Electronic Supplementary Material (ESI) for RSC Advances.

[Supplementary Information]

Mussel-inspired immobilization of Au on bare and graphene-wrapped Ni nanoparticles toward highly efficient and easily recyclable catalysts

Fatima Mahnaz,[†] Mohammad Mostafa-Al-Momin,[‡] Md. Rubel,[‡] Md. Ferdous,[‡] and Md. Shafiul Azam[*‡]

[‡]Department of Chemical Engineering, Bangladesh University of Engineering and Technology (BUET), Dhaka 1000, Bangladesh
[†]Department of Chemistry, Bangladesh University of Engineering and Technology (BUET), Dhaka 1000, Bangladesh

**Corresponding Author:*

mdshafiulazam@chem.buet.ac.bd (M.S.A.)

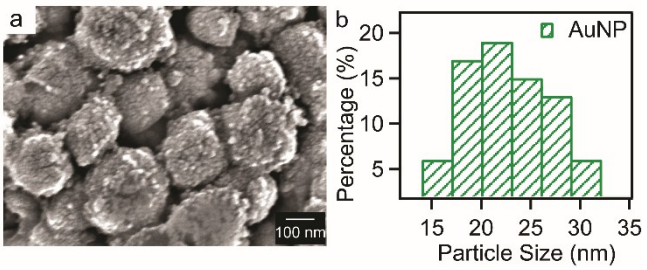

Figure S1. (a) Magnified SEM image of Ni-PD-Au nanocomposite (b) Size distribution of AuNPS on nanocomposite surface using *Image J* software

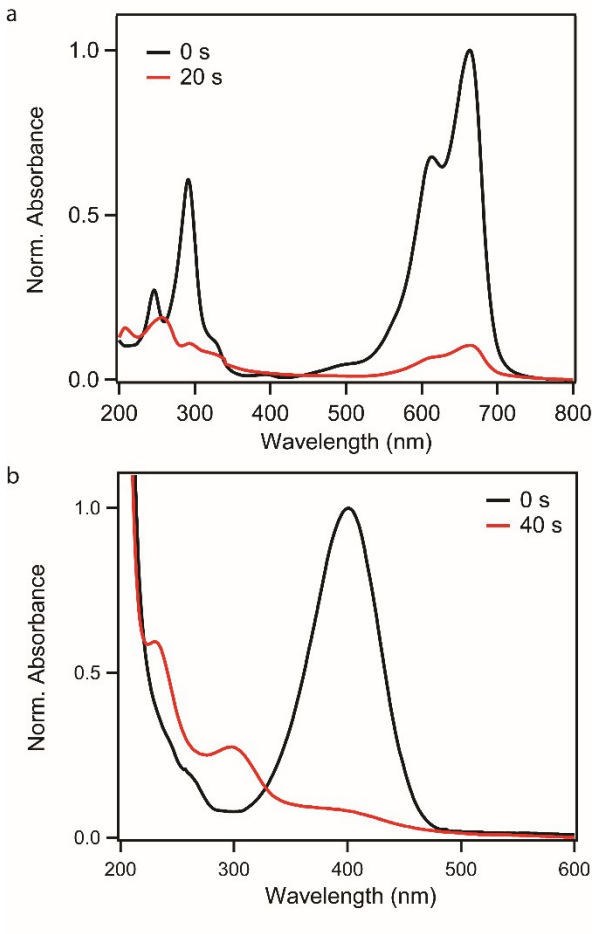

Figure S2. (a) UV absorption spectra of MB reduction and (b) 4-NP reduction in presence of Ni-PD-Au

In reduction reaction of MB and 4-NP by $NaBH_4$ in presence of metal catalyst, BH_4^- ion get adsorbed on the metal surface that triggers the formation of active hydrogen species and initiates the reduction of the organic dye molecules. In our case, as the reduction of MB and 4-NP in presence of Ni-PD-Au proceeded, the appearance of additional peak at 256 nm (for MB reduction)[1] and 300 nm (for 4-NP reduction)[2] were observed due to formation of LMB and 4-AP respectively.

Table S1. Summary of the Results for the Average Particle Diameter of AuNPs from XRD Measurements of Ni-PD-Au Using Scherrer's Equation

XRD Reflections at 2θ (°)	X-Ray Wavelength, λ (nm)	Crystal Shape Factor, K	Line Broadening, β (rad)	Particle Diameter, D_p (nm)
38	0.154	0.9	0.0061	23.9
43			0.0069	21.3
63			0.0073	22.3
77.7			0.0087	20.4
Average Diameter of AuNPs				22.0

Table S2. Summary of the Results for the Average Particle Diameter of AuNPs from XRD Measurements of Ni-G-PD-Au Using Scherrer's Equation

XRD Reflections at 2θ (°)	X-Ray Wavelength, λ (nm)	Crystal Shape Factor, K	Line Broadening, β (rad)	Particle Diameter, D_p (nm)
38	0.154	0.9	0.0057	25.5
43			0.0061	24.4
63			0.0069	23.3
77.7			0.0078	22.7
Average Diameter of AuNPs				23.9

References

1. Lee, S.-K.; Mills, A., Novel photochemistry of leuco-Methylene Blue. *Chemical Communications* **2003,** (18), 2366-2367.
2. Aditya, T.; Pal, A.; Pal, T., Nitroarene reduction: a trusted model reaction to test nanoparticle catalysts. *Chemical Communications* **2015,** *51* (46), 9410-9431.