Electronic Supplementary Information (ESI)

Hydrothermal Growth of Few Layer 2H-MoS_2 for Heterojunction Photodetector and Visible Light Induced Photocatalytic Applications

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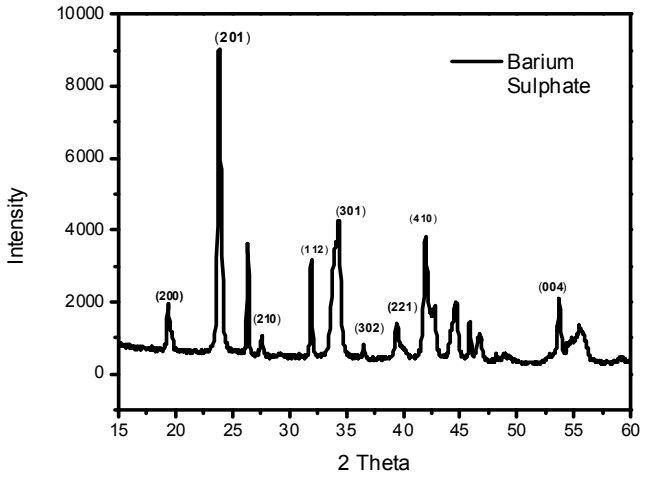


Figure S1: The XRD pattern of barium sulphate obtained in the precipitation.

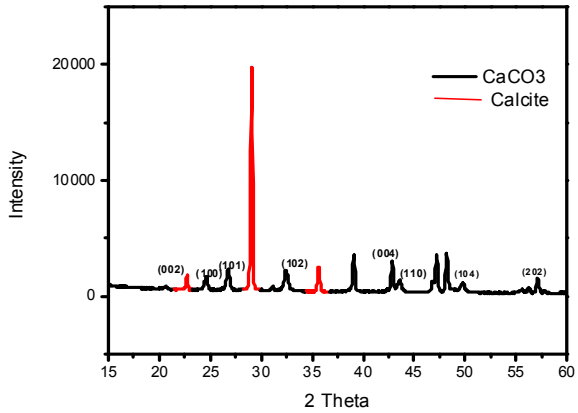


Figure S2: The XRD pattern is in consistent with vaterite phase of $CaCO_3$ (JCPDS NO-24-0030).

There are also few a peaks for the calcite phase.[1]

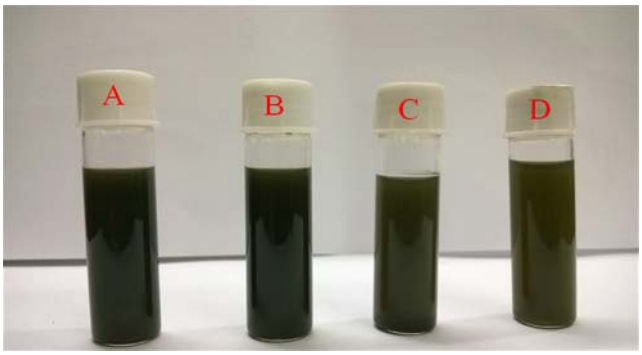
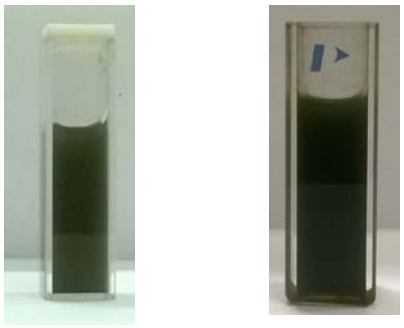


Figure S3: Digital images for MoS_2 dispersions in different organic solvent A) Propylene carbonate B) N- methyl pyrrolidone C) N,N-dimehyl formamdie D) Isopropyl alcohol.



