

## Supplementary Information

### Synergistic effect of MoS<sub>2</sub>-V<sub>2</sub>O<sub>5</sub> hetero-structure as advanced catalyst for photocatalytic degradation of methylene blue

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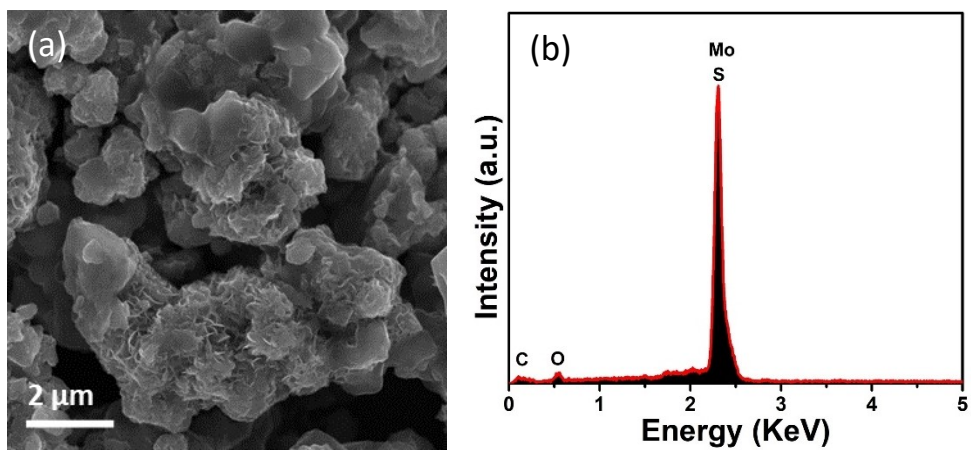


Fig. S1 (a) SEM image of MoS<sub>2</sub> (b) Corresponding EDX.

