Supplementary Information

Superior Dye Adsorbent towards Hydrogen Evolution Reaction Combining Active Sites and Phase-Engineering of (1T/2H) MoS_2/α-MoO_3 Hybrid Heterostructured Nanoflowers

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Sample	2H-MoS_2 (%)	1T-MoS_2 (%)	α-MoO_3 (%)
12 hr	40.8	46.8	12.2
16 hr	50.5	36.2	13.2
20 hr	70.6	21.9	7.3

Table S1: Calculated percentages of desired phases of MoS_2 and α-MoO_3

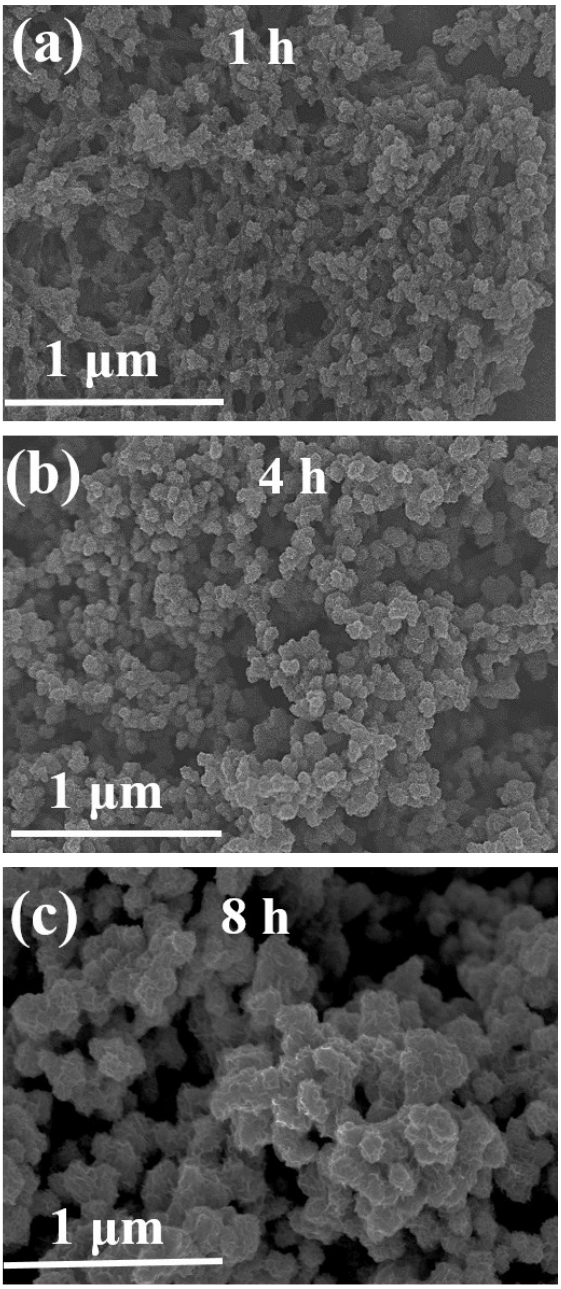

Fig. S1 SEM images of the sample prepared at 1h (a), 4h (b) and 8h (c).

