Robust Production of 2D Quantum Sheets from Bulk Layered Materials

[Supplementary information]

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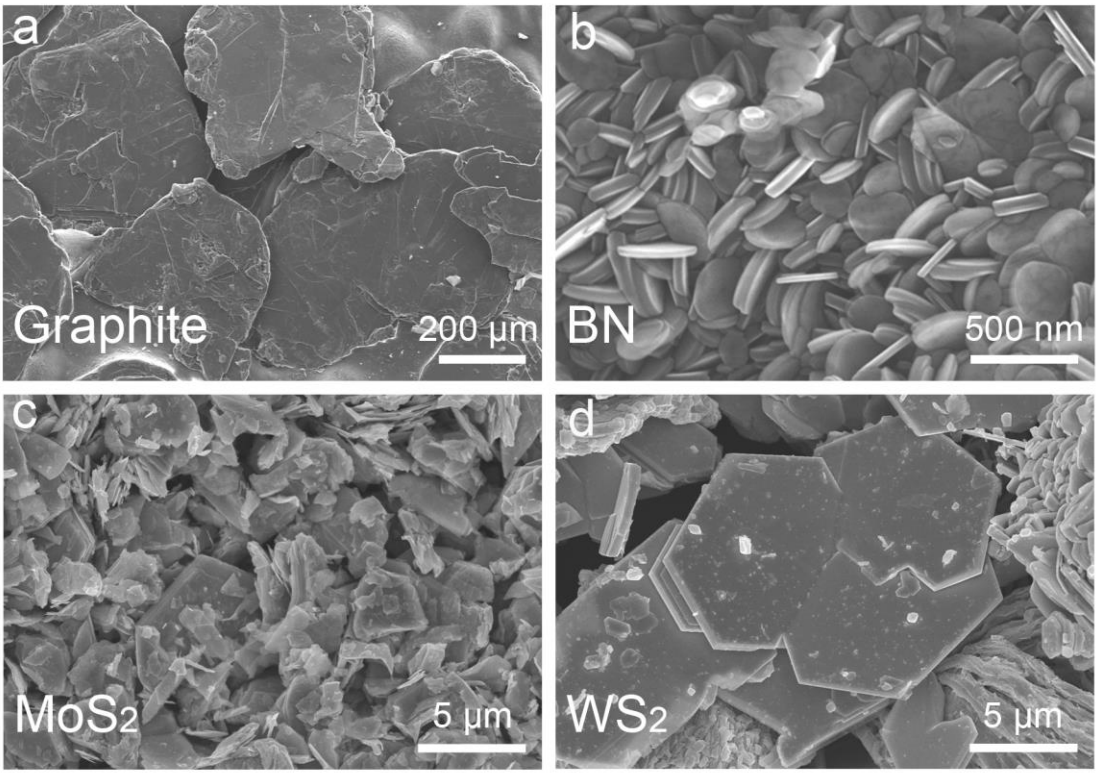

Fig. S1. SEM images of the bulk layered materials. Graphite (a), BN (b), MoS_2 (c), and WS_2 (d).

