Supporting Information

Detailed experimental conditions

MoS\(_2\) (500 mg) and KOH (5 g) were added to DI water (100 mL) to create a MoS\(_2\) dispersion (5 mg/mL). The mixture was stirred and maintained at 80 °C for 24 h and then it was rapidly quenched to low temperature in liquid N\(_2\). After quenching, the dispersion was subjected to exfoliation for 180 min in an ultrasonication bath maintained at 20 kHz under a power of 130 W. The resulting exfoliated MoS\(_2\) powder was collected through vacuum filtration through PVDF membranes (average pore size: 0.2 µm) supported on a fritted glass holder. The as-prepared product was washed with DI water and then dried at 50 °C under vacuum for 24 h. After peeling off the PVDF membrane, the resulting MoS\(_2\) powder, described herein as exfoliated MoS\(_2\), was stored in a drying box at 50 °C until required for use.

Preparation of exfoliated MoS\(_2\) dispersion

The exfoliated MoS\(_2\) (50 mg) was added to CHCl\(_3\) (100 mL) to create a dispersion (0.5 mg/mL), which was subjected to treatment for 30 min in an ultrasonication bath maintained at 20 kHz under a power of 130 W.

Characterization

Raman spectra of the raw MoS\(_2\) and exfoliated MoS\(_2\) powder were recorded using a high-resolution confocal Raman microscope (HOROBA, Lab RAM HR) and a 632-nm He–Ne laser source. SAED patterns and HRTEM images were recorded using a JEOL 2100F instrument equipped with an Oxford Instruments EDS apparatus operated at 200 kV; for HRTEM measurement, a few drops of the diluted dispersion of exfoliated MoS\(_2\) were placed on a standard holey C-covered Cu TEM micro grid. AFM images were recorded using a Digital Instruments Nanoscope III apparatus equipped with a NANOSENSORS Si tip, operated in the tapping mode with a resonance frequency of 130 kHz. AFM and Raman samples were prepared by spin-coating the dispersions onto the surfaces of Si/SiO\(_2\) substrates and then drying in air.
Fig. S.1 Raman spectra of raw MoS\textsubscript{2} (bulk MoS\textsubscript{2}) and exfoliated MoS\textsubscript{2} samples processed from solutions of MoS\textsubscript{2} in DI water and aqueous KOH.

MoS\textsubscript{2}-DI: Exfoliation of solution of MoS\textsubscript{2} in DI water, without quenching.
MoS\textsubscript{2}-DIQ: Exfoliation of solution of MoS\textsubscript{2} in DI water, with quenching.
MoS\textsubscript{2}-KOH: Exfoliation of solution of MoS\textsubscript{2} in aqueous KOH, without quenching.
MoS\textsubscript{2}-KOHQ: Exfoliation of solution of MoS\textsubscript{2} in aqueous KOH, with quenching.
S.2a AFM images and height profiles of MoS$_2$-DI.
S.2b  AFM images and height profiles of MoS$_2$-KOH.
S.2c AFM images and height profiles of MoS₂-DIQ.
S.2d AFM images and height profiles of MoS$_2$-KOHQ.