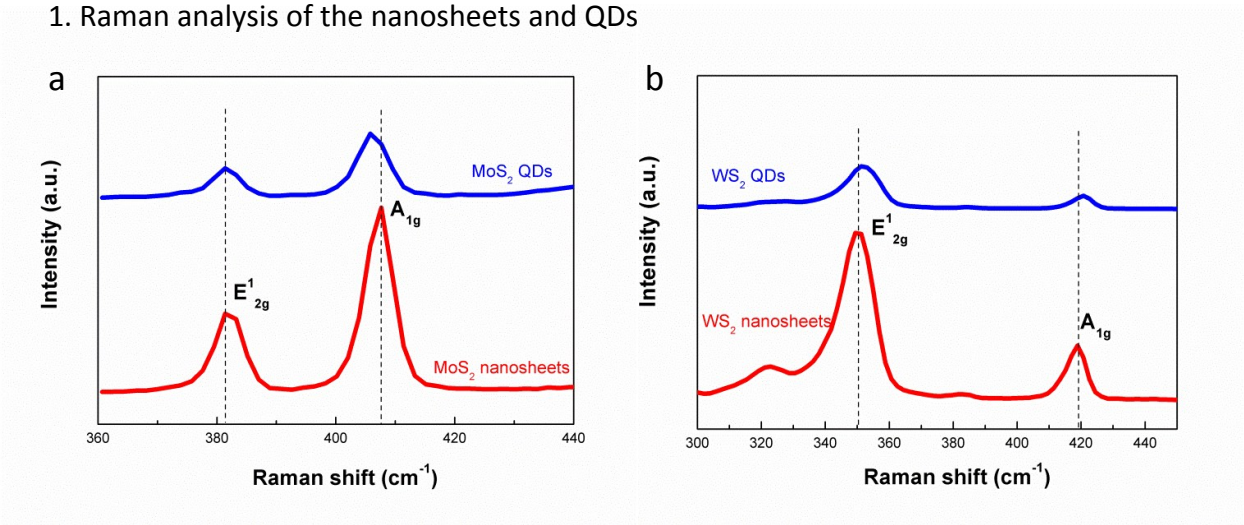

Fig. S1 The Raman spectra of MoS_2 (a) and WS_2 (b) nanosheets and corresponding QDs.

In Fig. S1 a, for the nanosheets of MoS_2 obtained after sonication, there are two first-order Raman active modes,[1] the A_{1g} and the E^1_{2g}, located at 407.7 and 381.4 cm^{-1}, respectively. For their irradiated nanoparticles, the A_{1g} peak red shifts in the order of 2 cm^{-1}, indicating the thinning and exfoliation of nanosheets. On the spectra of WS_2 (Fig. S1 b), there are two intensive peaks corresponding to the A_{1g} and E^1_{2g} modes from out-of-plane and in-plane vibrations, respectively.[2] The two peaks both blue shift after downsizing to ultrasmall nanoparticles. The A_{1g} peak shifts to 420.8 from 418.9 cm^{-1}. While the E^1_{2g} peak shifts to 352.2 from 349.4 cm^{-1}. In the meantime, there is no identifiable peak corresponding to the oxides of molybdenum and tungsten in the Raman spectra. The Raman results further confirmed the as-prepared nanoparticles were the QDs of MoS_2/WS_2.

2. AFM measurements of QDs

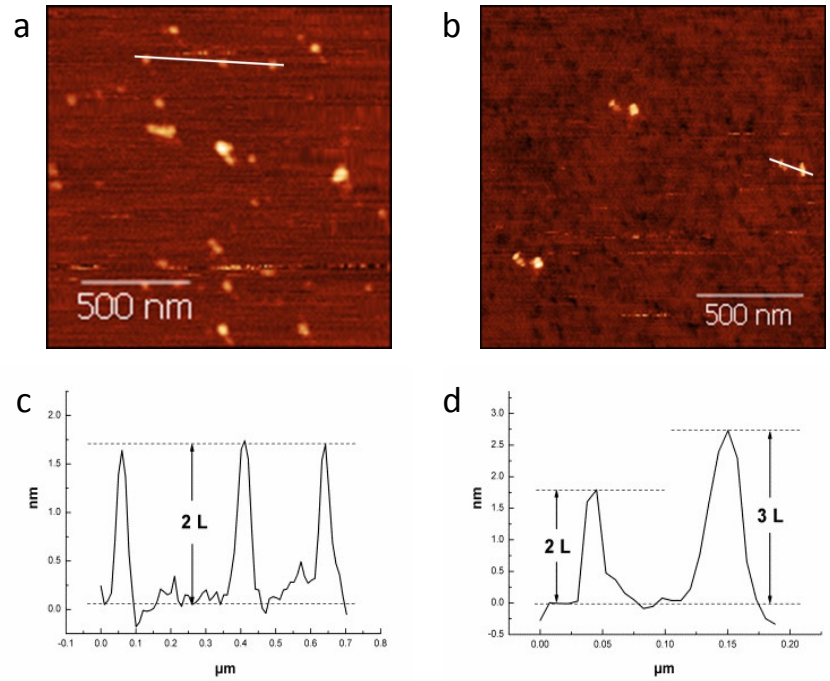

Fig. S2 The AFM images and their corresponding height profiles of the QDs of MoS_2 (a) (c) and WS_2 (b) (d).

