

Supporting information

Micelles assisted synthesis of bismuth oxide nanoparticles for chemocatalytic degradation of toxic Congo red into non-toxic

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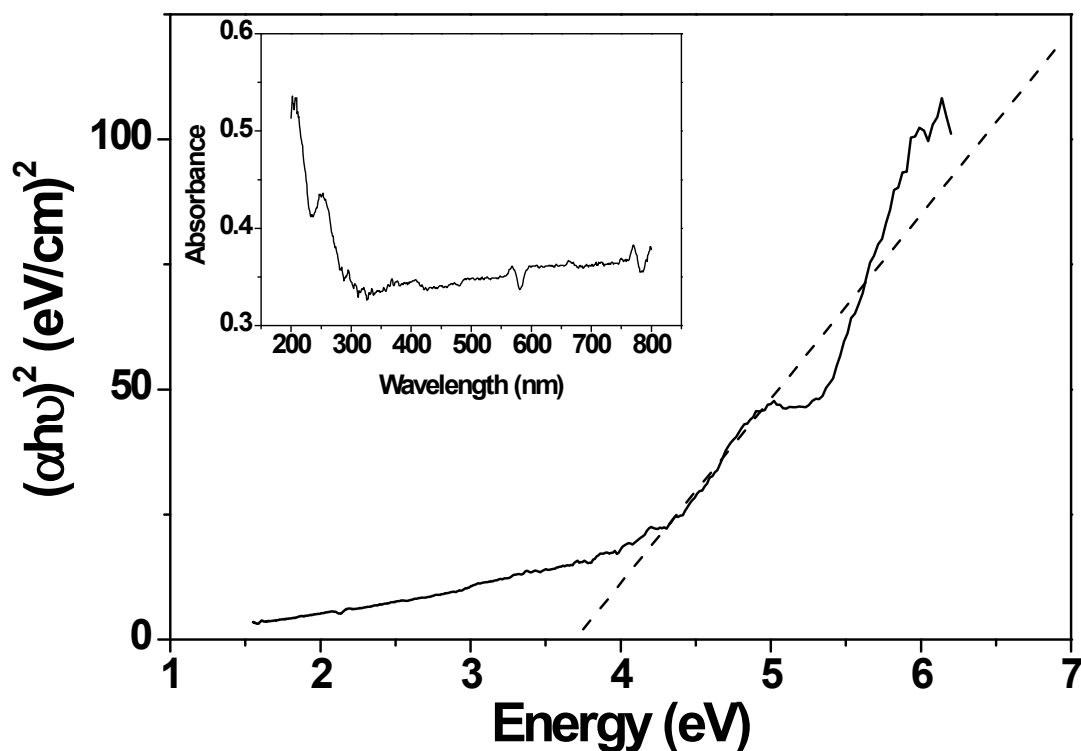


