

Supporting Information for

CeO₂ Nanoparticles Supported on 1-D silica Nanostructures for Room Temperature Selective Oxidation of Styrene

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Fig. S1

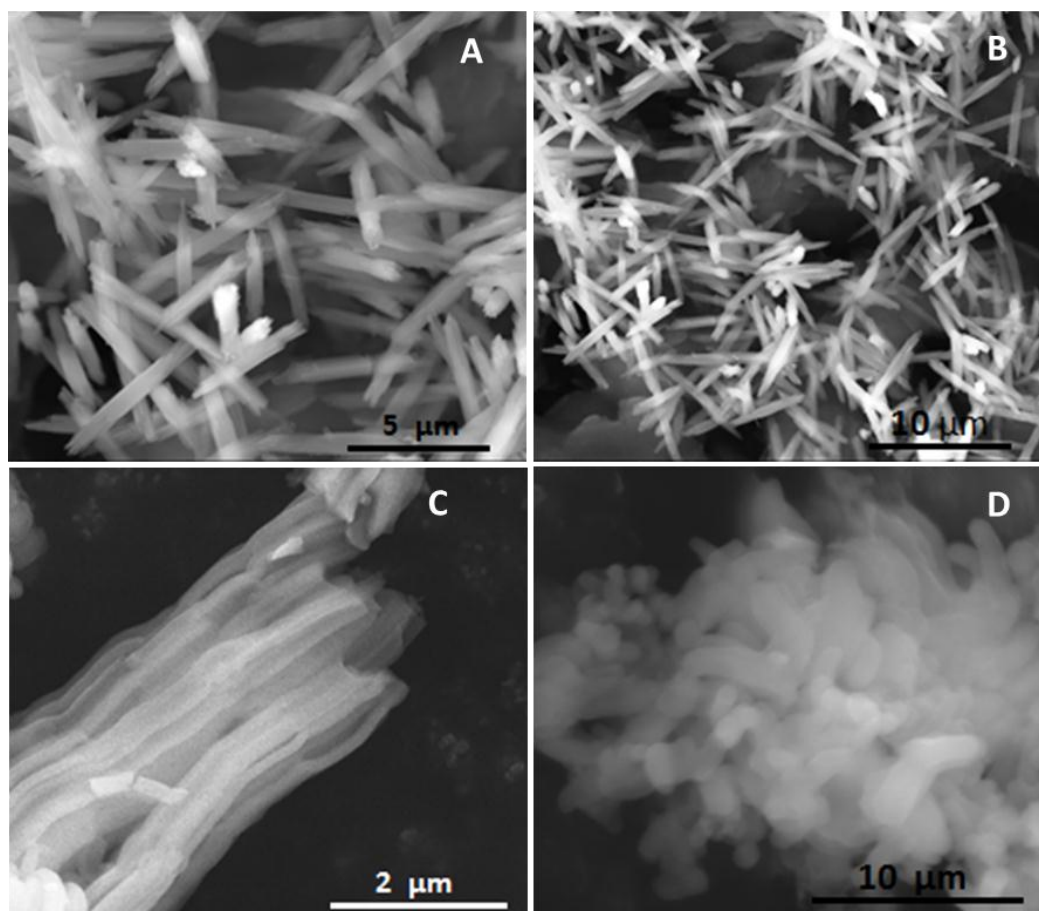


Fig. S1 FE-SEM of the CeO₂- SiO₂ sample prepared varying Si/Ce ratio.

