

Supplementary Information

Synthesis and characterization of vanadium-doped Mo(O,S)₂ oxysulfide for efficient photocatalytic degradation of organic dyes

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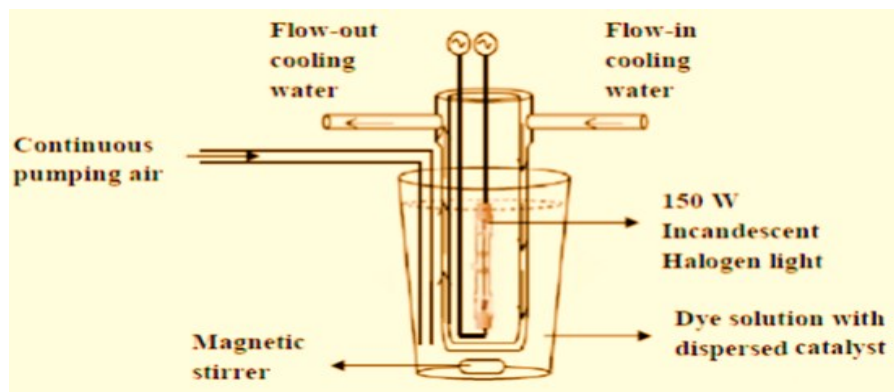


Fig. S1. Visible light experimental setup for degradation of methylene blue (MB) dye in aqueous solutions using the synthesis photocatalyst.