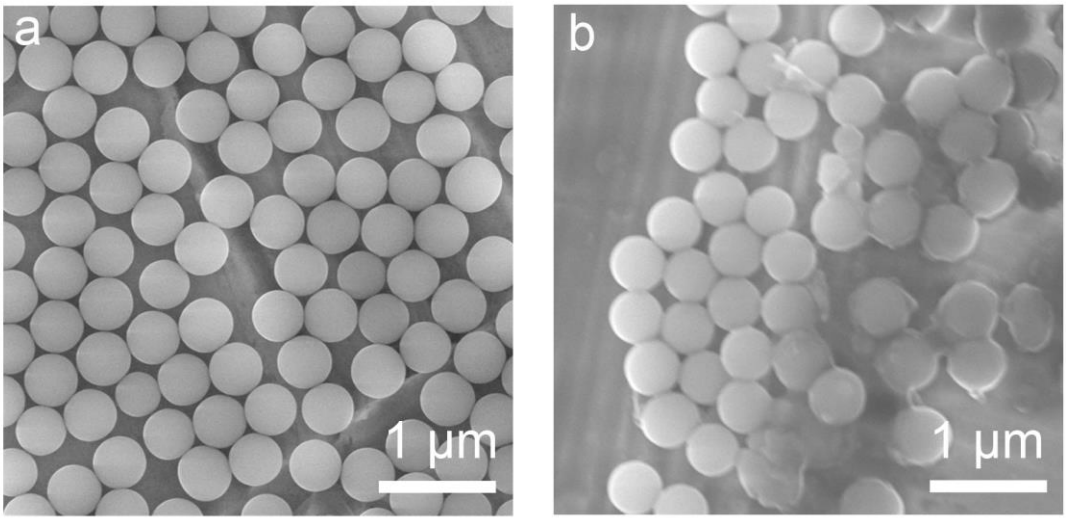

Fig. S2. SEM images of silica microspheres during ball-milling. (a) Before ball-milling, (b) After ball-milling for 12h (agate balls: silica microspheres: graphite = 100: 10: 1 by weight).

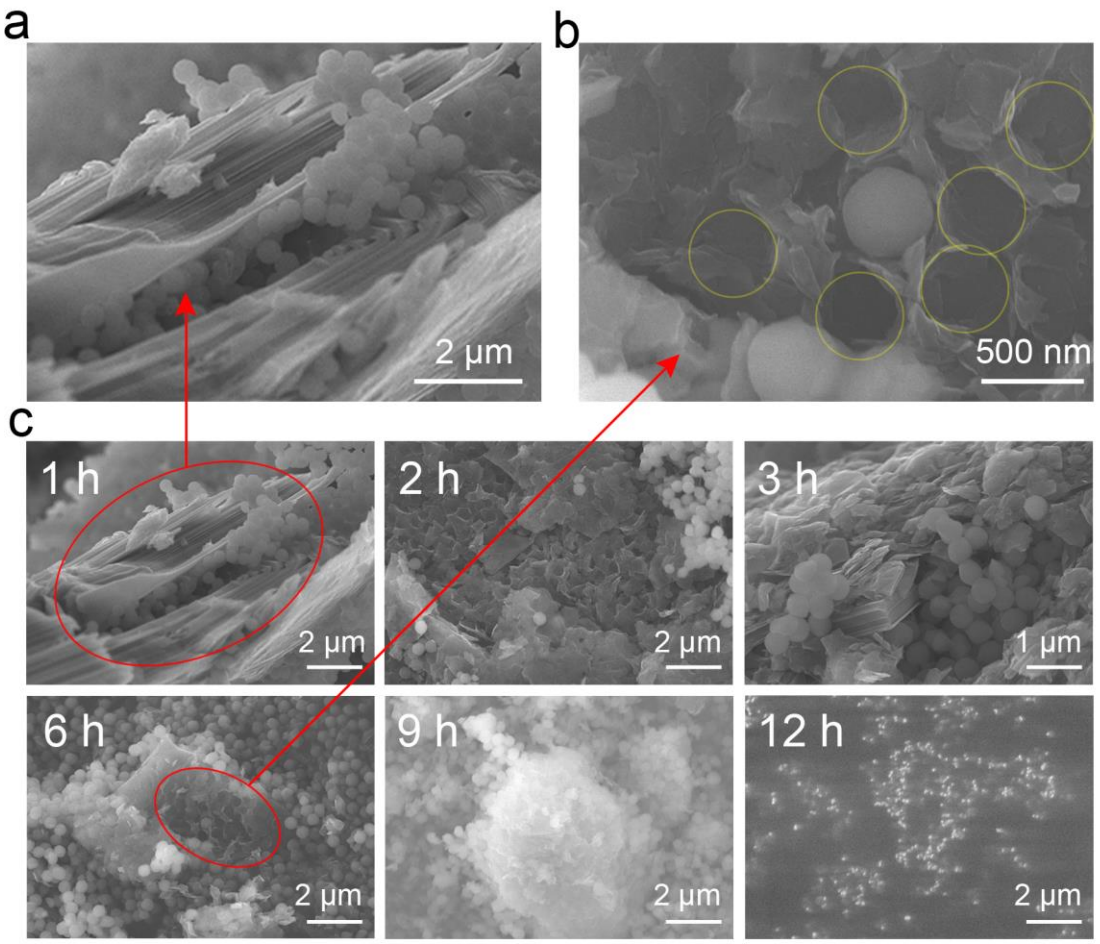

Fig. S3. SEM images of graphite during silica-assisted ball-milling. (a) Graphite interlayers inserted by silica microspheres. (b) Graphite surfaces severely cracked and well blended with silica microspheres and their voids. (c) Evolution of graphite with increasing ball-milling time.