(MoS_2-GO) (MoS_2-RGO)

Figure S4: Digital image of MoS_2-GO and MoS_2-RGO;

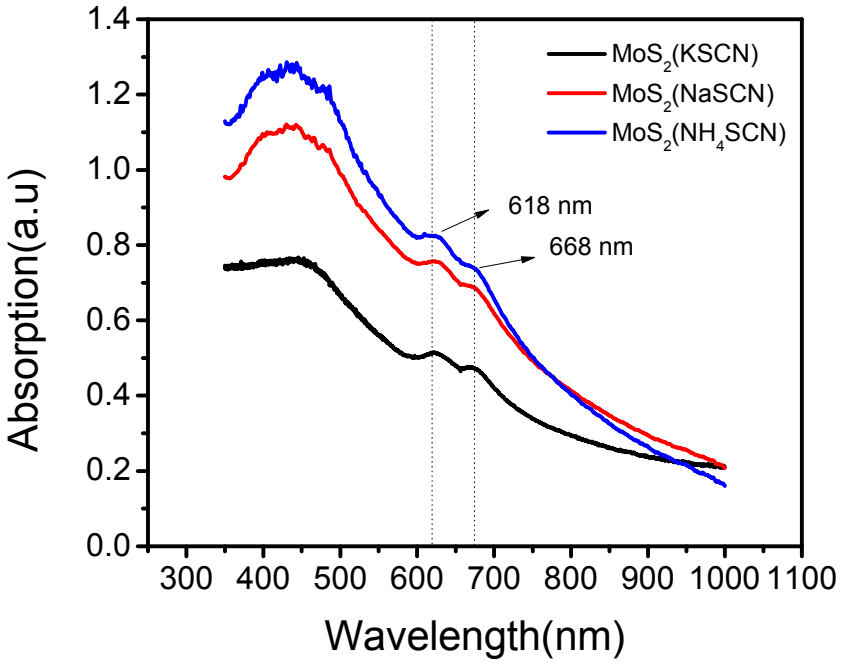


Figure S5: UV- vis absoption spectra of as synthesized MoS_2 using different S sources, KSCN, NH_4SCN and NaSCN.

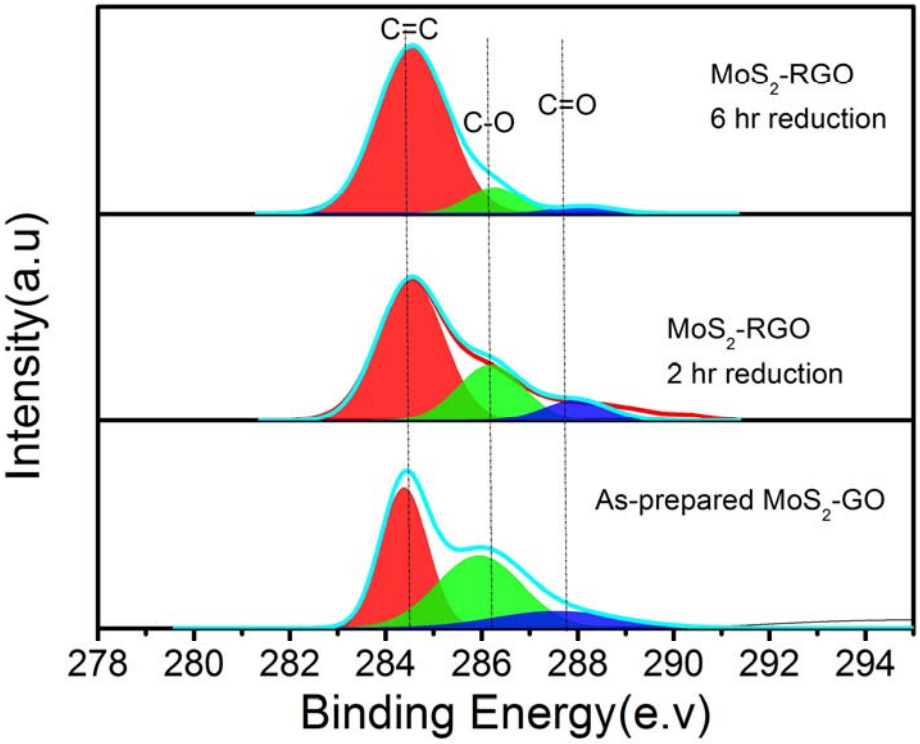


Figure S6: High resolution XPS spectra of C1s electrons of (a) As-prepared MoS_2-GO (a) MoS_2-RGO after 2 hr reduction c) MoS_2 -RGO after 6 hr reduction, showing substantial loss of oxygenated carbon (green) and gain of graphitic carbon (red) on reduction at longer time.