Fig. S2

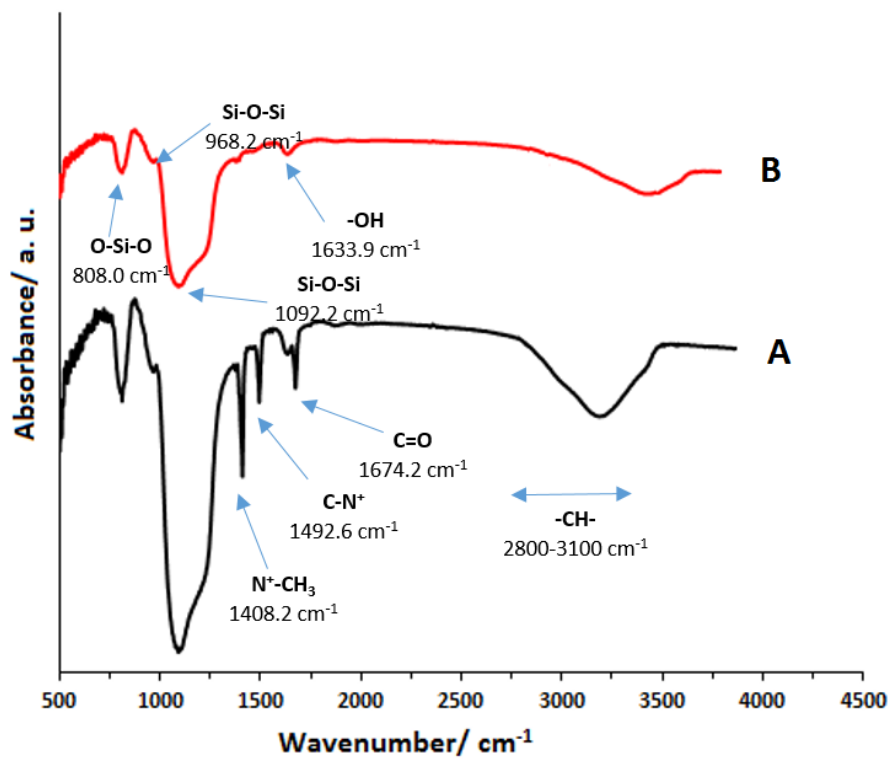


Fig. S2 FTIR spectrum of (A) uncalcined $\text{CeO}_2\text{-SiO}_2$ and (B) calcined $\text{CeO}_2\text{-SiO}_2$ nanoarchitecture; Spectrometer was recorded in the range 4000-500 cm^{-1} at a resolution of 2 cm^{-1} .