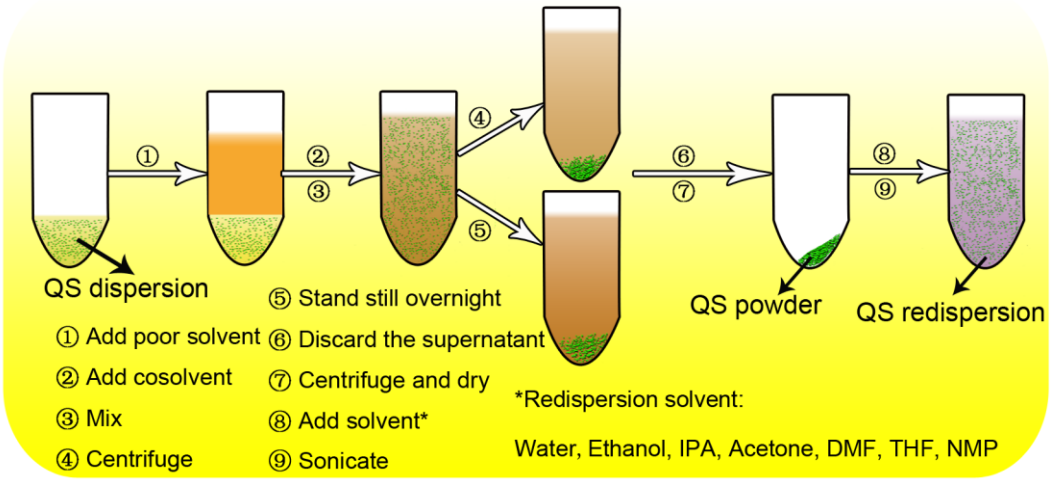

Fig. S4. Schematic illustration of the redispersion process.

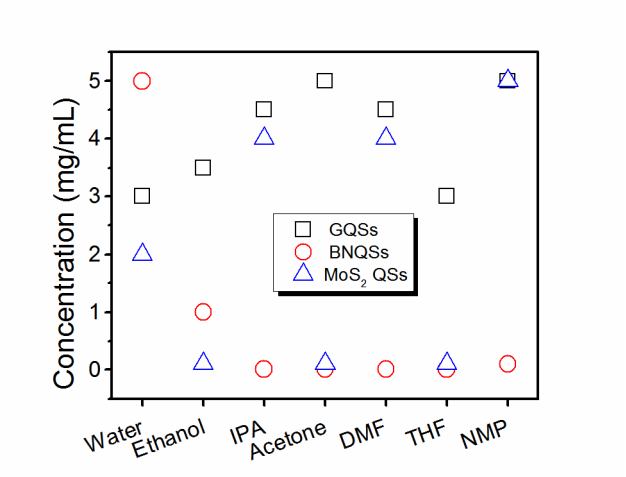

Fig. S5. Solvent diversity and solvability towards redispersion of GQSs, BNQSs, and MoS_2 QSs.