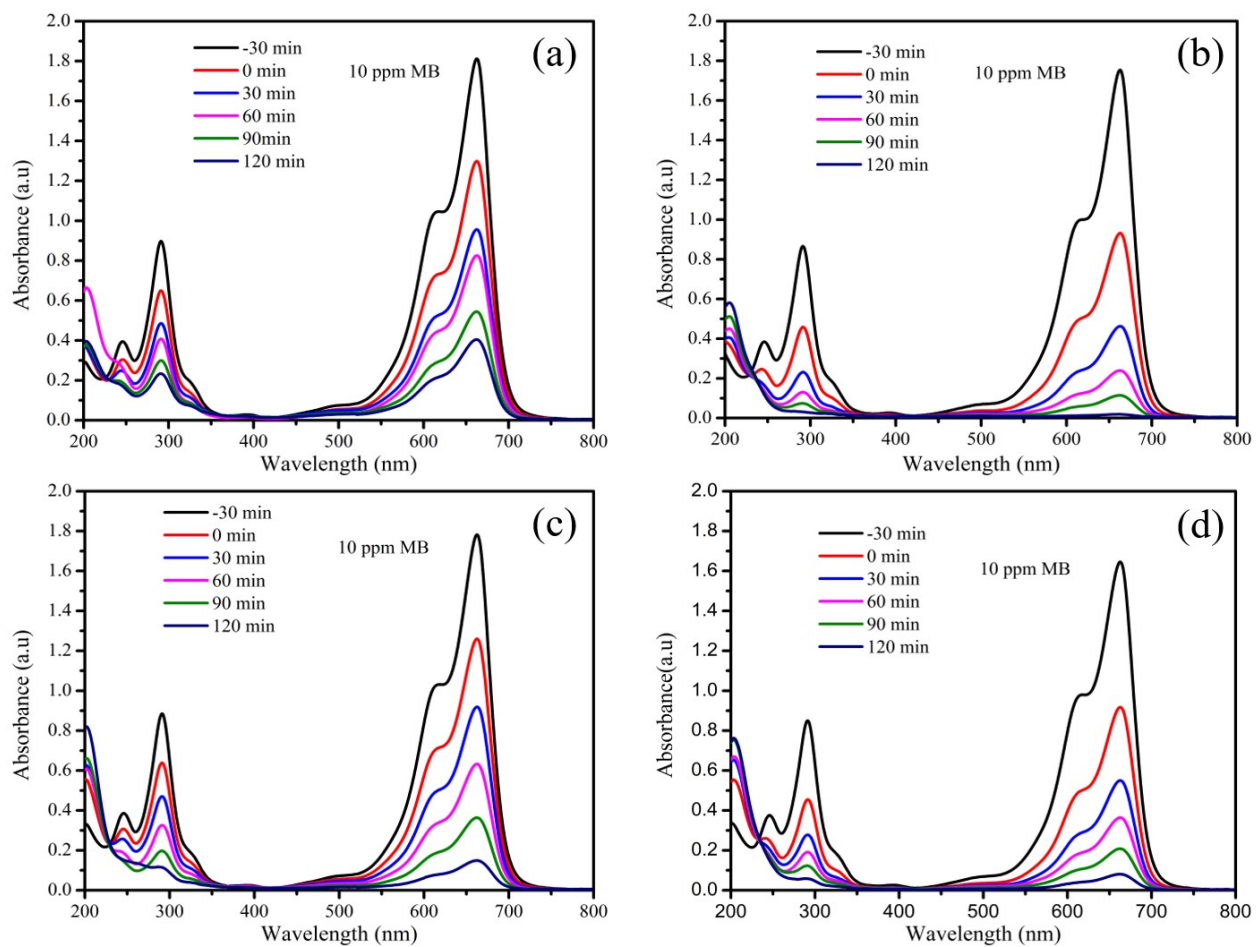


Fig. S2. UV-Visible absorbance profile for MB degradation using (a) V-Mo(O,S)₂-0, (b) V-Mo(O,S)₂-10, (c) V-Mo(O,S)₂-5, and (d) V-Mo(O,S)₂-20.

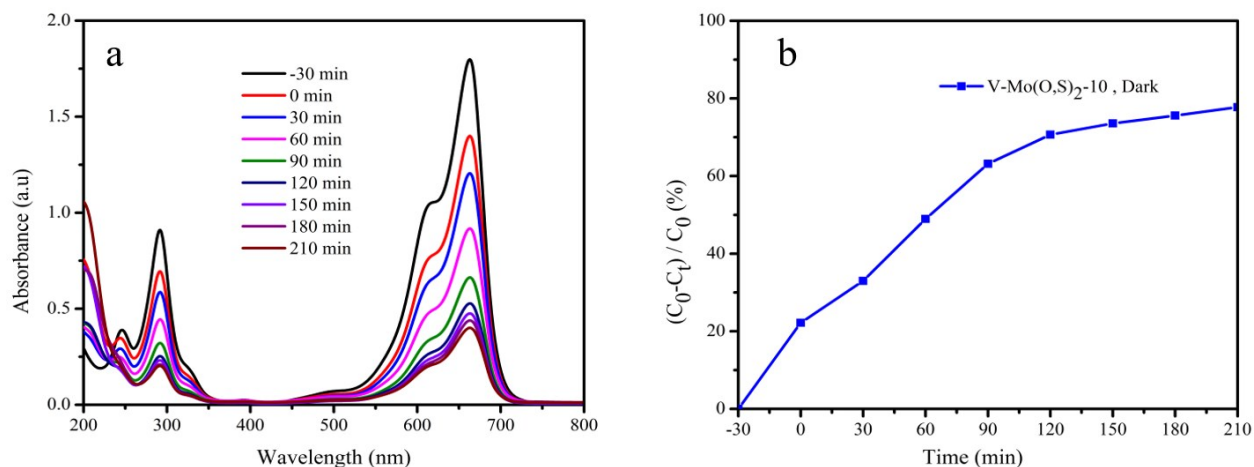


Fig. S3. (a) UV-Visible absorbance spectra for MB degradation using V-Mo(O,S)₂-10 under dark condition . (b) Degradation efficiency of MB over V-Mo(O,S)₂-10 under dark condition.

