Supplementary Information

Enhanced visible light harnessing and oxygen vacancy promoted N, S co-doped CeO_2 nanoparticle: A challenging photocatalyst for Cr(VI) reduction

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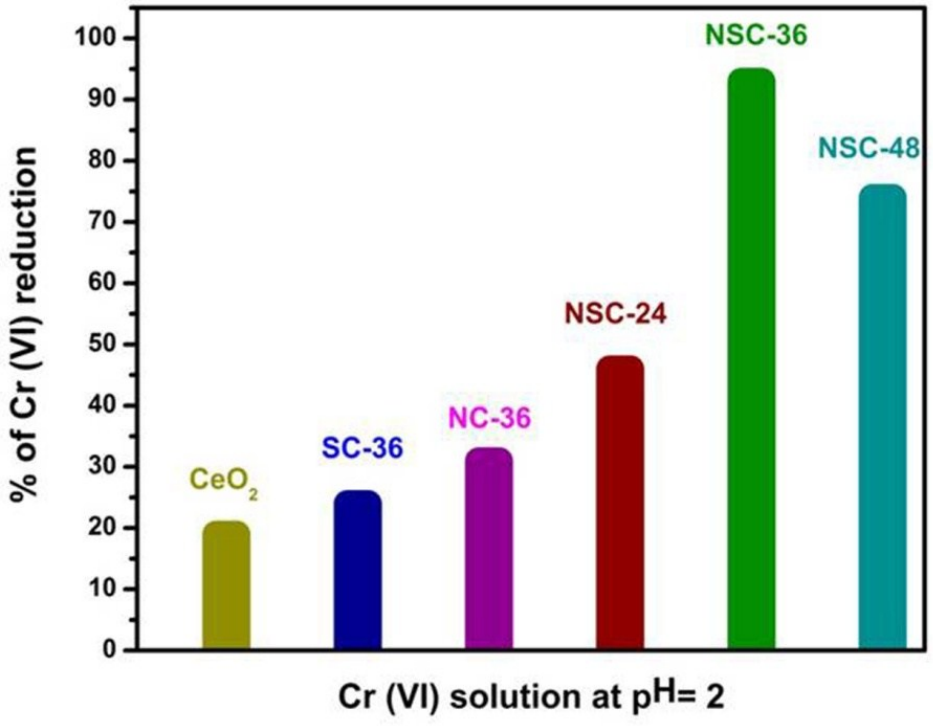

Figure S1. Photo-reduction of Cr(VI) by neat CeO_2, SC-36, NC-36, NCS-24, NCS-36 and NCS-48 under Visible-light irradiation[catalyst dose = 1g/L; [Cr(VI)] = 50 mg/L; time = 120 min]

Mott-Schottky

Mott-Schottky measurements was carried out to know the flat band edge potential and type of semiconducting material (n or p),which are important parameter of photochemical reaction because of their impact on charge transfer mechanism and recombination probability. The electrochemical flat band potential of the as prepared photocatalystswere calculated from by the following equation:

$$\frac{1}{C^2} = \frac{2}{ee_0 N_D}\left(E - E_{fb} - \frac{k_b T}{q}\right) \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where the symbols have specific notations such as C is the space charge capacitance, e and e_0 are the dielectric constants of free space and material electrodes respectively, N_D is the donor density, k_b is the Boltz's man constant, q is the electronic charge and T is the absolute temp.

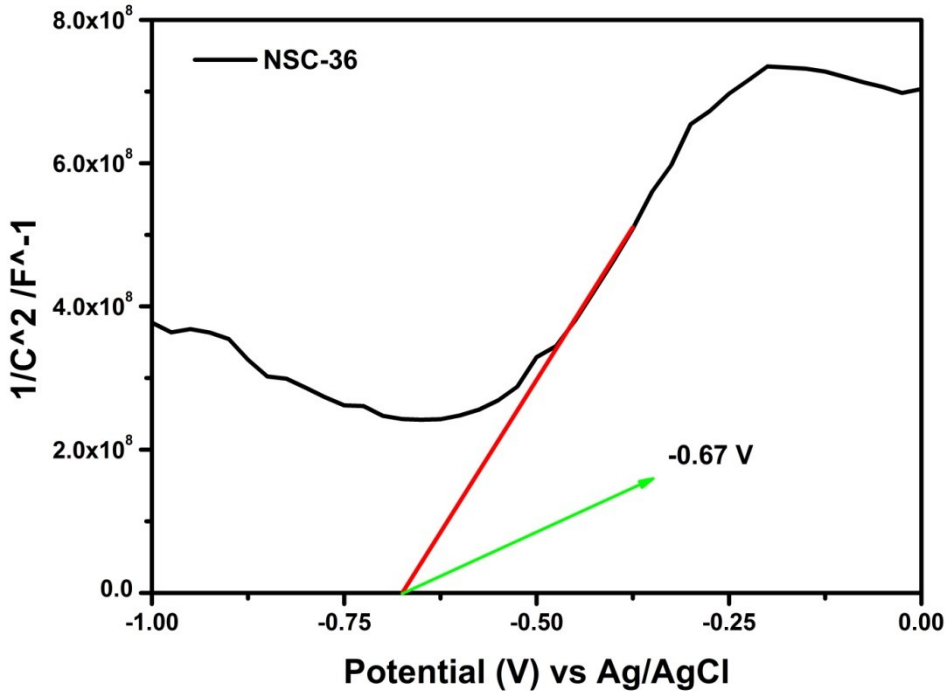

Figure S2. Mott-Schotky plot of NSC-36 photocatalyst measured 1k Hz.

The flat band (E_{fb}) potential of the semiconductor was determined from the intercept of the straight line on potential axis as shown in fig(1) and the nature of tangent indicates the type of extrinsic material i.e. positive slope for n-type and negative for p-type materials. In this case the E_{fb} value for the n-type doped

CeO_2 is computed to be -0.67 V vs Ag/AgCl electrode. Hence, the conduction bandage potential of NSC-36 was determined to -0.41 eVvs NHE. Accordingly, its corresponding valence band potential (VB) was calculated to be 1.78 eVvs NHE.

Reference

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[2] X. F. Lei, X. X. Xue, H. Yang, C. Chen, X. Li, J. X. Pei, X. Y. Gao, *Journal of Alloys and Compounds*, **2015**, *646*, 541-549.

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[4] J. Zai, F. Cao, N. Liang, K. Yu, Y. Tian, H. Sun, X. Qian, *Journal of Hazardous Materials*. **2017**, *321*, 464-472.