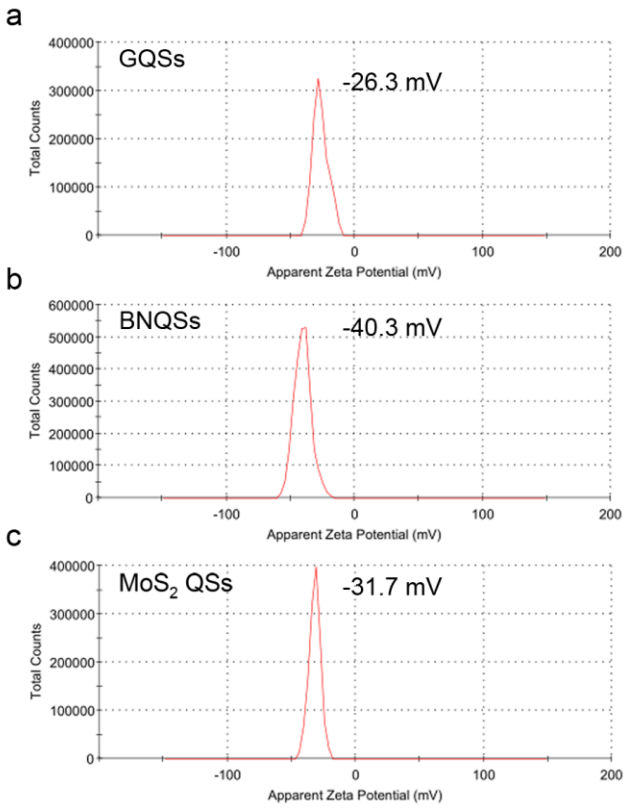

Fig. S6. Zeta potential of the QS aqueous dispersions. GQSs (a), BNQSs (b), and MoS_2 QSs (c). The concentration for each dispersion is 0.1 mg/mL.

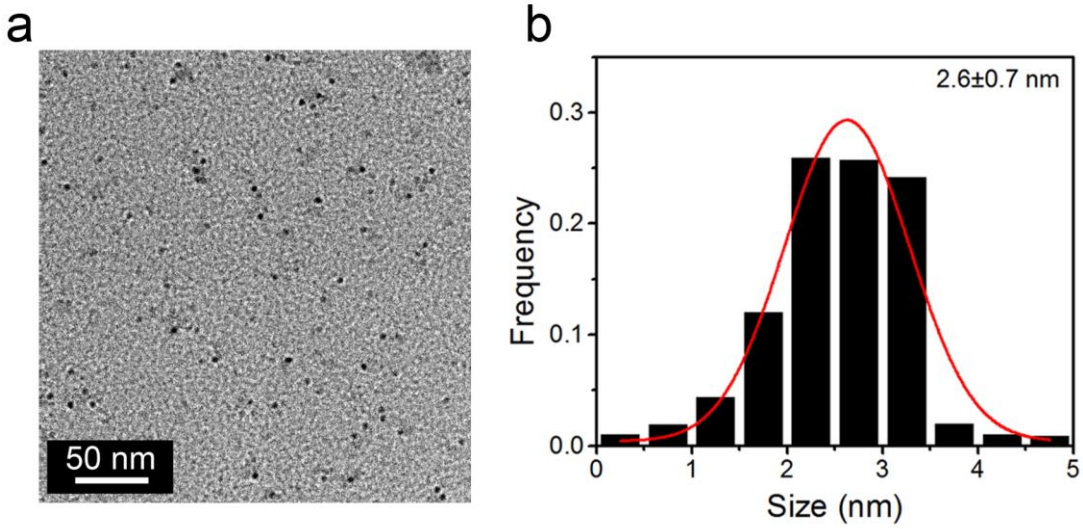

Fig. S7. TEM image (a) and lateral size distribution (b) of WS_2 QSs.

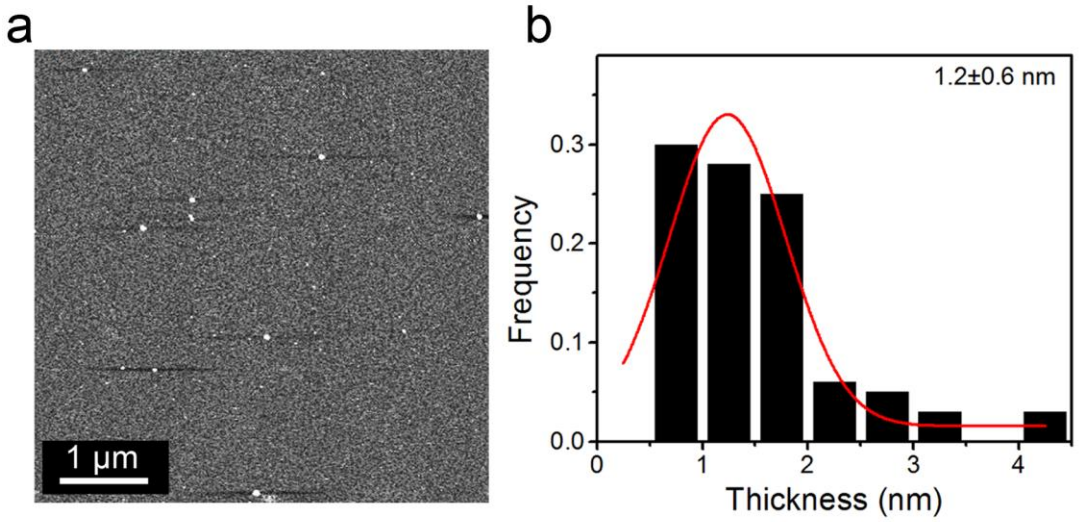

Fig. S8. AFM image (a) and height distribution (b) of WS_2 QSs.

