Electronic Supplementary Material (ESI) for Inorganic Chemistry Frontiers.

Defects-Boosted Molybdenite-Based Co-Catalytic Fenton Reaction

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Materials and Methods

Materials reagents

Synthetic pure molybdenum disulfide (MoS_2, ~5 μm, purchased from Sinopharm Chemical Reagent Co., Ltd.), Ferrous sulfate ($FeSO_4 \cdot 7H_2O$), hydrogen peroxide (30% wt), rhodamine B (RhB) and tetracycline (TC) were used without further purification.

Materials characterization

The crystal structure of the as-prepared materials was identified by X-ray diffraction (XRD, Bruker D8 diffractometer with monochromatic Cu Kα radiation and wavelength of 1.5406 Å). The morphology was analyzed by field emission scanning electron

microscopy (SEM, FEI Quanta 200, Japan) and transmission electron microscopy (TEM, JEM-2100F, Japan).

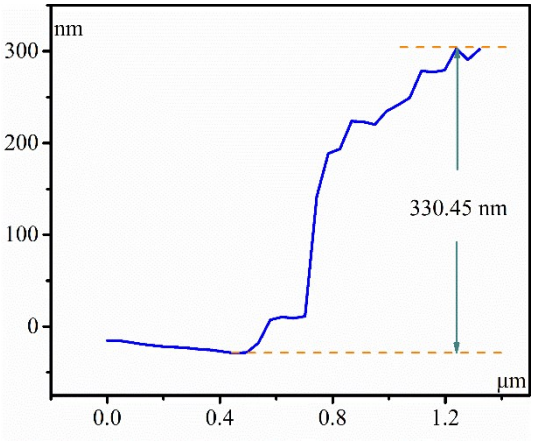

Figure S1. AFM images and thickness measurement of natural molybdenite sample.

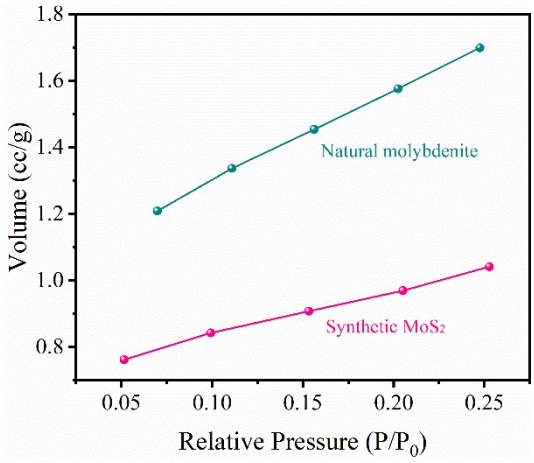

Figure S2. BET test results of natural molybdenite and synthetic MoS_2.