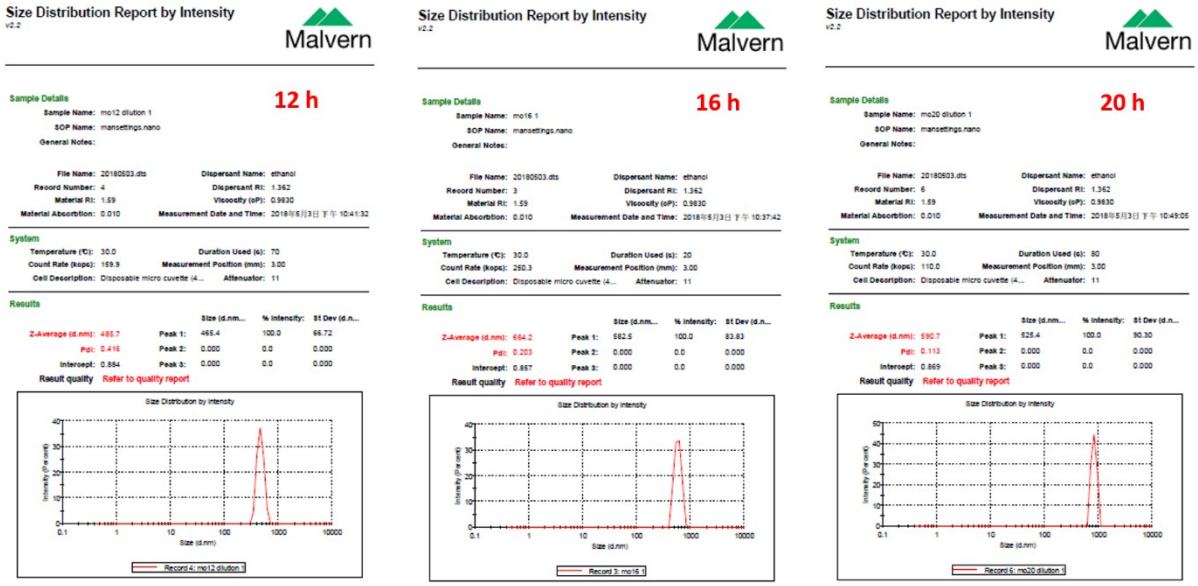

Fig. S2 Calculated size distribution by DLS for samples prepared at 12 h, 16 h and 20 h.