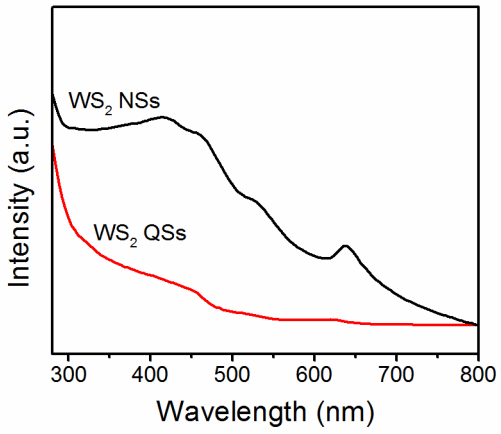

Fig. S9. UV-vis absorption spectra of WS_2 QSs. Data for WS_2 NSs are shown for comparison.

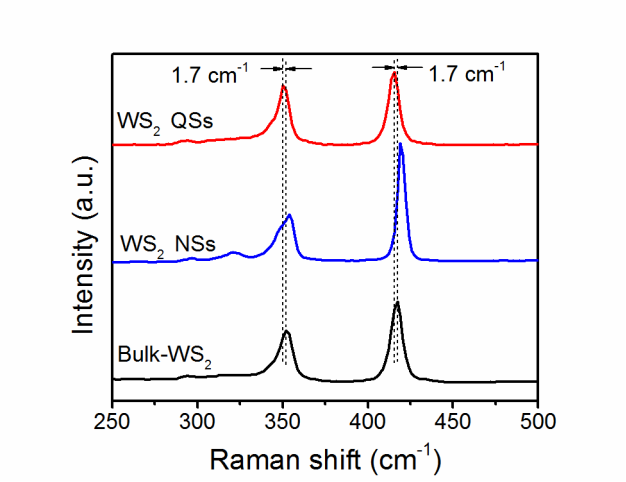

Fig. S10. Raman spectra of WS_2 QSs. Data for WS_2 NSs and bulk materials are shown for comparison.

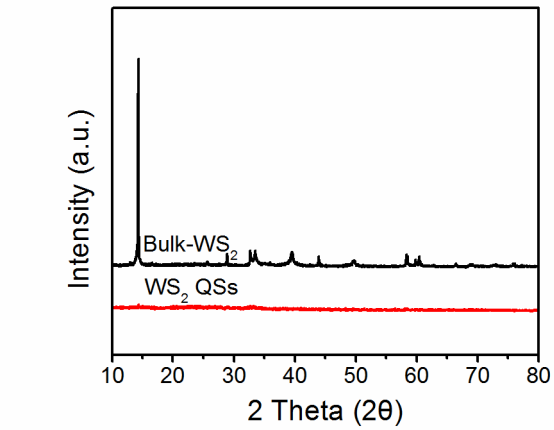

Fig. S11. XRD patterns of WS_2 QSs. Data for bulk materials are shown for comparison.