Figure S1: UV-vis-DRS spectra and Tauc's plot of Bi₂O₃ NPs

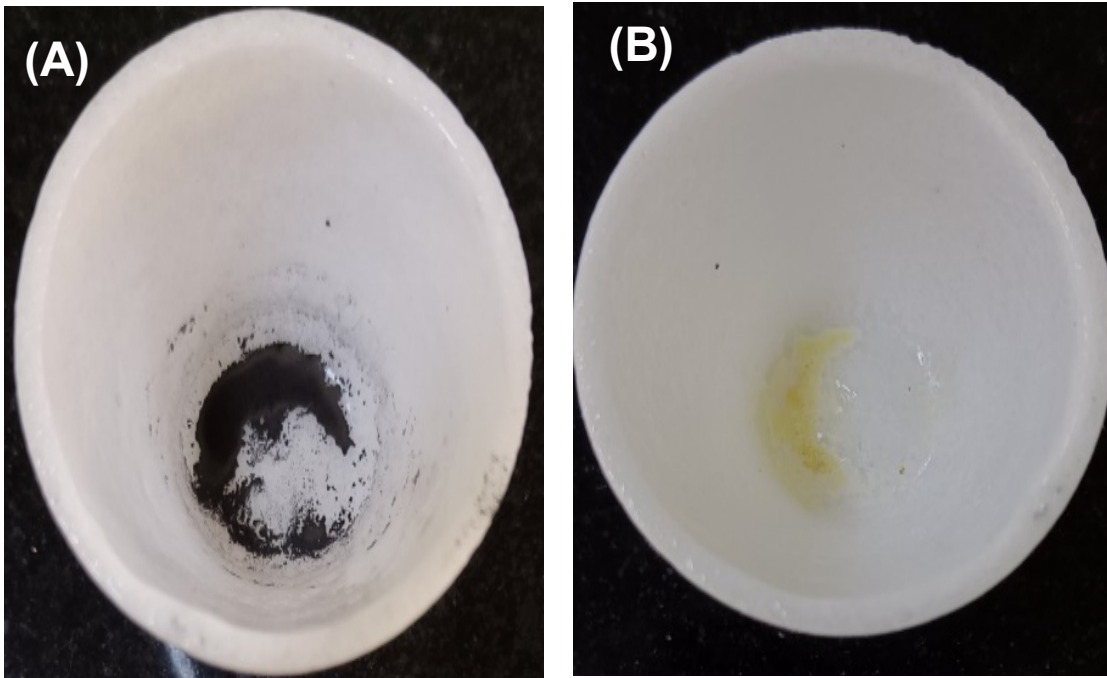
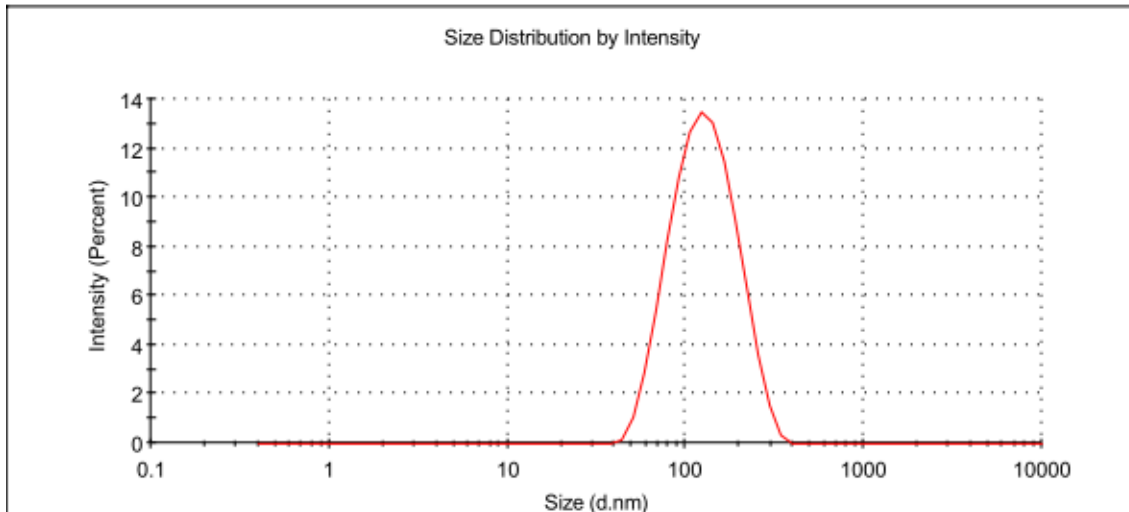


Figure S2: Bi_2O_3 NPs (A) before and (B) after calcinations at 500°C for 6 h. Oxygen vacancies gave the material a black colour that turns fully oxygenated during calcinations and appear in the characteristic yellow colour of Bi_2O_3 NPs.

(A)

Z-Average (d.nm): 111.8	Peak 1: 135.5	% Intensity: 100.0	St Dev (d.n...) 54.77
Pdl: 0.177	Peak 2: 0.000	% Intensity: 0.0	St Dev (d.n...) 0.000
Intercept: 0.938	Peak 3: 0.000	% Intensity: 0.0	St Dev (d.n...) 0.000

Result quality : Good



(B)

Zeta Potential (mV): -19.8	Mean (mV)	Area (%)	St Dev (mV)
Zeta Deviation (mV): 9.15	Peak 1: -19.8	Area (%) 100.0	St Dev (mV) 9.40
Conductivity (mS/cm): 0.132	Peak 2: 0.00	Area (%) 0.0	St Dev (mV) 0.00
	Peak 3: 0.00	Area (%) 0.0	St Dev (mV) 0.00