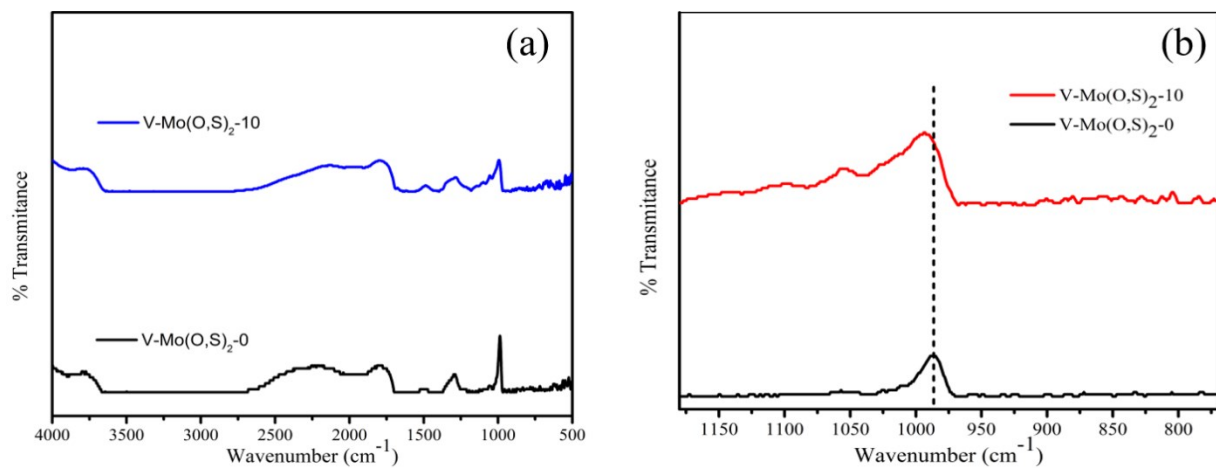


Fig. S4. (a) FT-IR spectra of bare Mo(O,S)₂ and V-doped Mo(O,S)₂. (b) Scaled view illustrating the shift of the vibrational frequency at 987 cm⁻¹ for V-doped Mo(O,S)₂ in comparison with bare Mo(O,S)₂.