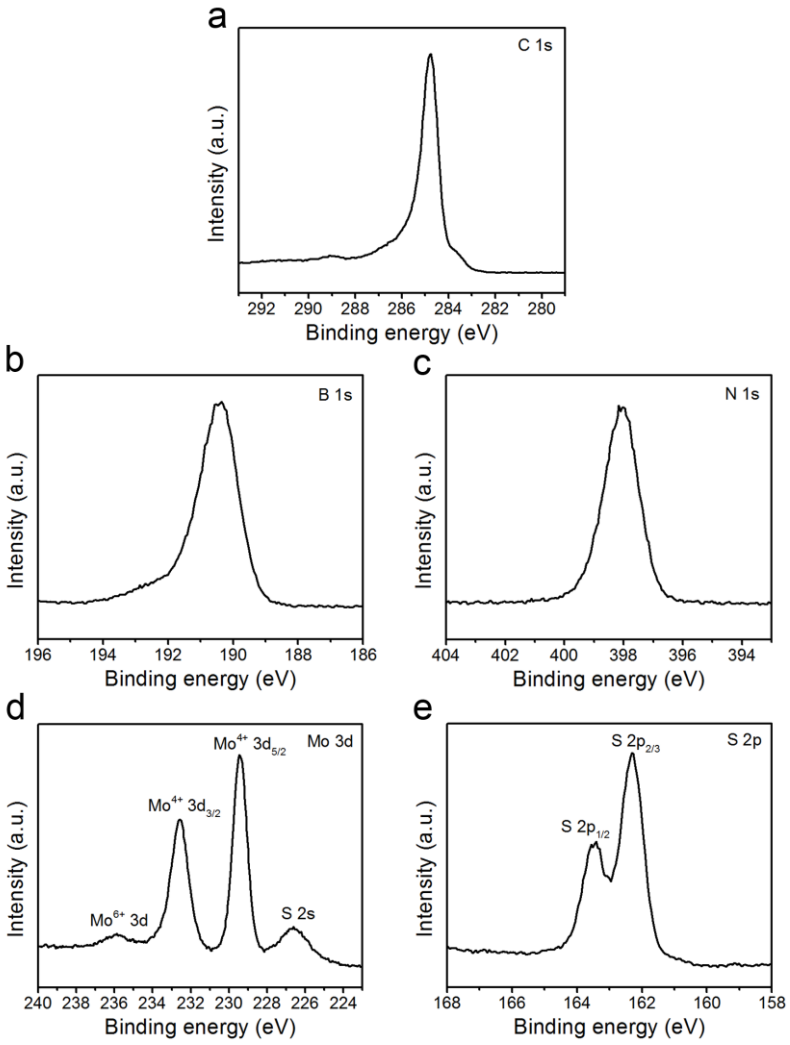

Fig. S12. XPS spectra of GQSs (a), BNQSs (b, c), and MoS_2 QSs (d, e).

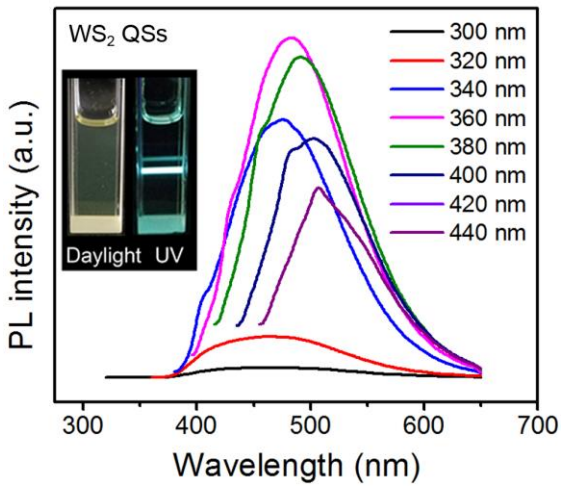

Fig. S13. PL spectra of WS_2 QSs/NMP dispersions at varying excitation wavelengths.