Result quality : Good

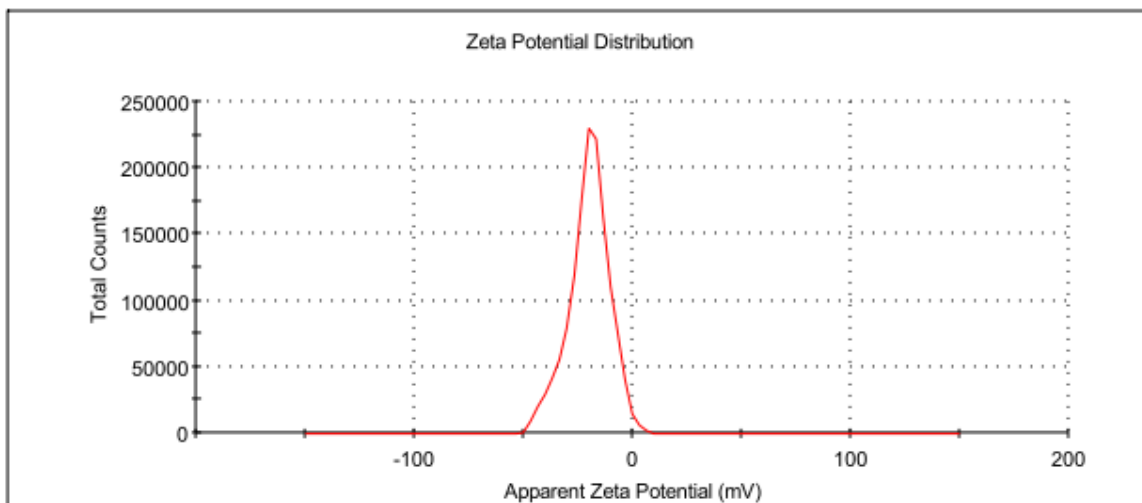


Figure S3: (A) Zeta size and (B) Zeta potential of Bi₂O₃ NPs.

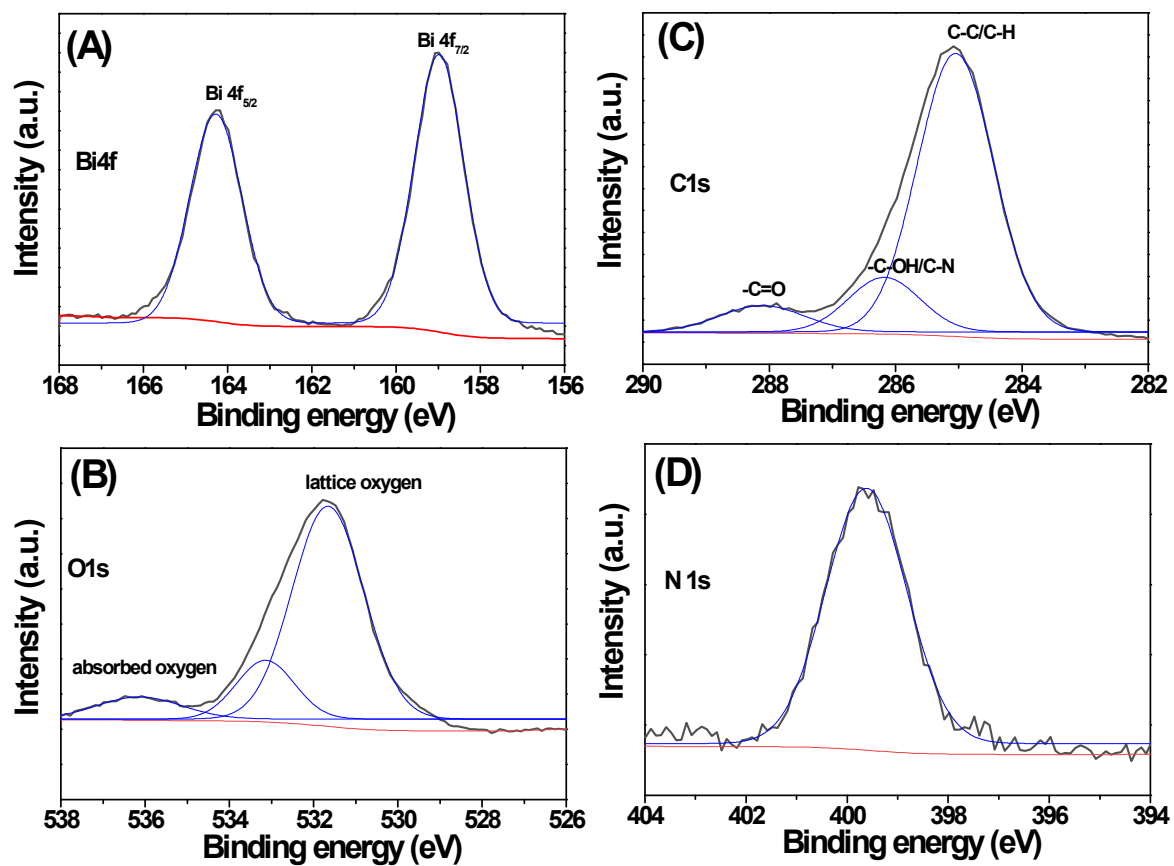


Figure S4: XPS spectra of (A) Bi4f, (B) O1s, (C) C1s, and (D) N1s.

