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Supplementary Information for

Fabrication of novel g-C_3N_4 based MoS_2 and Bi_2O_3 nanorods embedded ternary nanocomposites for superior photocatalytic performance and destruction of bacteria

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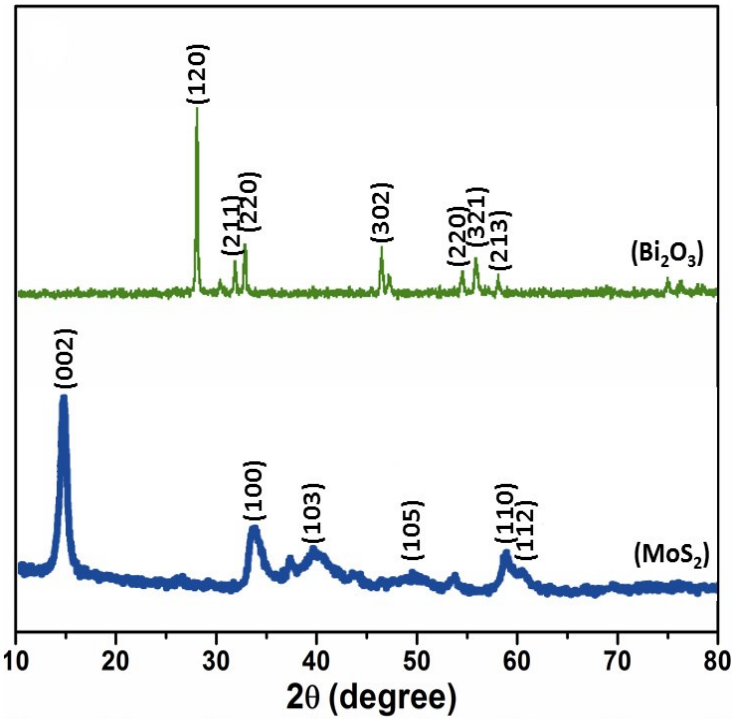