Fig. S3

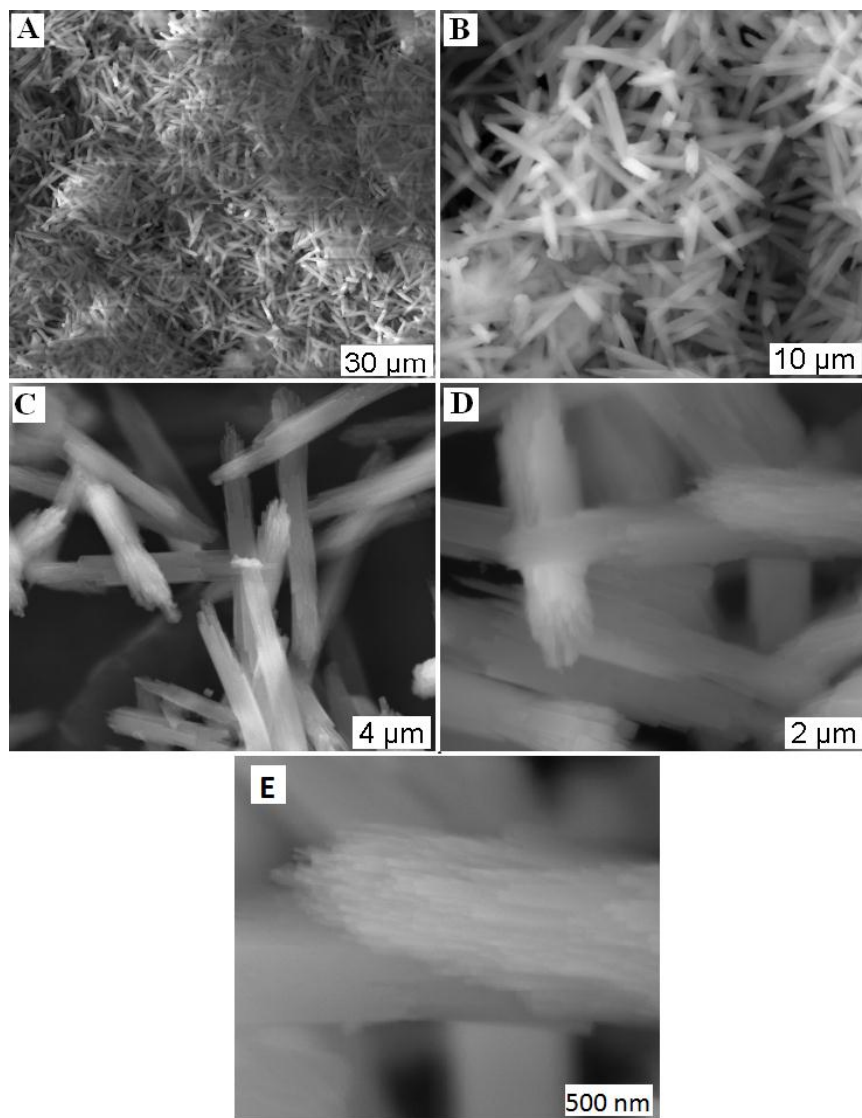


Fig. S3 FE-SEM images of the $\text{CeO}_2\text{-SiO}_2$

Fig. S4

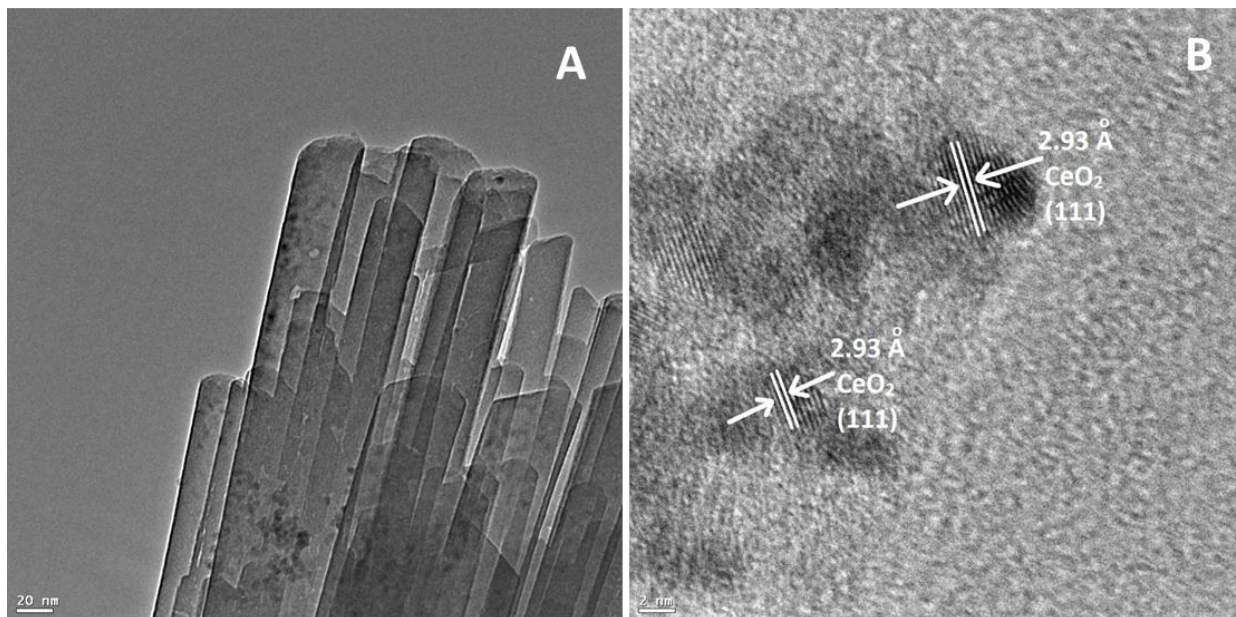


Fig. S4 HR-TEM images of the CeO₂-SiO₂ catalyst (A) a portion of the CeO₂ supported SiO₂ sheets and (B) showing the lattice fringes of Ce nanoparticle.

