**Supplementary Material**

N, S doped Carbon dots – plasmonic Au Nanocomposites for visible-light photocatalytic reduction of Nitroaromatics

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**1. TEM Images of carbon coated copper grid with and without NS CDs samples**

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**FIG. S1:** TEM images of carbon coated copper grid, (a) with sample and (b) without sample

**2. Calculation of crystallite size of Gold Nanoparticles from XRD**

Crystallite size of gold nanoparticles was determined using Debye Scherer equation1. The Full Width at Half Maximum (FWHM) was determined by XRD peak fitting (Gaussian) using origin 9.1 software (shown in FIG. S2). Crystallite size of gold nanoparticles was found to be 17.45 nm.

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**FIG. S2:** XRD spectrum (peak fitting) of the NS CDs – Au NCs sample used for crystallite size calculation.

**3. Image of aqueous sol of NS CDs, HAuCl4, and Colloidal dispersion of catalyst**

These images show that colloidal dispersion of NS CDs – Au NCs samples is quite stable for a couple of weeks.

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**FIG. S3:** Aqueous solution of (a) HAuCl4, (b) NS CDs, (c) Freshly prepared NS CDs – Au NCs and (d) NS CDs – Au NCs after 15 days.

**4. Zeta potential measurement of NS CDs and NS CDs – Au NCs**

The Zeta potential of NS CDs (0.5µg/mL) and NS CDs – Au NCs ((0.5µg/mL) were found to be -42.5 and -19.6 mV respectively (shown in Fig. S2). These high surface charge values indicate the stability of colloidal solutions and the decrease in value from -42.5 to -19.6 mV signify the interaction of NS CDs with gold nanoparticles. Zeta potential graphs of NS CDs and NS CDs – Au NCs have been shown in FIG. S4 respectively.

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**FIG. S4:** Zeta potential curve of the NS CDs and NS CDs – Au NCs samples.

**5. UV visible spectra of Nitrophenol in absence of catalyst and NaBH4**

The reduction of Nitrophenol (NP) in the presence of excess of NaBH4 is a standard reaction model for testing catalytic activity of nanoparticles therefore, reduction of NP has been used to test reduction process in the absence one of the components among catalyst and NaBH4 it was noticed that there is no conversion of NP to amino phenol in the absence of NaBH4 as shown in FIG. S5a. Similarly, even the availability of excess of NaBH4 was unable to trigger the reduction process in the absence of the catalyst (shown in FIG. S5b). Therefore, reduction of NP to amino phenol essentially required the presence of catalyst as well as NaBH4.

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**FIG. S5:** Reduction of NP in the absence of (a) NaBH4 and (b) Catalyst, keeping other parameters constant.

**6. Determination of HOMO-LUMO for NS CDs – Au NCs.**

The HOMO and LUMO of NS CDs – Au NCs were determined via standard three electrode cyclic voltammetric measurement with a sweep rate of 20 mV s-1 (shown in FIG. S6). In the voltammogram, distinct oxidation and reduction peaks were observed at 0.813 and -1.08 V (versus Ag/Ag+) respectively. The potential of reference electrode (Ag/Ag+) was +0.197 V (*versus* NHE). Therefore, the oxidation potential = (0.813+0.197) V = 1.01 V and the reduction potential = (–1.08+0.197) V = -0.883 V (vs. NHE) corresponds to 4.5 eV (w.r.t. vacuum level).

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**FIG. S6:** Cyclic votammogram curve of the NS CDs – Au NCs sample.

**7. BET adsorption isotherm and pore size distribution of NS CDs**

BET Specific area anaThe Brunauer Emmett Teller (BET) specific surface area and Barret, Joyner and Halenda (BJH), pore size distribution of NS CDs have been determined from the N2 adsorption–desorption process using the Micromeritics 3 FLEX 3500- Multi Port Gas Adsorption Analyzer. The BET surface area was found to be 47.48 m2/g with the average pore diameter of 2.1 nm. FIG. S7 shows that the hysteresis loop of the adsorption–desorption isotherm is very similar to type IV isotherm, indicates formation of monolayer followed by a formation of multilayer2.

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**FIG. S7:** N2 Adsoption desorption isotherm and BJH (inset) pore size distribution curve of NS CDs sample.

**References**

1. U. Holzwarth and N. Gibson: The Scherrer equation versus the 'Debye-Scherrer equation' *Nat Nanotechnol.* **6**, 534 (2011).

2. A.A. Ashkarran, A.I. Zad, S.M. Mahdavi and M.M. Ahadian: Photocatalytic activity of ZnO nanoparticles prepared via submerged arc discharge method *Appl Phys a-Mater.* **100**, 1097 (2010).