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Supplementary file

2D/2D Nitrogen-Doped Graphitic Carbon Nitride/Cobalt Sulfide nanostructures for fast Photodegradation of Methylene Blue Dye and real industrial sewage effluents

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Details of Instrumentation for catalysts:

XRD

Source	:	X-Rays
Range	:	10-80 °
Step size	:	0.005/sec
Software	:	Origin (2018)
Instrument	:	Bruker d8

XPS

Software	:	Origin (2018)
Calibration		
of energy	:	C 1s
Instrument	:	Bruker d8

FESEM

Stub	:	Aluminum
Coating	:	Gold
Cycle	:	5 cycles
Dispersion	:	Ethanol

TEM

Grid	:	Carbon coated copper grid
Mesh Size	:	200 mesh
HT	:	200 kV
Dispersion	:	Ethanol
Preparation		
Method	:	Drop-casting method

For a better understanding of the band positions of the as-prepared photocatalysts, positions of the conduction band (E_{CB}) and valence band (E_{VB}) were evaluated by the following formula: [46, 47]

$$\begin{split} E_{CB} &= \chi + E_e - 0.5 E_g \\ E_{VB} &= E_{CB} + E_g \end{split}$$

Where χ is electronegativity, E_e energy of free electrons on hydrogen scale (~ 4.5eV).

The electronegativity (χ) of the photocatalyst can be calculated by the following formula: [47, 48]

$$\chi = \{(A)^a * (B)^b * (C)^c\}^{1/(a+b+c)}$$

Where, A, B, C are the elements in the compound, while a, b, c are the number of atoms present in the compounds. After depicting the values in the above equations, χ value of NG and CS is 4.73 and 5.14 respectively. Thus, E_{CB} and E_{VB} values of NG are -1.03, and +1.5 eV while for CS are -0.24 and +1.53 eV respectively.



Fig.S1 Shows the XRD patterns of bare g-C₃N₄ and N-doped g-C₃N₄ nanosheets



Fig.S2. BET analysis of NG and CSNG-2 nanocomposite



Fig.S3.1 GC analysis of MB, RS.II, MB+Catalyst (Cat), RS.II+Cat, MB+RS.II+Cat



Fig.S3.2 GC-MS Spectral analysis of MB, RS.II, MB+Catalyst (Cat), RS.II+Cat, MB+RS.II+Cat



Fig. S4.1. UV-Vis absorbance spectra of NG, CS, CSNG nanocomposites



Fig.S4.2 The energy band gap of bare photocatalysts.

Catalyst	% Degradation	Rate (min ⁻¹)	R ²	Time (min)
NG	83	0.00836	0.98578	150
CS	88	0.00593	0.49477	150
CSNG-1	72	0.0087	0.84062	150
CSNG-2	96	0.03474	0.99062	40
CSNG-3	91	0.00407	0.85942	150

 Table S1: Photocatalytic rate constant of NG, CS, and CSNG nanocomposites