Fig. S1 XRD pattern of as-obtained pristine MoS_2 and Bi_2O_3 nanomaterials

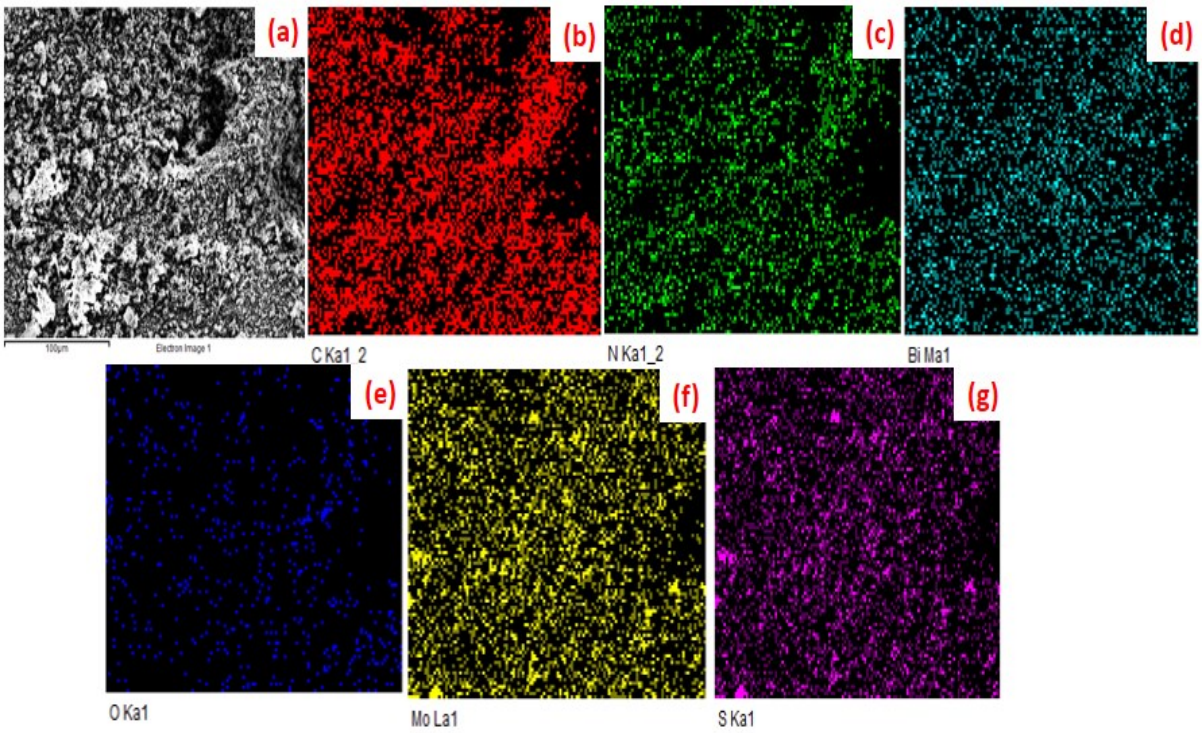

Fig. S2 Elemental mapping analysis of g-C_3N_4/MoS_2/Bi_2O_3 nanocomposite

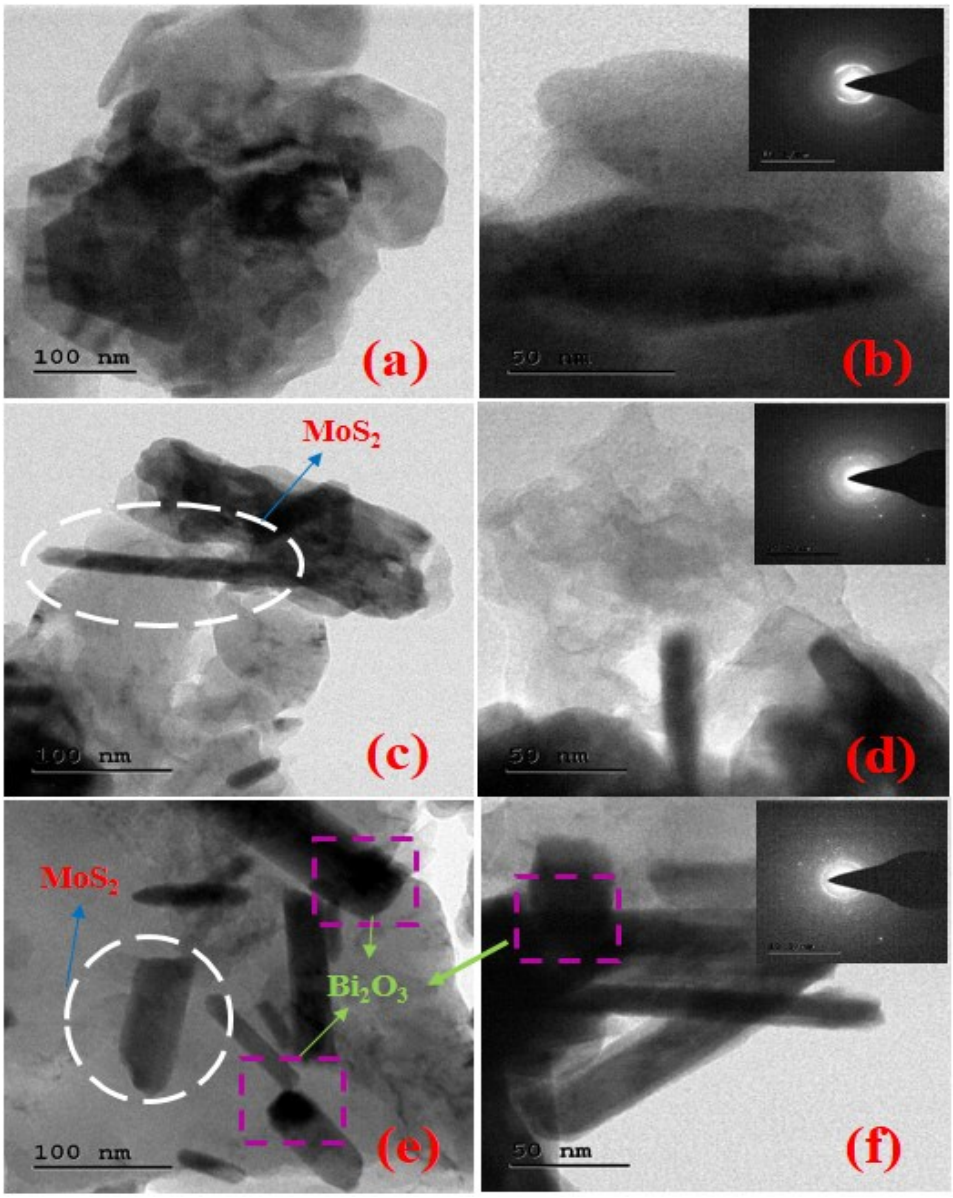

Fig. S3 HR-TEM images of (a, b) g-C_3N_4 (c, d) g-C_3N_4/MoS_2 and (e, f) g-C_3N_4/MoS_2/Bi_2O_3 nanorods embedded nanocomposites and corresponding SAED pattern

S1. Depiction of Electrochemical investigation

The electrochemical execution of as-arranged samples was tried on a CHI-760 electrochemical workspace in an ordinary three-electrode conspire comprising of Ag/AgCl (in soaked KCl) as a kind of reference electrode, Pt wire by a counter electrode, and test covered Indium doped Tin oxides (ITO) glass for working electrode. Na_2SO_4 (0.5 M; 50 ml of D.I water) fluid arrangement [1] was used by the electrolyte. The working electrode was composed as

pursues: 25 mg of the granulated sample was coupled by 20 mL of ethanol absolute in a testing tube, trailed by amassing of acetone to involved and ultra-sonication the slurry for 2 h. In addition, the clear dispersion was moved to 20 mL glass beaker and two bits of (2 cm × 0.5 cm) ITO glass was destroyed in the dissemination inside +10V to -10V for 10 minutes. Light irradiation was used in the photocurrent examinations was from a Xe lamp with several incidences with a time of light in ON and OFF settings. In addition, the main functionalization of EIS bends were gotten at - 0.4 V versus Ag/AgCl.