Fig. S5

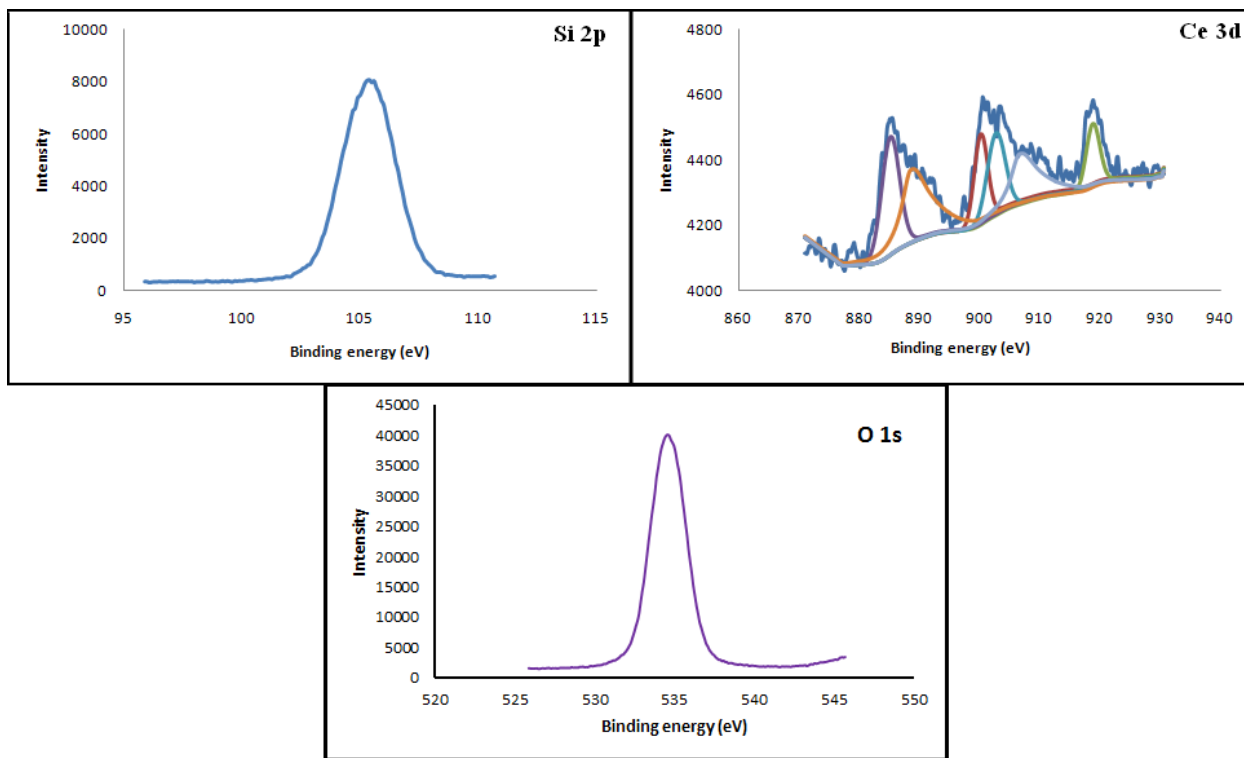


Fig. S5 XPS patterns of prepared nanostructure $\text{CeO}_2\text{-SiO}_2$ catalyst.

Fig. S6 X-ray diffraction data.