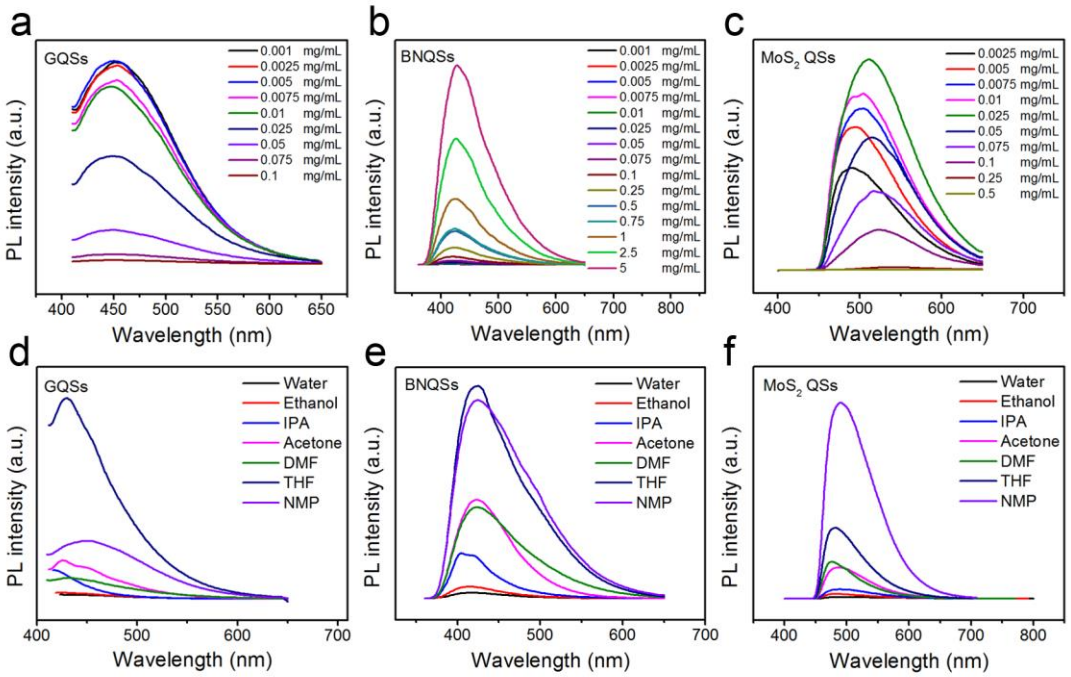

Fig. S14. PL spectra of the QS dispersions. (a-c) With varying concentrations. The solvent is NMP, H_2O, NMP respectively. (d-f) In varying solvents. The concentration is fixed at 0.01 mg/mL. The excitation wavelength for the GQS (a,d), BNQS (b,e), and MoS_2 QS (c,f) dispersions is 360 nm, 330 nm, and 380 nm respectively.

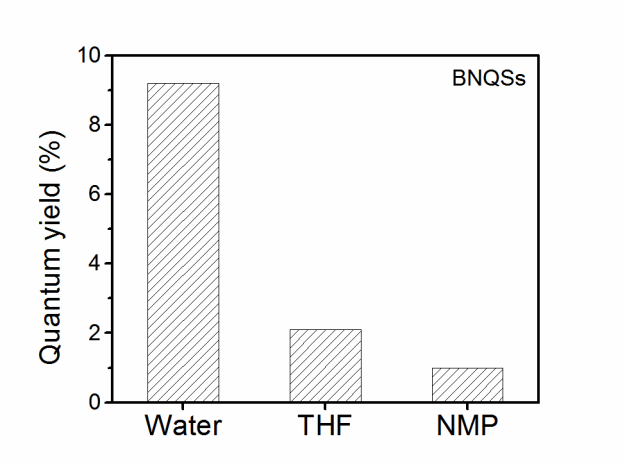

Fig. S15. Quantum yields of BNQSs in varying solvents. The excitation wavelength is 330 nm. The concentration is fixed at 0.01 mg/mL.

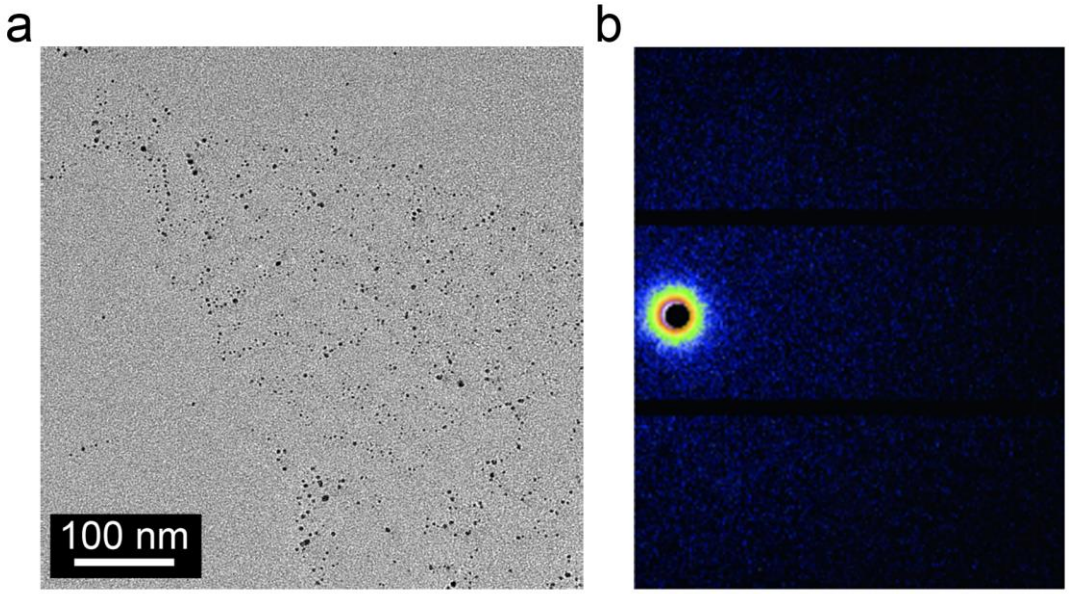

Fig. S16. TEM image of (BNQSs-PMMA) cross-section (a) and corresponding SAXS image (b).

