Electronic Supplementary Material (ESI) for Journal of Materials Chemistry B.

Electronic Supplementary Information

Intrinsic Peroxidase-like Activity of Mesoporous Nickel Oxide for Selective Cysteine Sensing

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S1. EXPERIMENTAL SECTION

Materials

All the reagents were of analytical grade and used in the synthesis without further purification. Nickel acetate [$Ni(OCOCH_3)_2$. H_2O], 3, 3', 5, 5' tetramethylbenzidine (TMB), cysteine, N-acetyl cysteine (NAC) were purchased from Sisco ResearchLaboratory,Mumbai, India. Ethanol amine, H_2O_2 (30%) were purchased from Merck, Gurgaon, India. *Ortho*-phenylene diamine (OPDA) was acquired from Aldrich. All the glassware was washed with double distilled water and dried well before use. Double distilled water was used throughout the course of experiments.

Instrumentations

UV-Visible Spectroscopy: All the absorbance spectra were recorded in a SPECTRASCAN UV 2600 digital spectrophotometer (Chemito, India) and absorbance was measured by taking all solutions in a 1cm well-Stoppard quartz cuvette.

X-ray Diffraction (XRD) Study: XRD pattern of the all samples were documented on a Philips PW-1710 X-ray diffractrometer (40 kV, 20 mA) with Cu Kα radiation (λ = 1.5418 Å) in the 2θ range of 20°-80° at a scanning rate of 0.5° min^{-1}. All XRD data were scrutinized using *JCPDS* software.

X-ray photoelectron spectroscopy (XPS): Phase purity of the samples were confirmed with use of VG Scientific ESCALAB MK II spectrometer (UK) equipped with an Mg Kα excitation source (1253.6 eV) and a five-channeltron detection system.

Fourier Transform Infrared Spectroscopy (FTIR): Fourier transform infrared spectroscopy (FTIR) spectral analysis of the samples were carried out with Nexus 870 Thermo-Nicolet instrument coupled with a Thermo-Nicolet Continuum FTIR Microscope.

Field-Emission Scanning Electron Microscopy (FESEM): The morphology of the product were analyzed in detailed by Field Emission Scanning Electron Microscopy (FESEM) using a (Supra 40, Carl Zeiss Pvt. Ltd.) microscope at an accelerating voltage of 20 kV and compositional analysis of the sample was done with an energy dispersive X-ray micro analyzer (OXFORD ISI 300 EDAX) attached to the scanning electron microscope.

Transmission Electron Microscopy (TEM): TEM analyses of the samples were performed on a Hitachi H-9000 NAR transmission electron microscope, operating at 100 kV on a carbon coated copper grid.

Gas Sorption Measurement: The nitrogen gas adsorption and desorption measurements were executed at 77 K using a Quantachrome Autosorb Automated Gas Sorption analyzer. For adsorption study the sample was dried in vacuum for overnight and 20-25 mg amount was loaded in a 6 mm sample holder. In desorption study the sample was used for degassing at 70°C for 2 h and Brunauer–Emmett–Teller (BET) calculations were performed for the analysis of surface area of the sample. Barrett-Joyner-Halenda (BJH) calculations were implemented for the pore-size distribution calculation after the samples were degassed in a vacuum overnight.

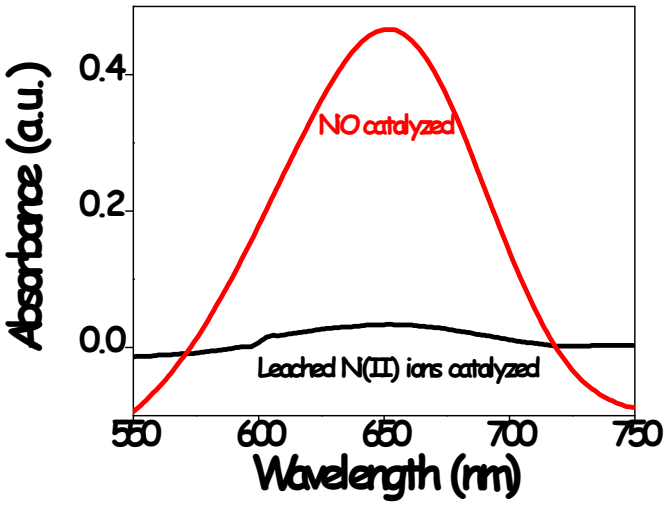

Fig. S1 Comparison of absorbance spectra of NiO and leached Ni(II) catalyzed TMB oxidation in presences of H_2O_2

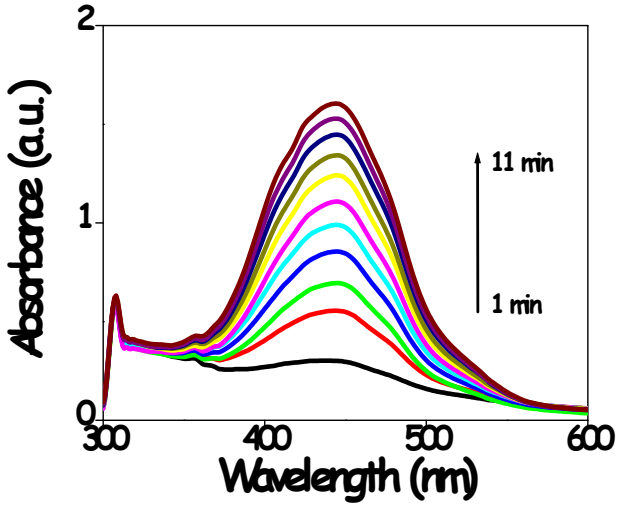

Fig. S2 Time dependent absorbance spectra of OPDA-H_2O_2 system in presence of NiO as catalyst

Table S1. Kinetic Parameters for the Peroxidase-Like Activity of $Ni(OH)_2$ NFs , NiO NFs, and HRP enzyme

Materials	Substrate	K_m (mM)	V_{max} (Ms^{-1})
NiO	TMB	0.018	2.4×10^{-8}
	H_2O_2	1.77	2.1×10^{-8}
$Ni(OH)_2$	TMB	0.023	1.4×10^{-8}
	H_2O_2	1.76	1.2×10^{-8}
HRP [40]	TMB	0.062	3.6×10^{-8}
	H_2O_2	3.7	8.7×10^{-8}