Due to the fact that the height of monolayer MoS_2 and WS_2 is 0.8-1.0 nm,[2,3] all of the three measured heights of MoS_2 QDs correspond to 2 layers. While in the height profile of QDs of WS_2, the measured heights correspond to 2 and 3 layers, respectively. The AFM results confirm the layered structure of the obtained QDs.

3. Contrast experiments conducted under higher power irradiation

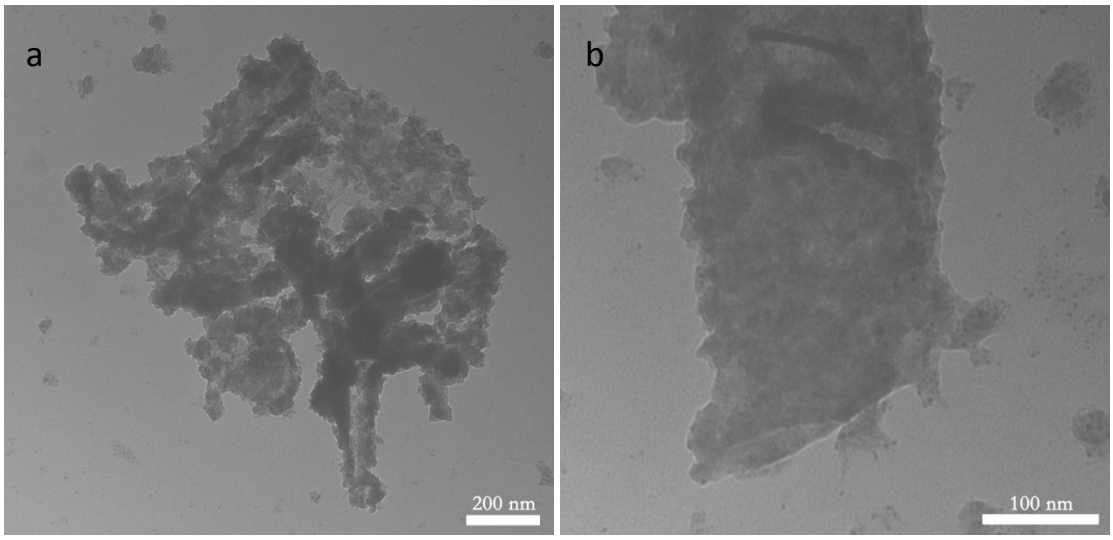

Fig. S3 TEM images of the etched nanosheets of MoS_2 under high powder (125 W, ~17 mW/cm^2) irradiation for 24 h. QDs could be seen in the vicinity of the etched nanosheets in (b).

4. Contrast experiments conducted in ethanol/water

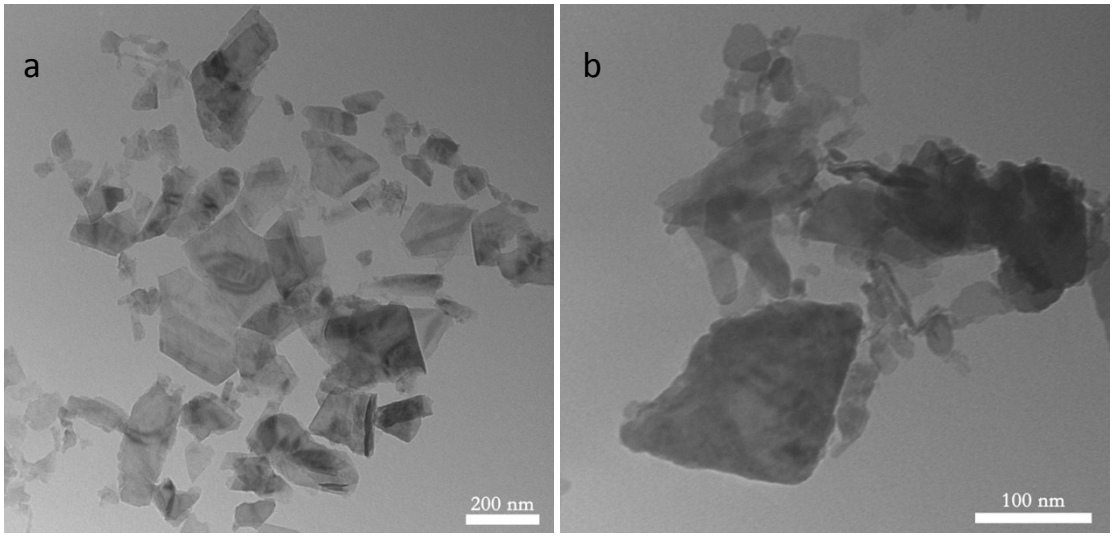

Fig. S4 TEM images of the nanosheets of MoS_2 (a) and WS_2 (b) in water/ethanol obtained after irradiation for 48 h. The morphologies of nanosheets are basically intact and no QDs are produced.

References

1 C. N. R. Rao, H. S. S. Ramakrishna Matte, and Urmimala Maitra. *Angew. Chem. Int. Ed.*, 2013, 52, 13162-13185.
2 Yinghan Yan, Cuiling Zhang, Wei Gu, *et al. J. Phys. Chem. C*, 2016, 120, 12170-12177.
3 L. Dong, S. Lin, L. Yang, *et al. Chem. Commun.*, 2014, 50, 15936-15939.