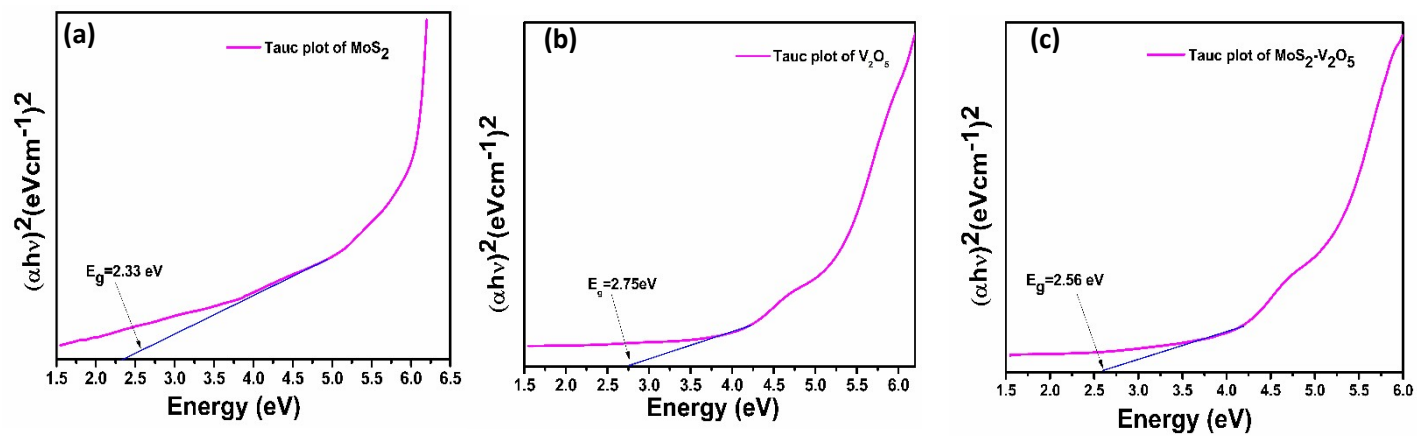
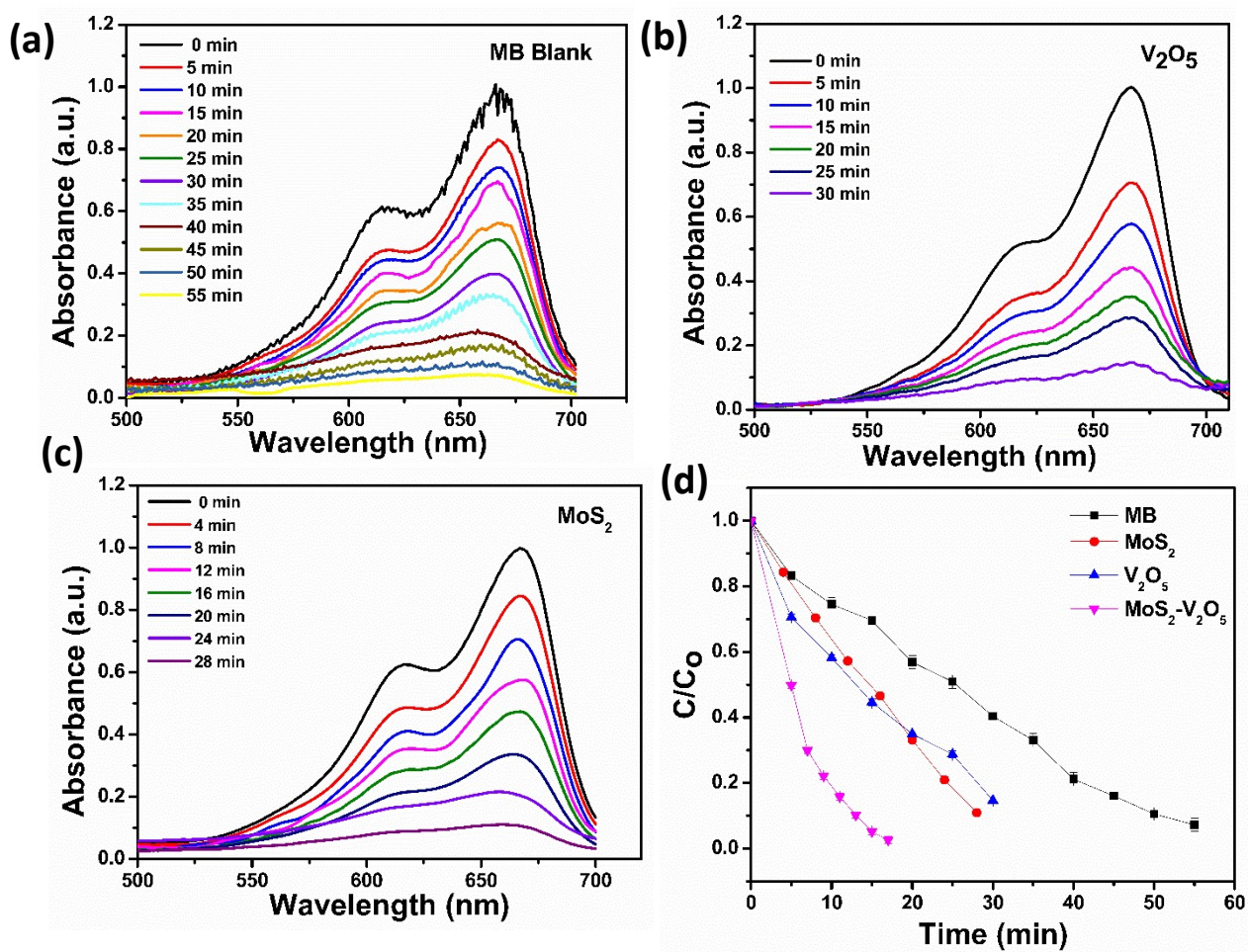


Fig. S2 Band gap analysis of (a) MoS<sub>2</sub> (b) V<sub>2</sub>O<sub>5</sub> and (c) MoS<sub>2</sub>-V<sub>2</sub>O<sub>5</sub> structures.