S2. Photocatalytic Phenol degradation

Phenol is a noxious and carcinogenic complex usually originate in industrial wastewater. It causes severe threats to the ecology and to humanoid health. In this current study, g-C_3N_4/MoS_2/Bi_2O_3 nanocomposite has been used and are active in the photocatalytic deprivation of phenol. Still, to the best of our data, revisions on the g-C_3N_4/MoS_2/Bi_2O_3 photocatalytic system are infrequent, and no reading has been stated on the photodegradation of phenol by g-C_3N_4/MoS_2/Bi_2O_3 NCs. The photocatalytic concerts of the g-C_3N_4/MoS_2/Bi_2O_3 PCs were assessed by decaying phenol under visible-light revelation [2].

S2.1 Photocatalytic Analysis

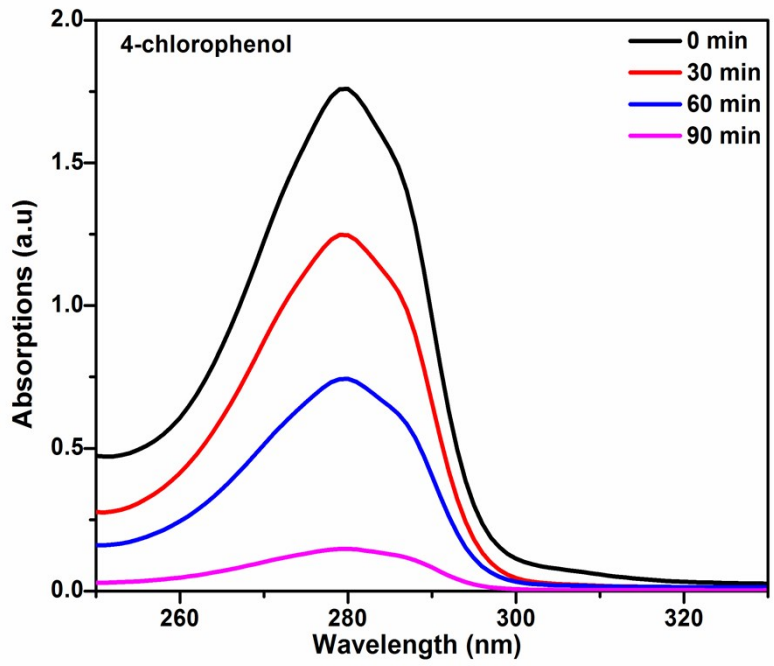

Fig. S4. UV-Vis absorption spectra of phenol over the g-C_3N_4/MoS_2/Bi_2O_3 composite under visible-light exposure

The photocatalytic enactment was appraised by the degradation of 4-chlorophenol, and experiments were carried out using a photocatalytic reactor with visible light were provided by a (500 W) halogen lamp by identical conditions. A mixture of 50 mg of the g-C_3N_4/MoS_2/Bi_2O_3 PCs and 10 mL of phenol (10 mg L^{-1}) was mixed into 100 mL of D.I water and it used for photocatalysis process [3]. The UV-Vis absorption spectrum was exploited to explore the deviations of 4-chlorophenol and its photo-degradation intermediates besides with the exposure time. Figure S4 displays a decrease in the 4-chlorophenol absorbance at λ= ~279 nm in the presence of g-C_3N_4/MoS_2/Bi_2O_3 PCs under visible-light, lastly, 4-chlorophenol could be absolutely (92 %) degraded after 90 min of photo-reaction. This designated that 4-chlorophenol was oxidized to a complex mixture of visible-light and intermediates of catalysts, whereas the deficiency of absorption spectra might propose that the g-C_3N_4/MoS_2/Bi_2O_3 PCs has a promising catalyst for different organic pollutant degradation of environmental remediation.