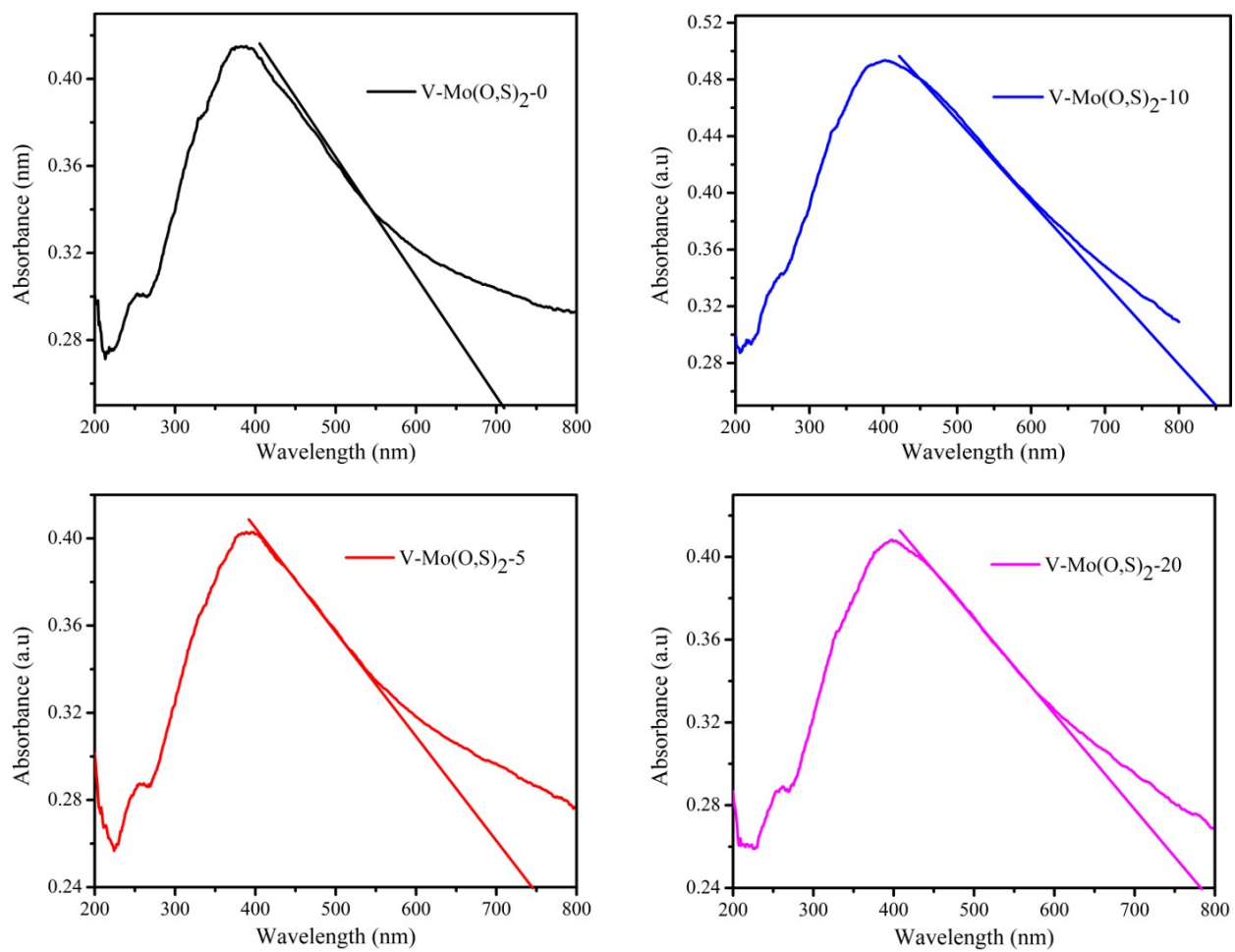


Fig. S5. UV-Vis diffuse reflectance spectra of V-Mo(O,S)₂₋₀, V-Mo(O,S)₂₋₅, V-Mo(O,S)₂₋₁₀, and V-Mo(O,S)₂₋₂₀, in view of the absorption edges.