**Fig. S3.** (a-d) Time dependent UV-Vis absorbance spectra of MB in aqueous solutions in the presence of (a) No catalyst (b) V<sub>2</sub>O<sub>5</sub> (c) MoS<sub>2</sub> under UV light irradiation (d) Change in degradation efficiency of MB in the presence of MoS<sub>2</sub>, V<sub>2</sub>O<sub>5</sub>, MoS<sub>2</sub>-V<sub>2</sub>O<sub>5</sub> and without any catalyst.

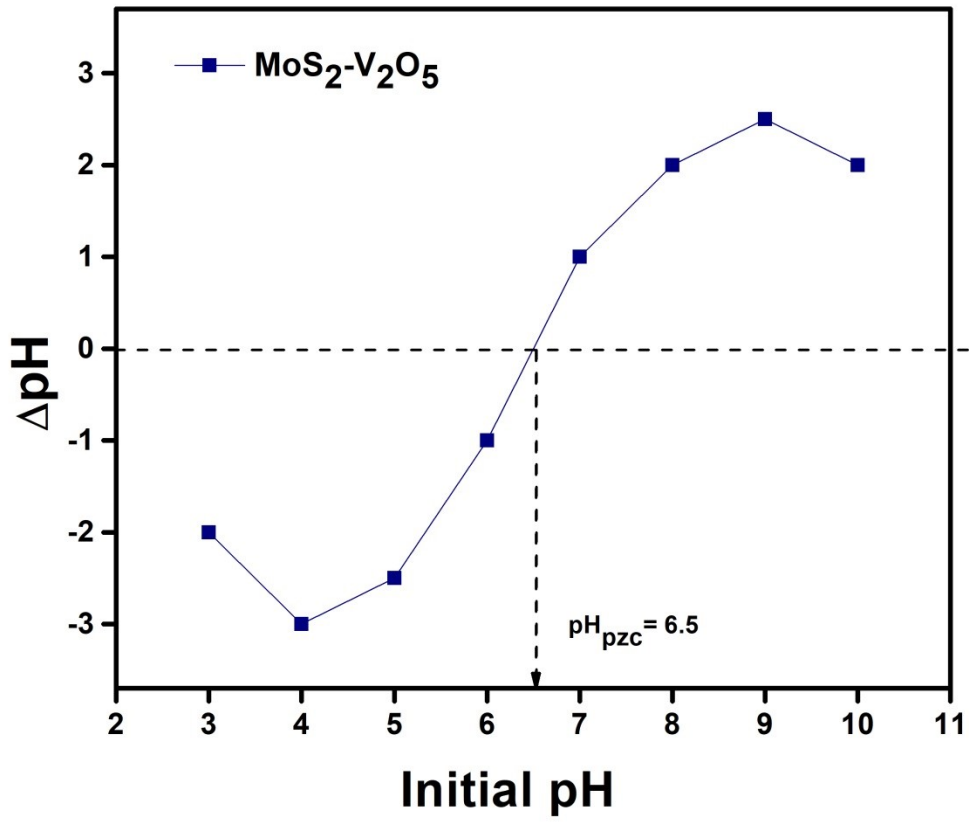
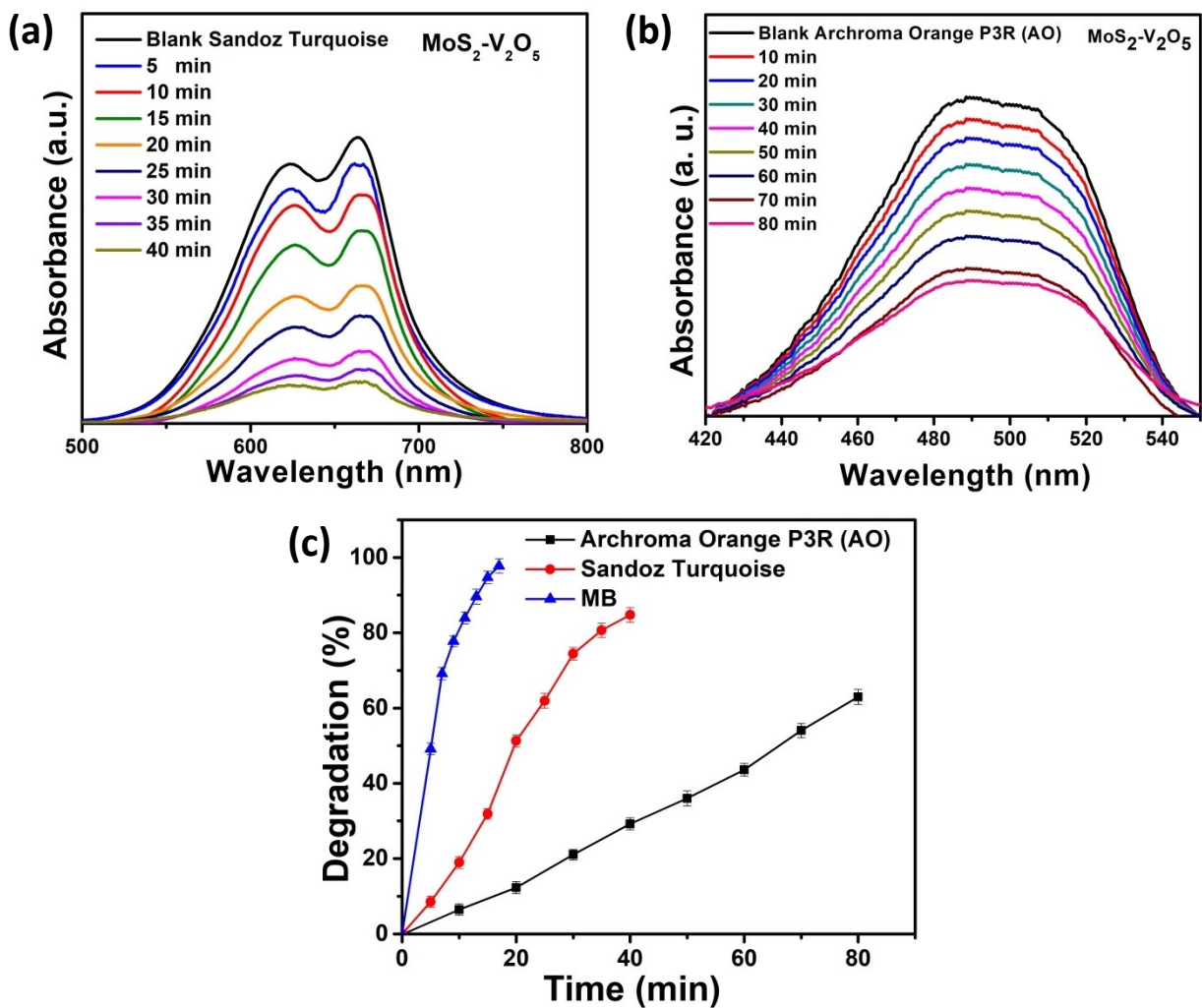
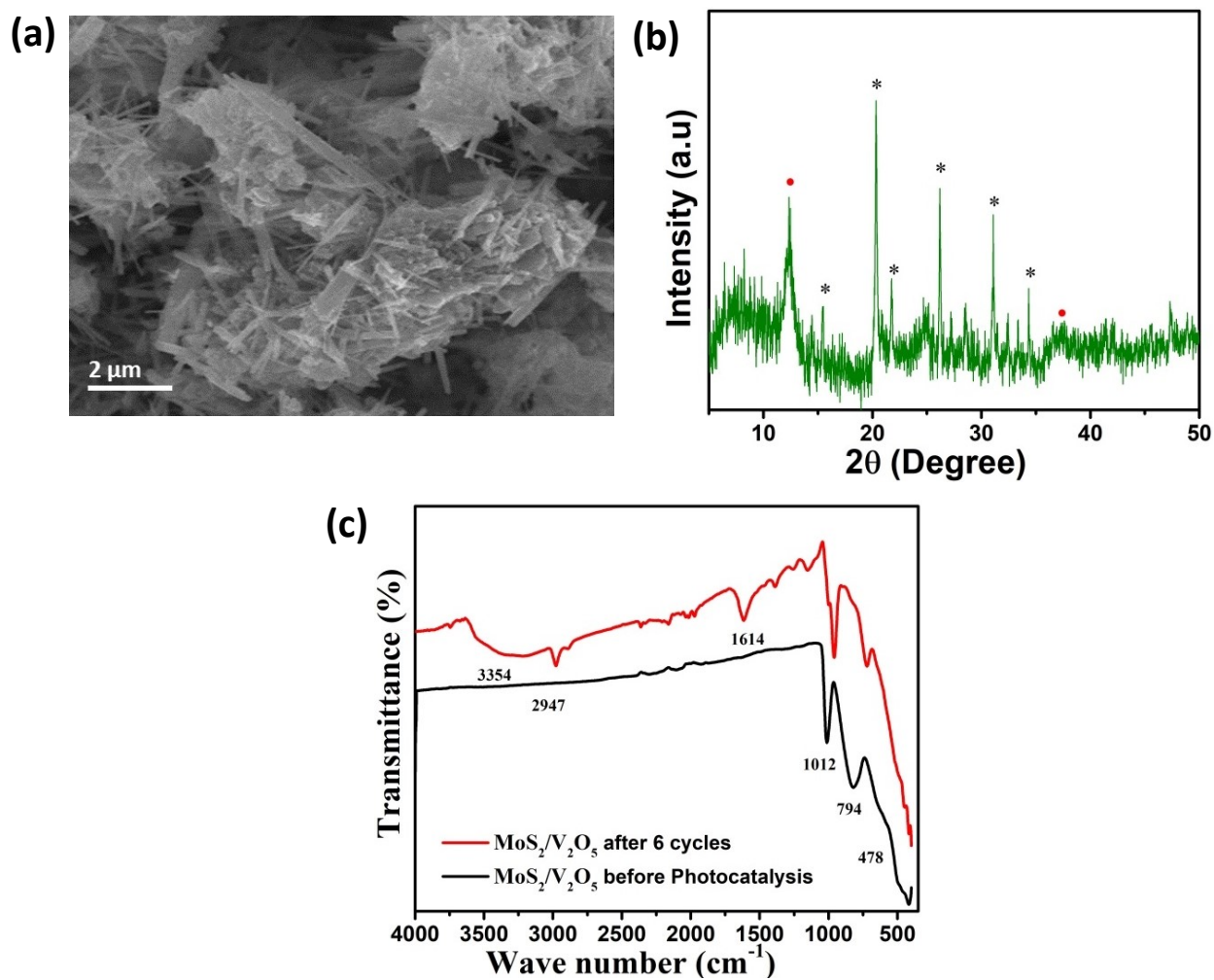


Fig. S4.  $\text{pH}_{\text{pzc}}$  calculation of  $\text{MoS}_2\text{-V}_2\text{O}_5$



**Fig. S5.** Time dependent UV-Vis absorbance spectra of in aqueous solutions in the presence of (a) sandoze Turquoise (b) Archroma Orange P3R (c) The comparison of photocatalytic activity of the catalyst in lab scale dye (MB) and real time local industrial dyes, AO and ST.



**Fig.S6** Structural stability of  $\text{MoS}_2\text{-V}_2\text{O}_5$  catalyst after 6 cycles of operation (a) SEM image (b) XRD and (c) FTIR