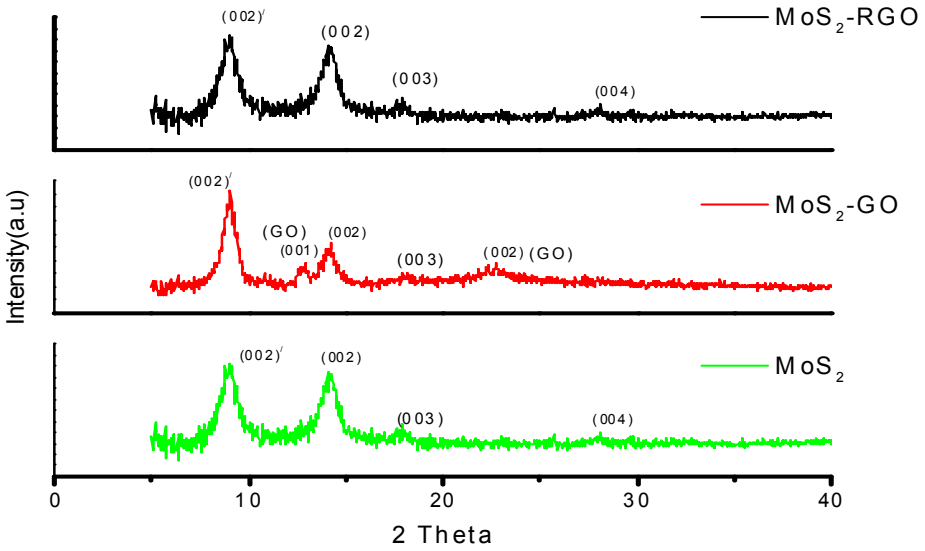


Figure S7: XRD pattern of MoS_2, MoS_2-GO, and MoS_2-RGO

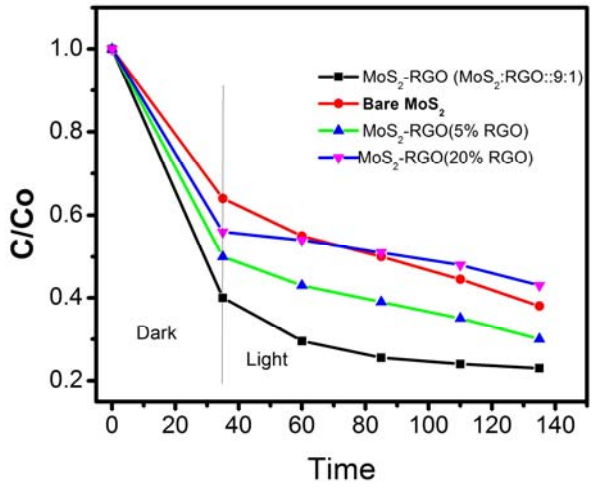


Figure S8: C/Co vs time curve, showing degree of visible light induced photocatalysis depending on the content of RGO in MoS_2-RGO hybrid. MoS_2-RGO hybrid with 5% RGO has shown higher rate of photocatalysis compared to bare MoS_2 catalyst. A complete decolorisation occurs using MoS_2-RGO (MoS_2: RGO:: 9:1). With increasing amount of RGO in MoS_2-RGO hybrid (20% RGO) the photon absorption decreases and degradation poccess become slower.