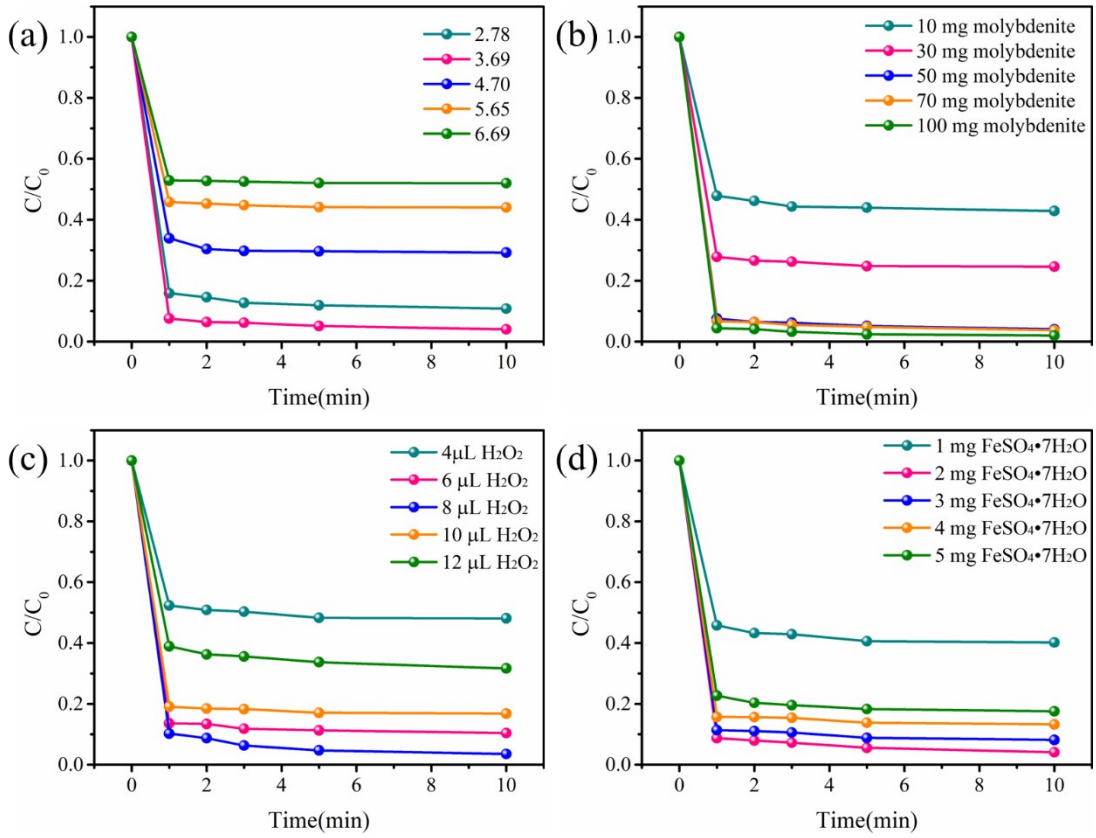

Figure S3. Different influencing factors of the molybdenite co-catalytic Fenton system for degradation of RhB (50 mg/L). (a) pH value influence (100 mL of aqueous solution including 0.02 g/L of $FeSO_4 \cdot 7H_2O$, 0.5 g/L of molybdenite and 8 μL of H_2O_2); (b) Molybdenite dosage influence (100 mL of aqueous solution including 0.02 g/L of $FeSO_4 \cdot 7H_2O$ and 8 μL of H_2O_2, pH 3.5~4); (c) H_2O_2 dosage influence (100 mL of aqueous solution including 0.02 g/L of $FeSO_4 \cdot 7H_2O$ and 0.5 g/L of molybdenite, pH 3.5~4); and (d) $FeSO_4 \cdot 7H_2O$ dosage influence (100 mL of aqueous solution including 0.5 g/L of molybdenite and 8 μL of H_2O_2, pH 3.5~4).

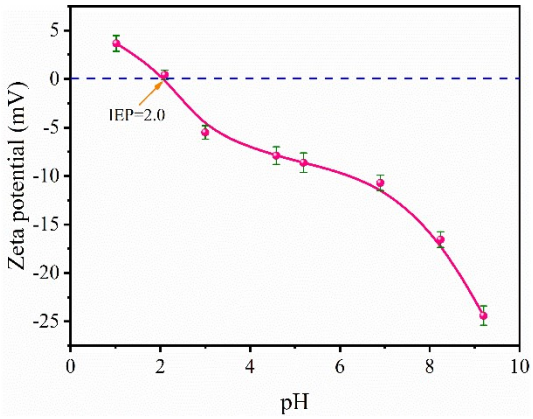

Figure S4. Zeta potentials of molybdenite particles as a function of pH.

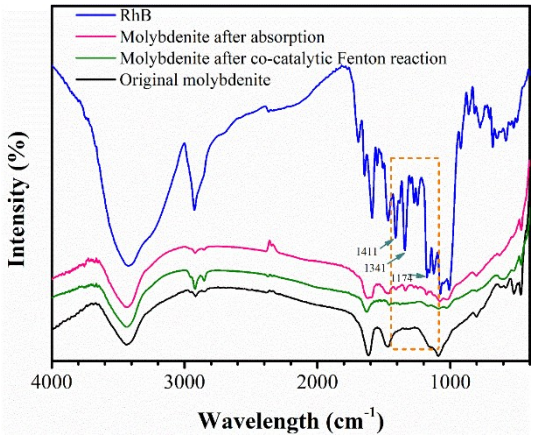

Figure S5. FTIR spectra of RhB, original molybdenite and molybdenite after adsorbing RhB and co-catalytic Fenton reaction.

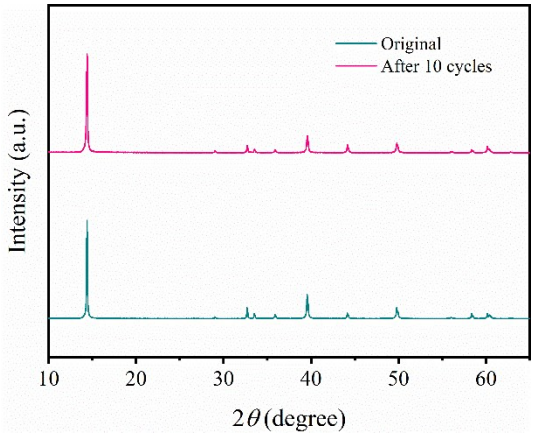

Figure S6. XRD spectra of the molybdenite before and after cyclic tests.