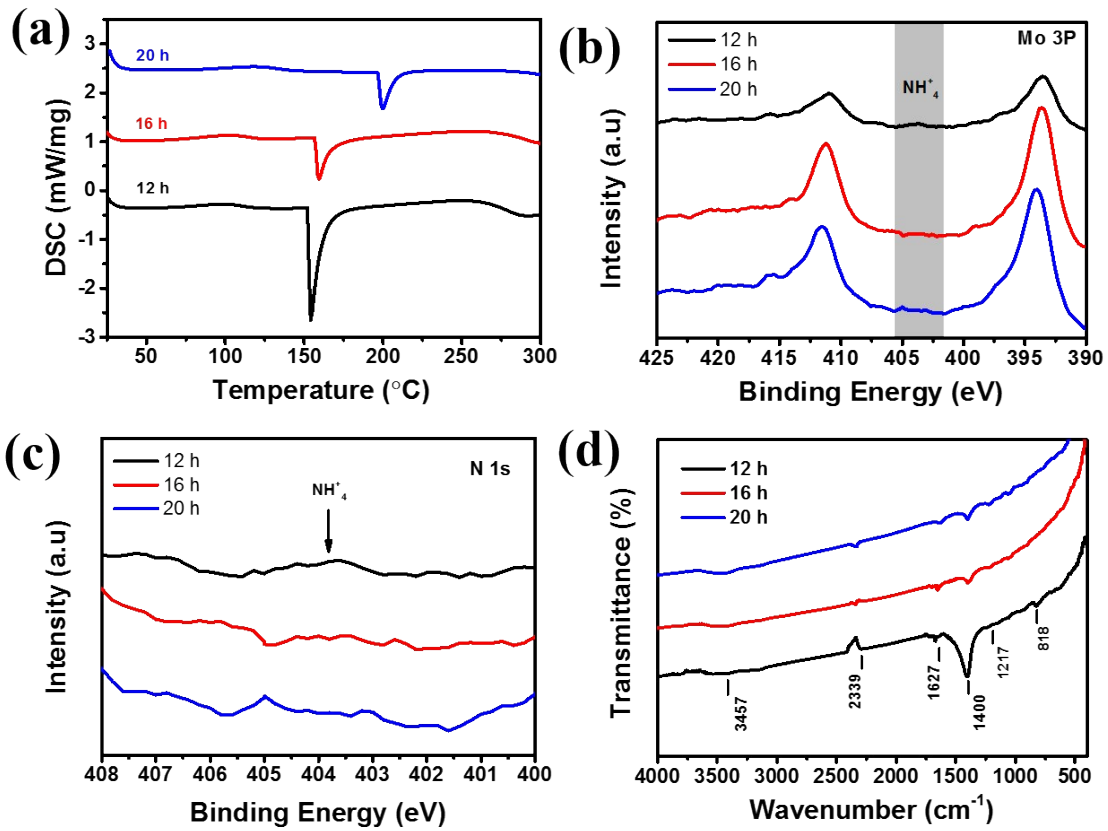

Fig. S3 (a) DSC (b and c) XPS and (d) FTIR spectra of (1T/2H) MoS_2/α-MoO_3 heterostructured nanoflowers prepared at 12, 16 and 20 h, respectively.

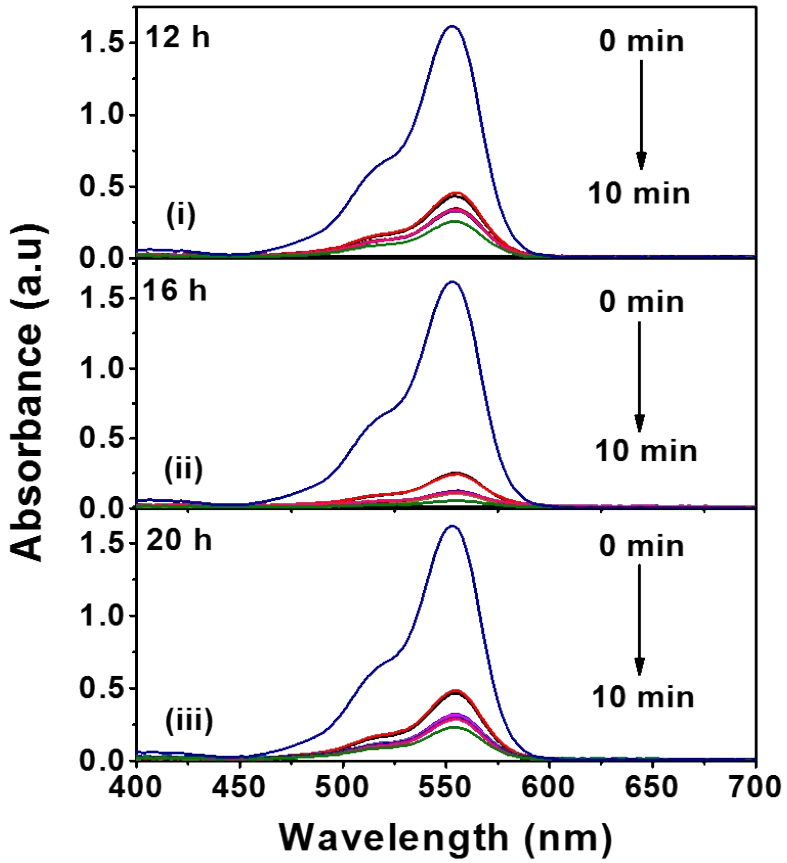

Fig. S4 UV-vis absorption spectra of samples with different reaction time. 12 hr (i), 16 hr (ii) and 20 hr (iii).