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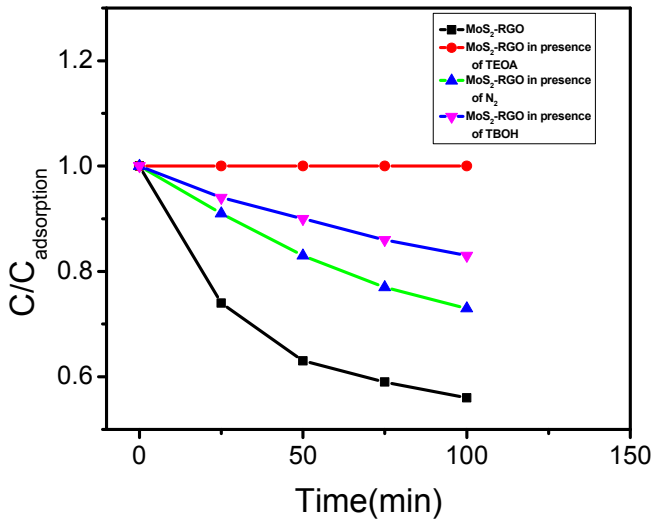

Figure S9: Ratio of final concentration and concentration after adsorption equilibrium ($C/C_{adsorption}$) vs. time showing photocatalytic degradation of Rh-B in presence of various scavengers. In presence of TEOA (hole scavenger) the photo degradation activity diminishes which is much more important than N_2 (O_2• radical scavenger) and Tertiary Butyl Alcohol (OH• radical scavenger). Thus the hole oxidation is responsible for mineralisation of the organic dye (Rh-B).

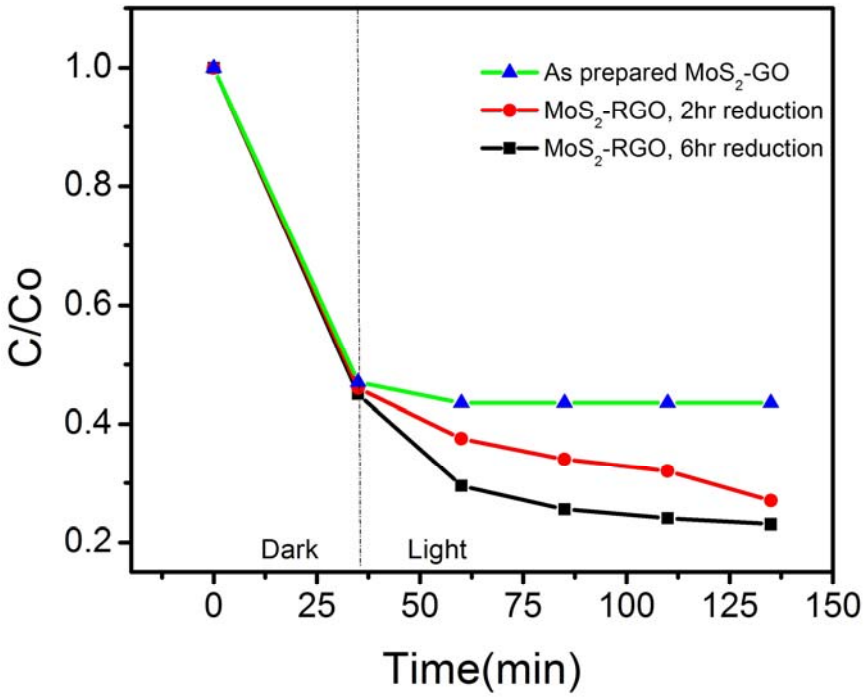

Figure S10: C/Co Vs time curve, showing degree of visible light induced photocatalysis depending on the extent of GO reduction. The amount of adsorption of dye remains almost same for all the three catalyst system, while, with increase in reduction level of the GO photocatalytic activity of the hybrid increases.

References:

[1] Won ,Y-H.; Jang , H..S.; Chung, D-W .; Stanciu, L. A. *J. Mater. Chem.*, **2010,** *20*, 7728–773.3