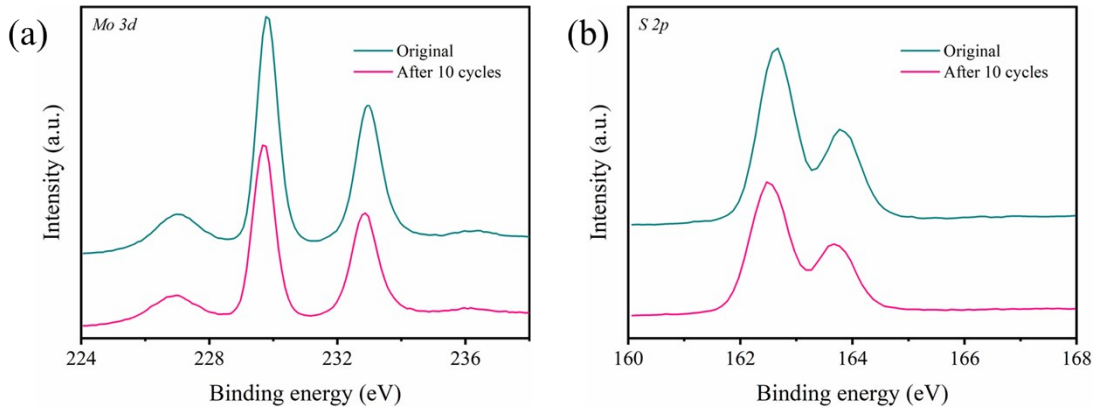

Figure S7. XPS (a) Mo 3d and (b) S 2p spectra of the molybdenite before and after cyclic tests.

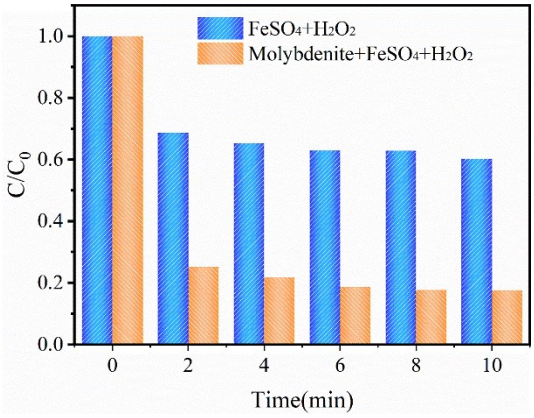

Figure S8. Comparison of conventional Fenton reaction and molybdenite co-catalytic Fenton system for degradation of COD.

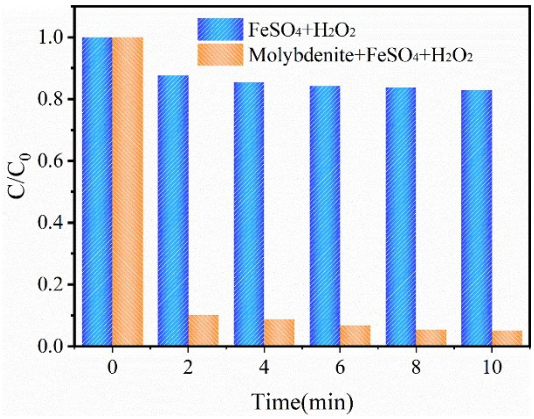

Figure S9. Comparison of conventional Fenton reaction and molybdenite co-catalytic Fenton system for degradation of tetracycline.

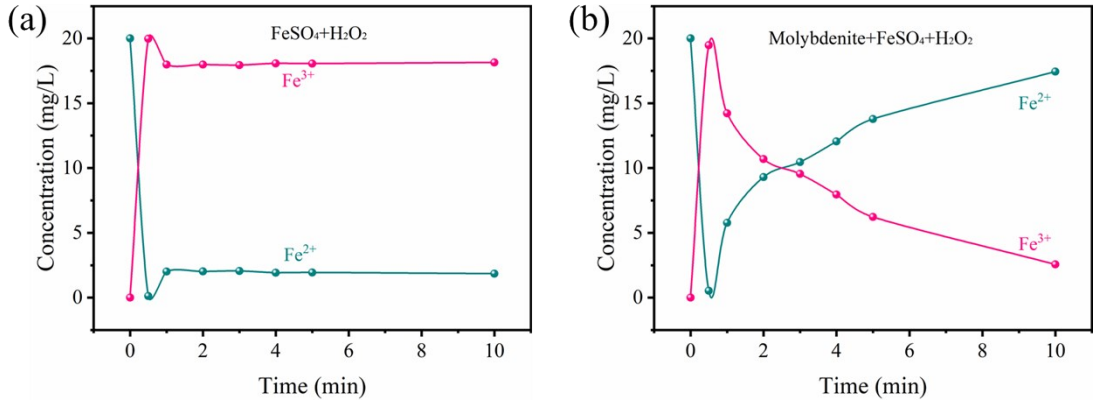

Figure S10. The concentration variations of Fe^{2+} and Fe^{3+} in (a) Fenton reaction and (b) molybdenite co-catalytic Fenton system