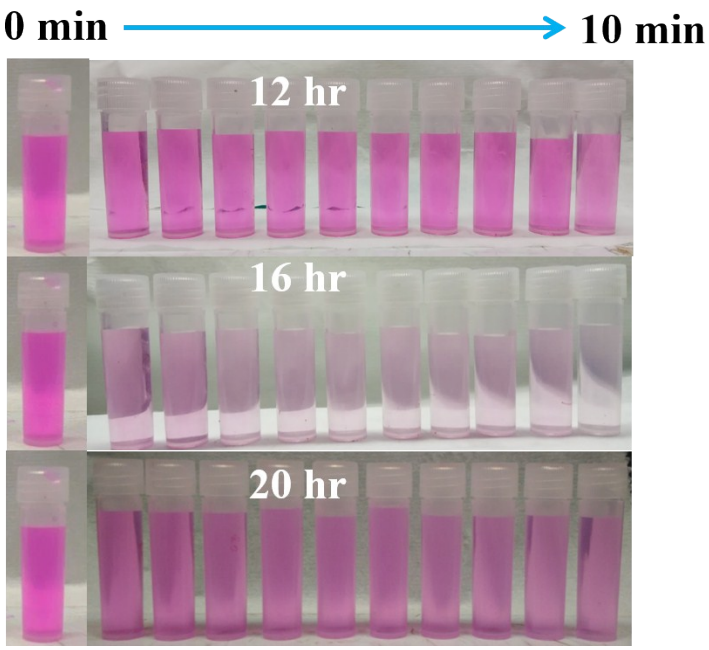

Fig. S5 Photographic images of RhB after adsorption with respect to time.

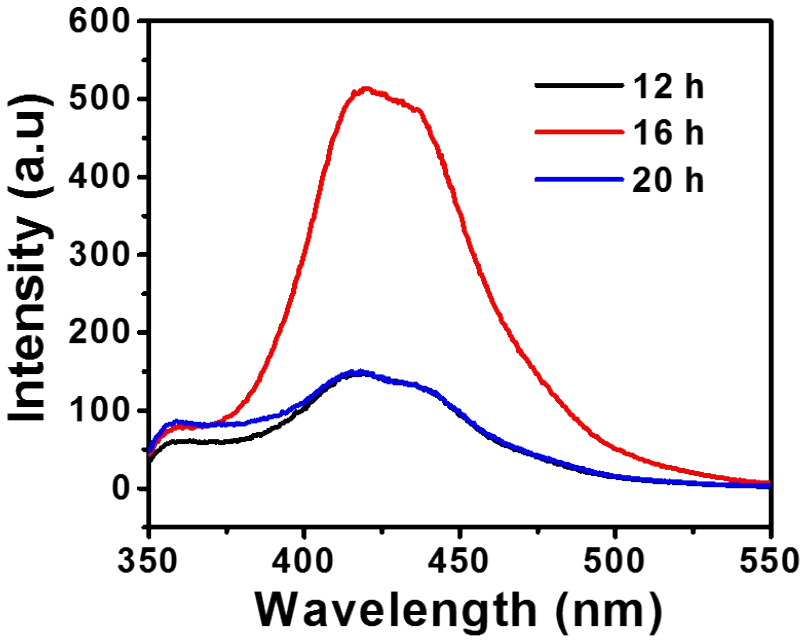

Fig. S6 The evolution of •OH radicals by fluorescence spectra of TA under mild sonication with all the three samples.

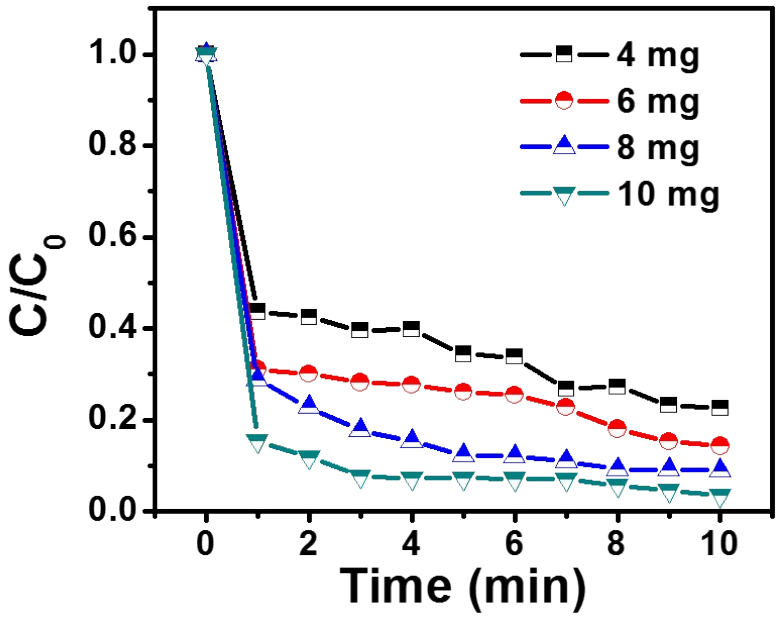

Fig. S7 Adsorbent quantity dependent of 16 hr sample towards degradation of RhB solution with initial concentration of 47.9 mg L^{-1}.