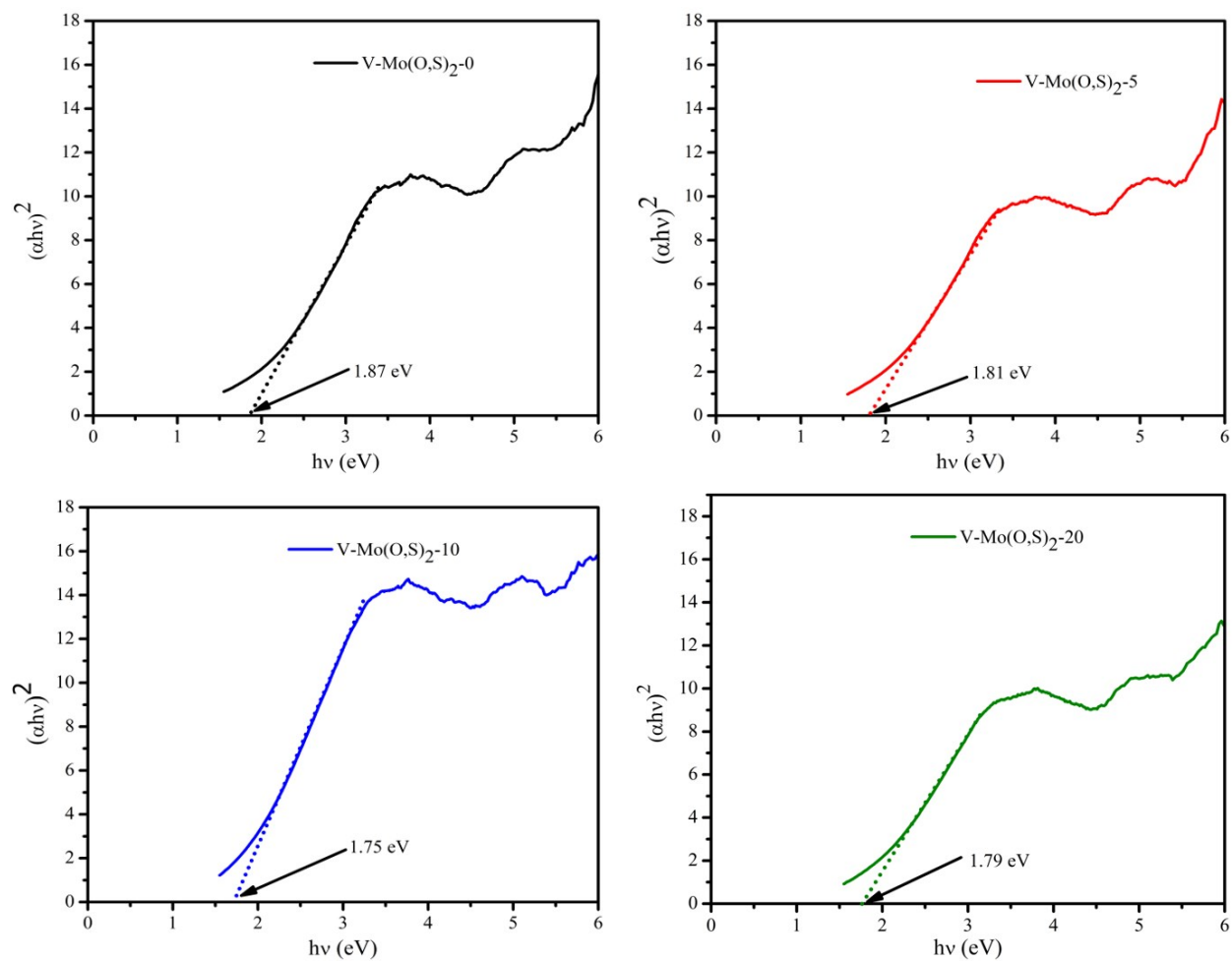


Fig. S6. Tauc plot for bandgap energy values of V-Mo(O,S)₂-0, V-Mo(O,S)₂-5, V-Mo(O,S)₂-10, and V-Mo(O,S)₂-20.

Table S1. Kinetics parameters of V-Mo(O,S)₂ oxysulfides for photocatalytic MB degradation

Conditions	Rate constant, k (min ⁻¹)	Pearson's r	R ²	Intercept
V-Mo(O,S) ₂ -0	0.0098	0.9984	0.9959	0.3111
V-Mo(O,S) ₂ -5	0.0155	0.9891	0.9729	0.3427
V-Mo(O,S) ₂ -10	0.0279	0.9939	0.98472	0.6754
V-Mo(O,S) ₂ -20	0.0194	0.9964	0.9910	0.5290
V-Mo(O,S) ₂ -10, dark	0.0074	0.9837	0.9595	0.3125
Blank	0.0033	0.9850	0.963	0.0520