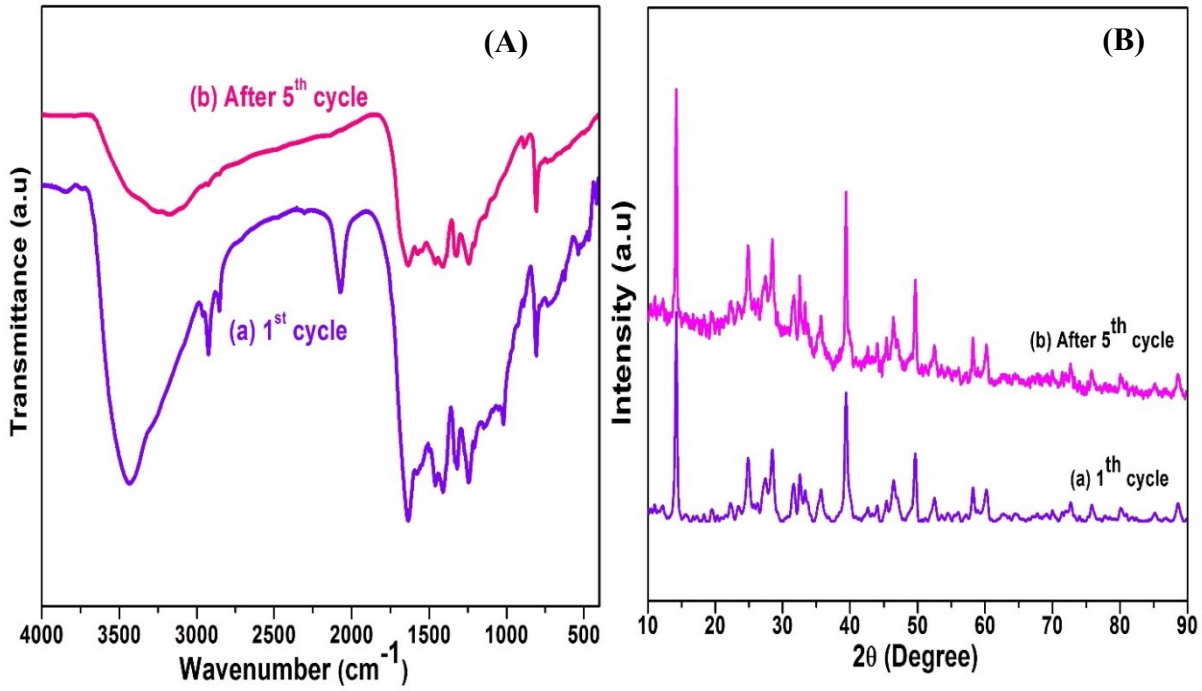

Fig. S5. (A) XRD and (B) FT-IR results of before and after MB dye photodegradation processed g-C_3N_4/MoS_2/Bi_2O_3 samples

By the way of probable mechanism, the g-C_3N_4/MoS_2/Bi_2O_3 PCs suspension under visible-light exposure, the enhanced photocatalytic system might be fashioned amid MoS_2/Bi_2O_3 and g-

C_3N_4, through which electrons (e^-) on the CB of MoS_2 and/or Bi_2O_3 migrate to the VB of g-C_3N_4 and syndicate by h^+ within. Such migration of (e^-) might extend the lifetime of (e^-) on the CB of g-C_3N_4 and h^+ on the VB of MoS_2/Bi_2O_3. Based on the above analyses, the charge migration across the photocatalytic organization which facilitates the capable charge separation, and hence conserving the further species for oxidation and reduction of organic pollutants of MB and colourless phenol as well.

S3. The description of Analysis of Antibacterial Activity

The assessment of antibacterial inhibition zone of the readied nanocomposites was additionally tried by the weld-diffusion technique. In this investigation, (G^+) *S. aureus* and (G^-) *E. coli* microscopic organisms were utilized for the run of the mill living being, which by characterizing the antibacterial properties of the readied tests by means of zone inhibition technique [4]. An appropriate proportion of the readied tests was then delicately situated on the LB agar plates. In such the fixation arrangement was 50, 100, 150 and 200 µg/ml and the dishes were brooded circumstance for 24 h on 37 °C. Subsequently, the activity was resolved by figuring the (ZOI) zone of the inhibition-free zone with no bacterial development that had conformed to each example, and the results were recorded and organized by Table S1.

Table. S1 Antibacterial activity of as-obtained nanocomposites against different microorganisms

	Inhibition zone (mm)							
	E. coli				***S. aureus***			
Samples	**50 µg**	**100 µg**	**150 µg**	**200 µg**	**50 µg**	**100 µg**	**150 µg**	**200 µg**
g-C_3N_4	7±0.0	7±0.5	8±0.5	8±0.5	6±0.5	7±0.5	7±1	7±0.5
g-C_3N_4/MoS_2	8±0.5	9±0.5	9±0.5	11±1	7±0.5	9±1	10±0.0	10±0.5
g-C_3N_4/MoS_2/Bi_2O_3	10±0.5	11±1	11±0	11±0.5	12±0.5	13±0.5	12±1.0	13±0.5

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