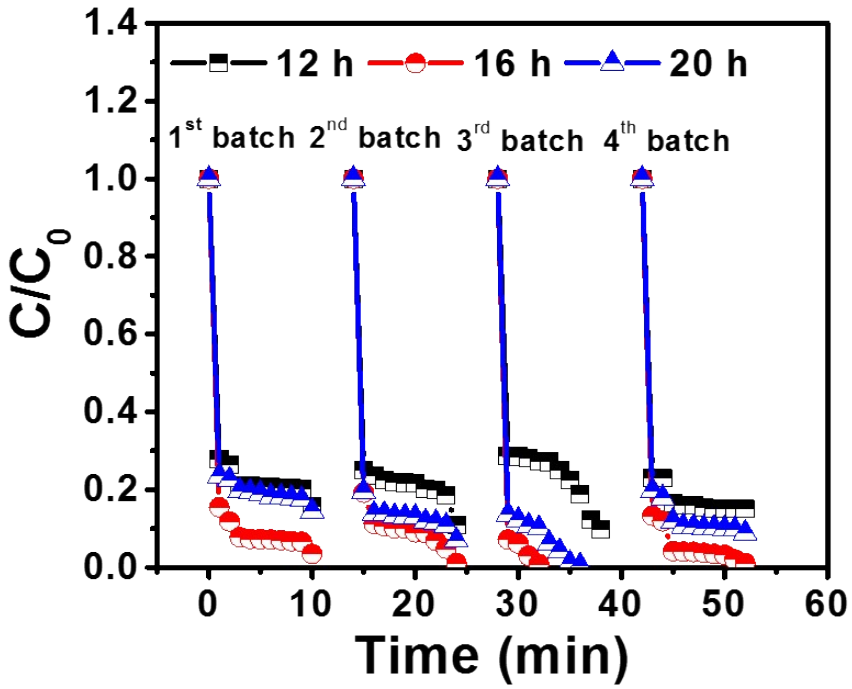

Fig. S8 Reproducibility of adsorption showing for all the three samples prepared over four batches.

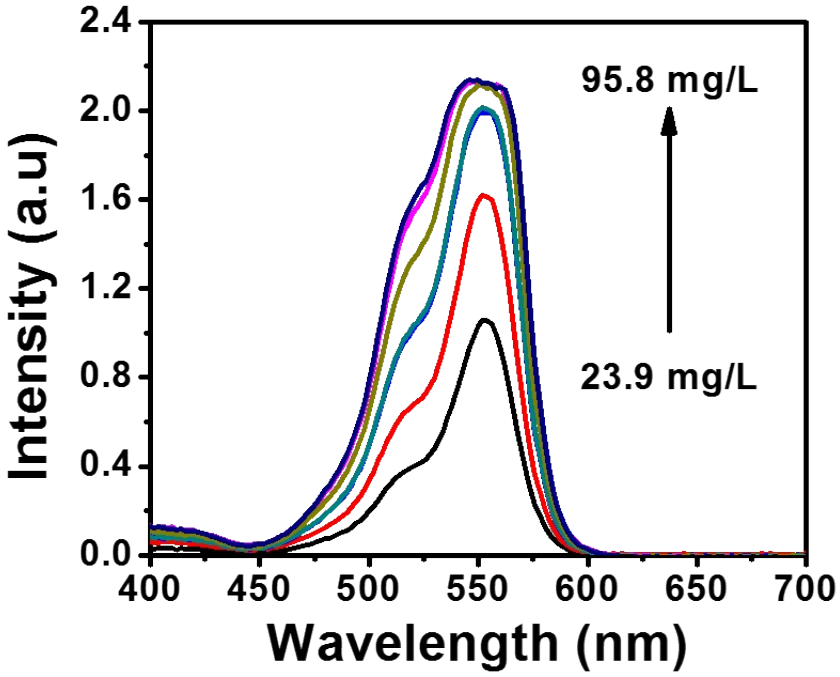

Fig. S9 UV-vis absorption spectra of RhB solution to the increase of its initial concentration.