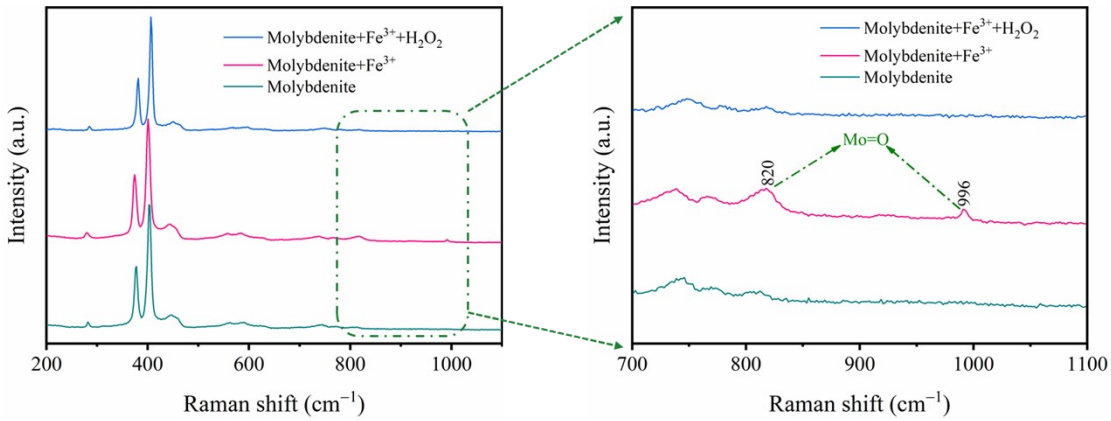

Figure S11. Raman spectra of molybdenite under different conditions.

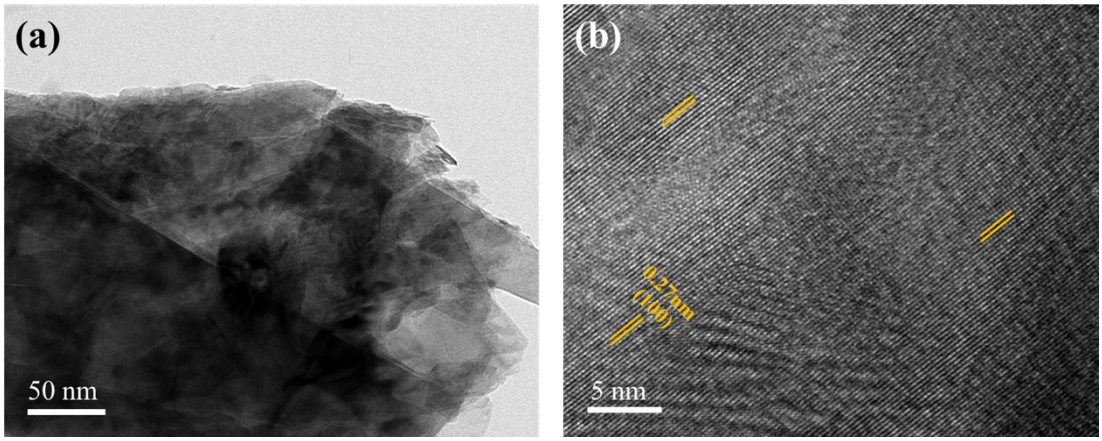

Figure S12. (a) TEM and (b) HRTEM images of the molybdenite after cyclic tests.

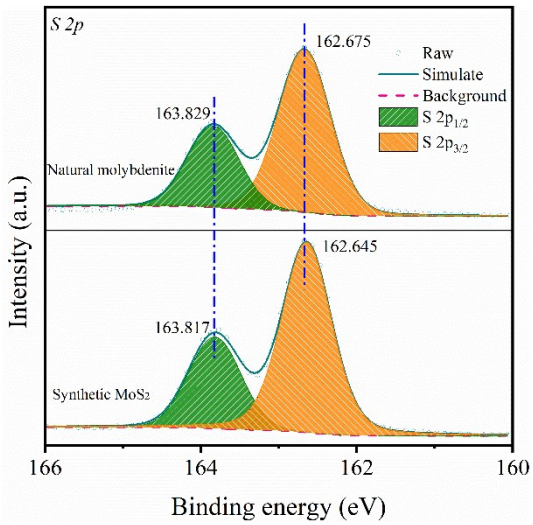

Figure S13. S 2p XPS spectra of molybdenite and synthetic MoS_2 samples.