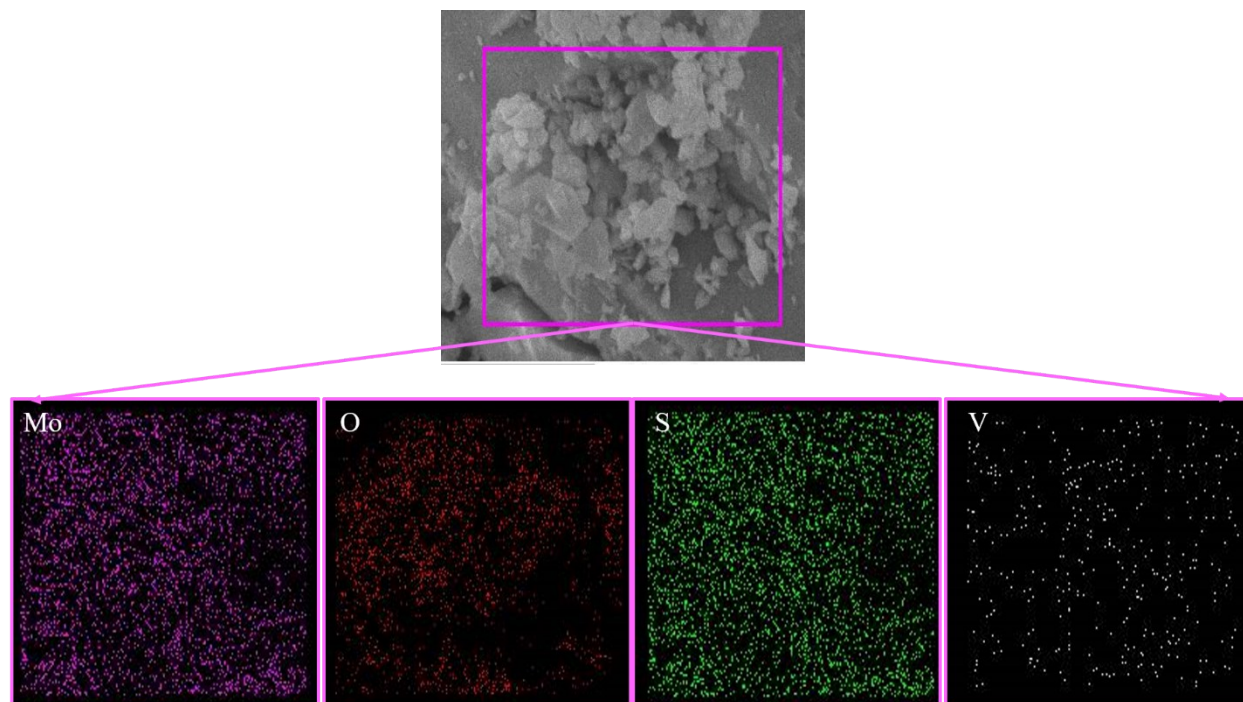


Fig. S7. EDS elemental mapping of Mo, O, S and V.