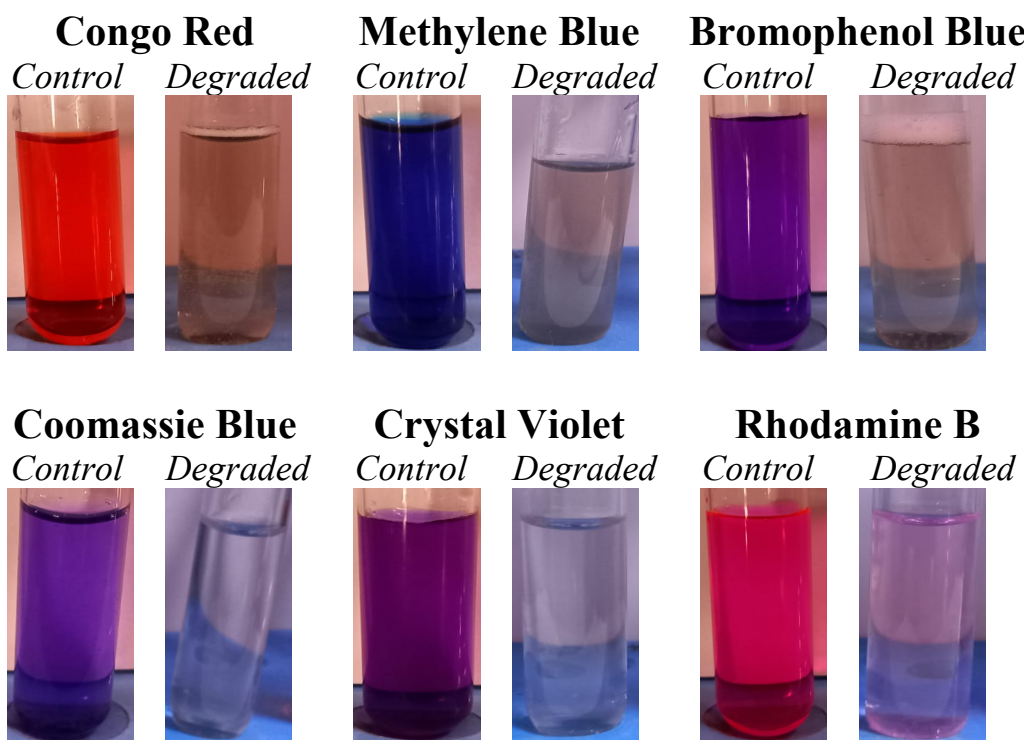


Figure S5: Bi_2O_3 NPs catalyzed reduction of dyes. Dyes are treated with NaBH_4 in the presence of Bi_2O_3 NPs. Decolourization suggests that the dyes are degraded.