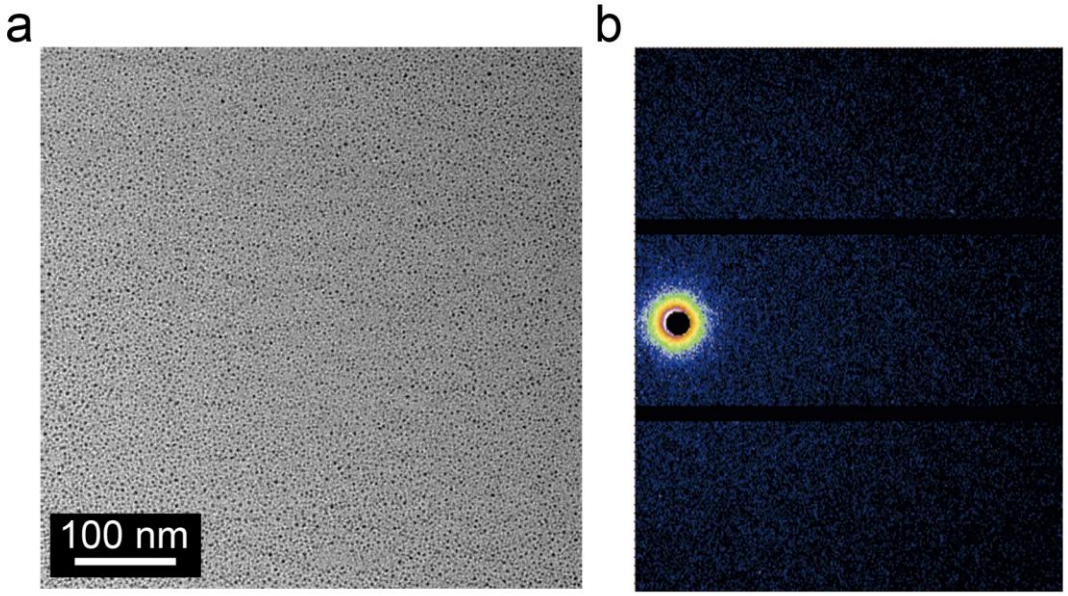

Fig. S17. TEM image of (MoS_2 QSs-PMMA) cross-section (a) and corresponding SAXS image (b).

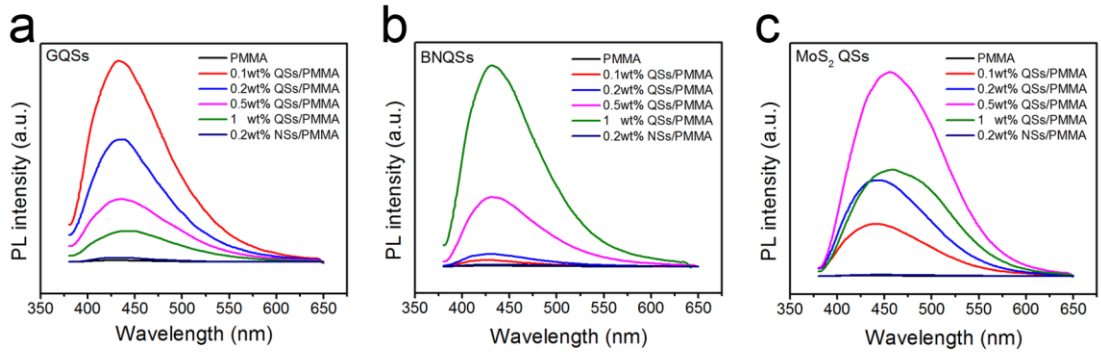

Fig. S18. PL spectra of QSs-PMMA thin films at the excitation wavelength of 360 nm.