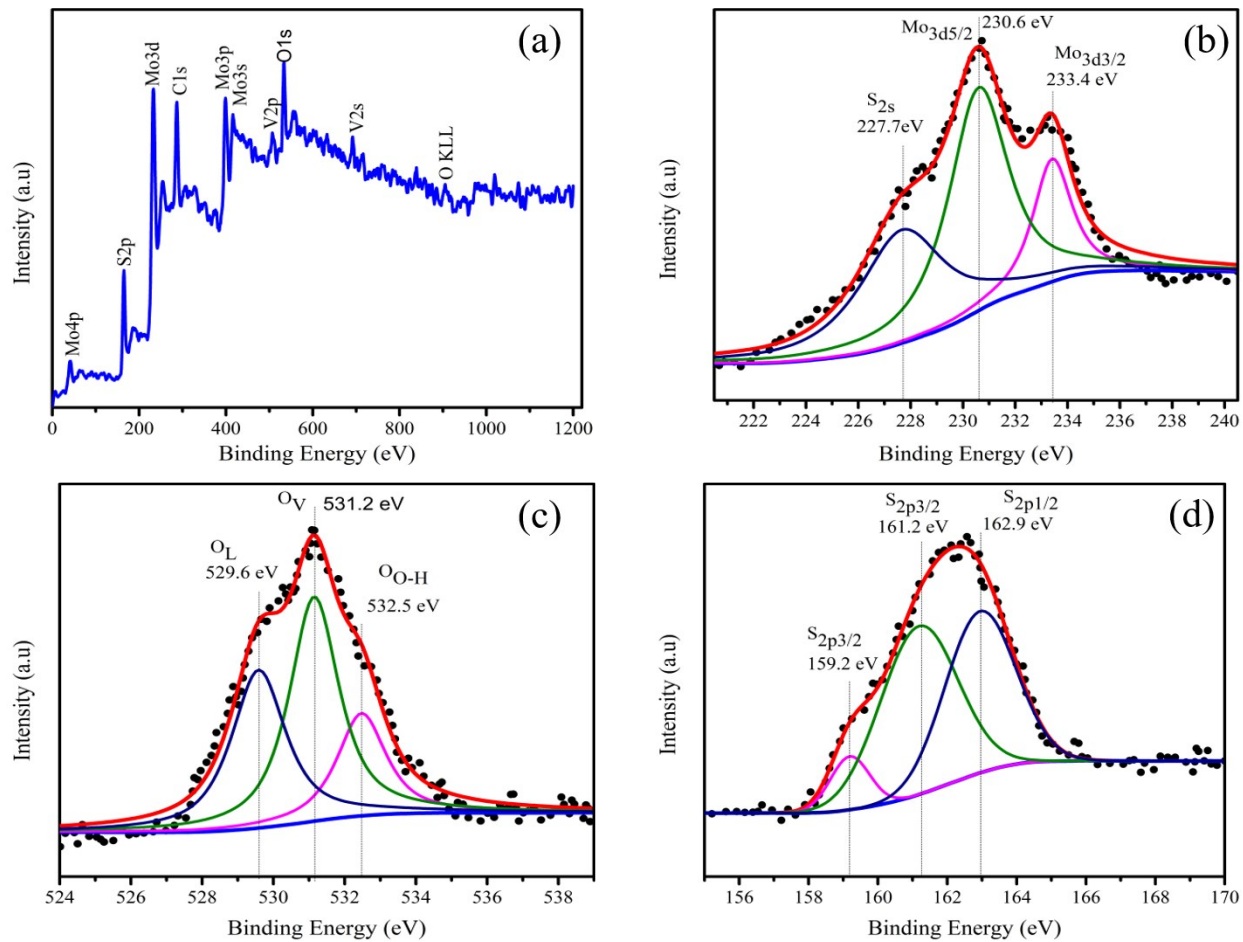


Fig. S8. (a) XPS full survey spectra for V-Mo(O,S)₂-10. High resolution spectra of (b) Mo3d, (c) O1s, and (d) S2p for pristine Mo(O,S)₂.

Table S2 . Binding energy of the deconvoluted XPS peaks of Mo3d, S2p, O1s, and V2p for V-Mo(O,S)₂-10 and V-Mo(O,S)₂-0

Photocatalyst	Binding Energy (eV)												
	Mo _{3d}			S _{2p}			O _{1s}			V _{2p}			
	2s	Mo _{3d5/2}	Mo _{3d3/2}	S _{2p3/2}	S _{2p3/2}	S _{2p1/2}	O _{ad}	O _L	O _V	V _{2p3/2}	V _{2p3/2}	V _{2p1/2}	V _{2p12}
V-Mo(O,S) ₂ -10	226.2	229.5	232.5	159.1	161.2	162.8	527.8	529.5	531.3	512.8	516.9	519.7	524.2
V-Mo(O,S) ₂ -0	227.7	230.6	233.4	159.2	161.2	162.9	532.5	529.6	531.2	-	-	-	

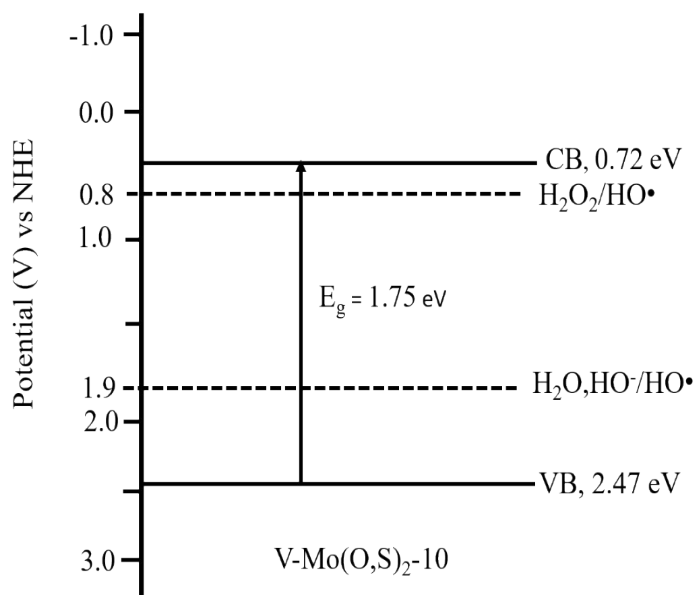


Fig. S9. Band edge potentials of V-Mo(O,S)₂-10 nanoplates for photocatalytic MB degradation.