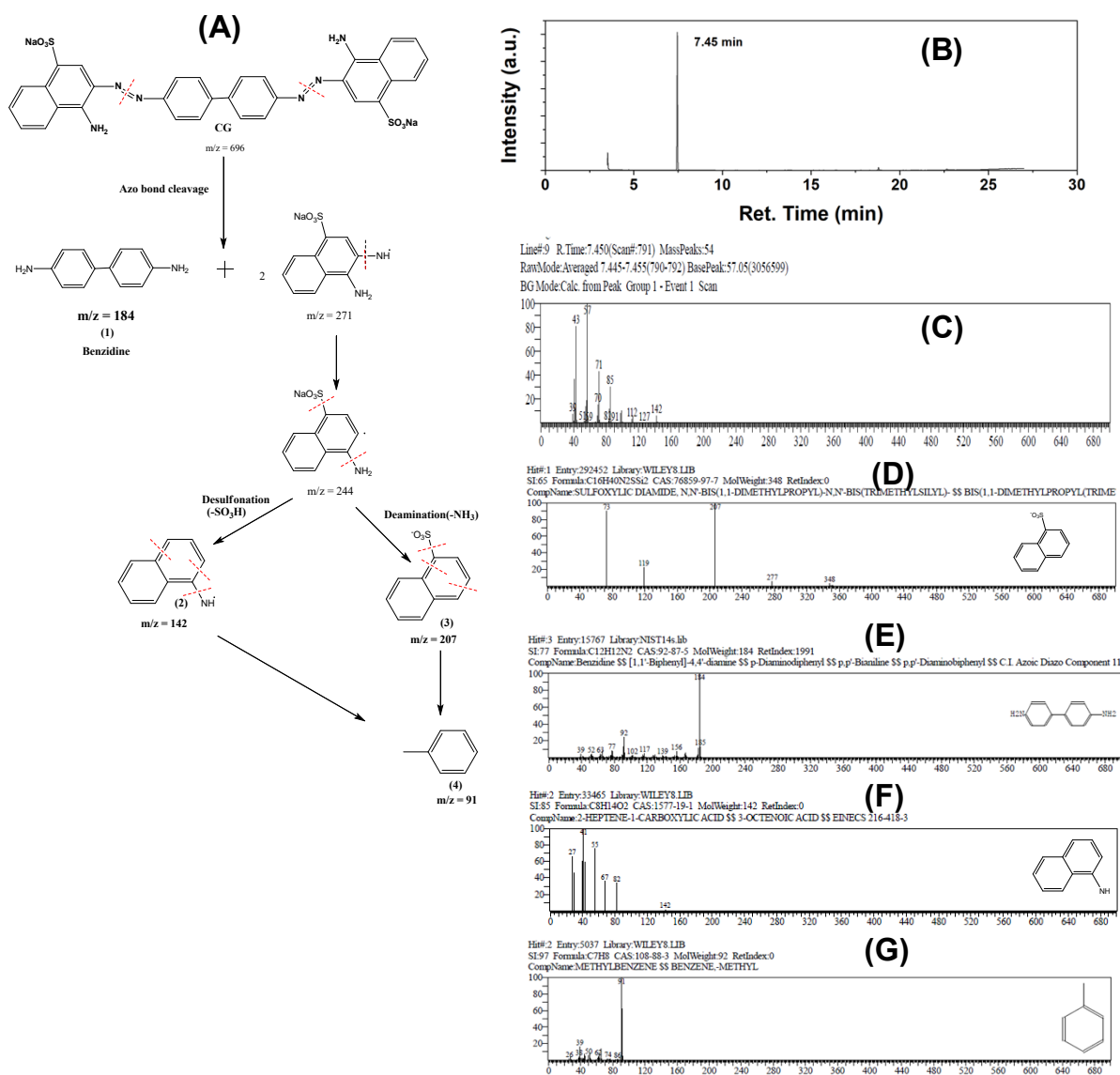


Figure S6: (A) Plausible products formed during degradation. (B) Gas chromatogram of degraded Congo red. (C) Mass profile for the peak at 7.45 min. (C-G) GC-MS of degraded congo red was compared with Wiley library and its matches. The finding suggests the Bi₂O₃ NPs catalyzed NaBH₄ mediated reduction yields smaller molecules from Congo red, as a result the degraded product becomes non-toxic.

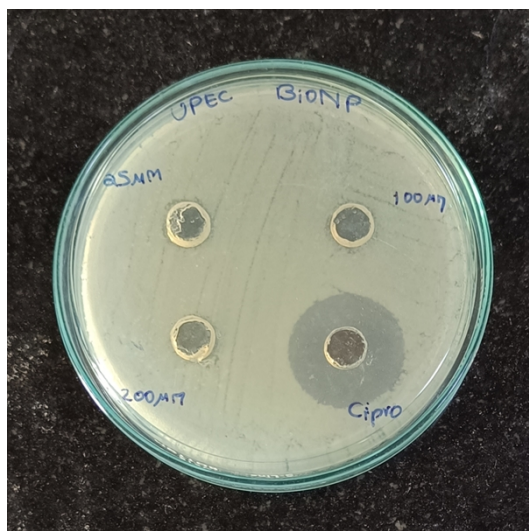


Figure S7: Zone of inhibition assay. About 0.1 OD bacterial cultures were swabbed on an LB-agar plate, and a well was created. 50 μL of Bi_2O_3 NPs were added to each well and incubated at 37°C for 12 h. 3 μM ciprofloxacin was used as a positive control. The formation of a zone around the well demonstrates the toxicity of the loaded molecules. It is noted that the zone was observed around the well with ciprofloxacin, whereas no zone is found around the wells loaded with different concentrations of Bi_2O_3 NPs. The findings indicate that Bi_2O_3 NPs are non-toxic to bacteria.