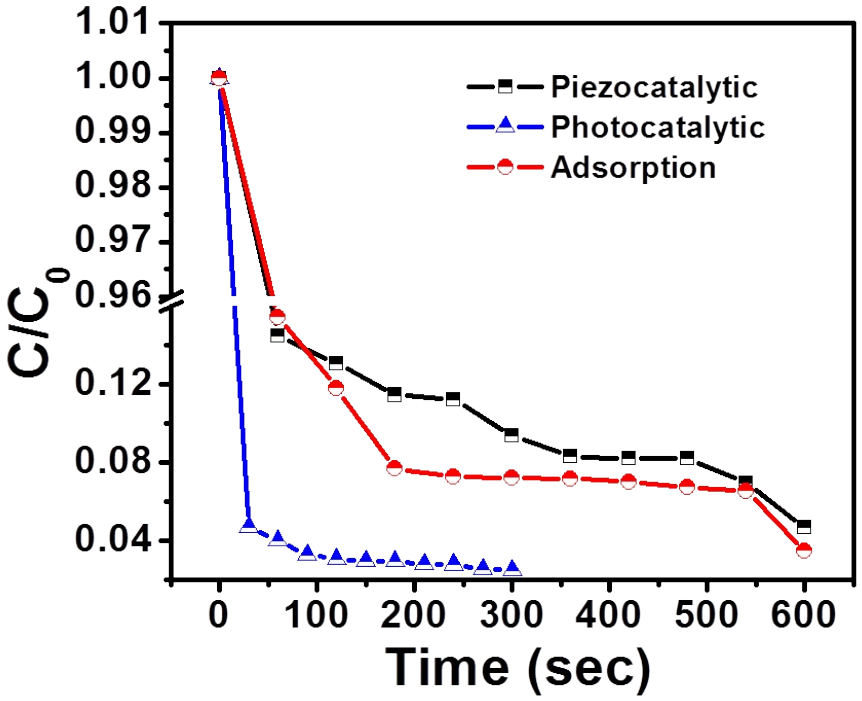

Fig. S10 Comparison of adsorption process with piezo-catalytic and photocatalytic method of dye degradation of RhB solution by utilizing 16 hr sample as adsorbent.

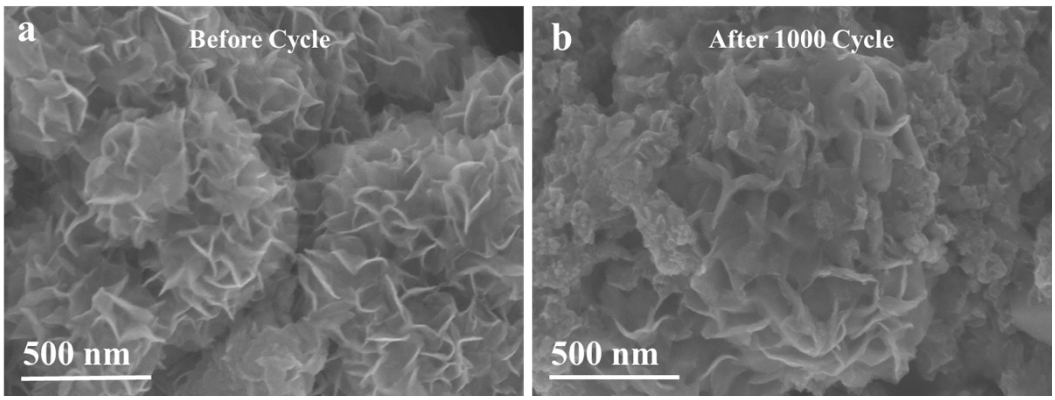

Fig. S11 (a) SEM image of 12 h sample before cycle and (b) after 1000 cycle.