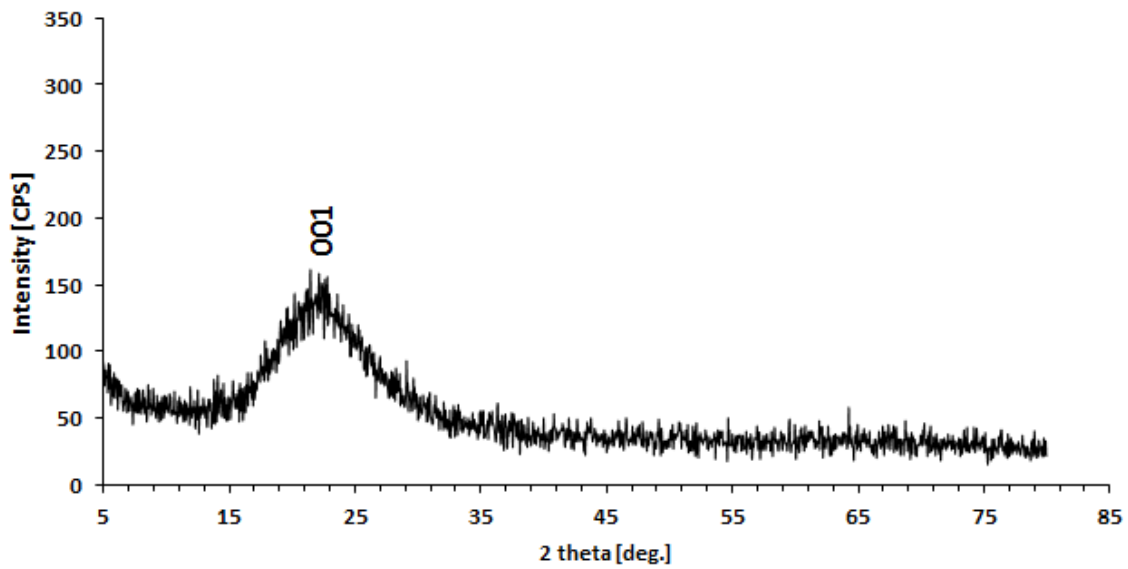


Fig. S6 XRD patterns of prepared nanostructure CeO_2 - SiO_2

Fig. S7

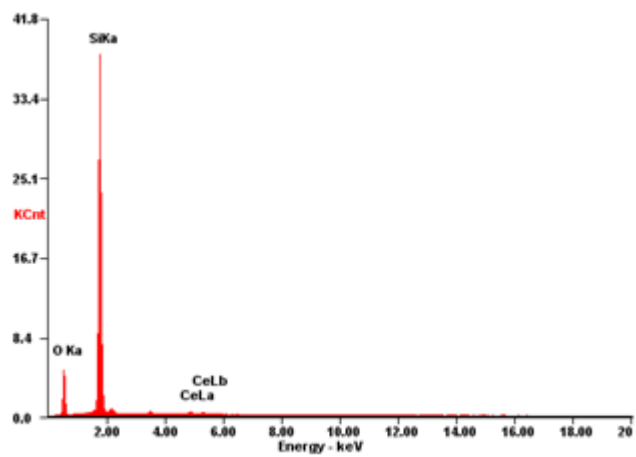


Fig. S7 EDAX spectrum of CeO₂-SiO₂ nanostructure.

Material characterization

Powder X-ray diffraction patterns were recorded on a Rigaku-Geigerflex x-ray diffractometer fitted with a Cu K α radiation source. Diffraction patterns in the 5 $^{\circ}$ -80 $^{\circ}$ region were recorded with a 0.04 step size (step time= 4s). FTIR spectra were recorded on a Nicolet 8700 Research FT-IR Spectrometer in the range 4000-500 cm $^{-1}$ at a resolution of 2cm $^{-1}$. Scanning electron microscopy (SEM) images were taken on a FEI Quanta 200 F, using tungsten filament doped with lanthanumhexaboride (LaB6) as an x-ray source, fitted with an ETD detector with high vacuum mode using secondary electrons and an acceleration tension of 10 or 30 kV. Samples were analyzed by spreading them on a carbon tape. Energy dispersive X-ray spectroscopy (EDX) was used in connection with SEM for the elemental analysis. The elemental mapping was also collected with the same spectrophotometer. TEM images were collected using a JEOL JEM 2100 microscope, and samples were prepared by mounting an ethanol-dispersed sample on a lacey carbon Formvar coated Cu grid and electron diffraction spectra (EDS) was also recorded. Surface area was analyzed at -180 $^{\circ}$ C using a Belsorbmax, BEL, Japan using BET equation. X-Ray photoelectron spectra (XPS) were recorded on a Thermo Scientific K-Alpha X-Ray photoelectron spectrometer and binding energies (\pm 0.1 eV) were determined with respect to the position C 1s peak at 284.8 eV.

Oxidation of Styrene

The oxidation of styrene was carried out at room temperature in a 50 ml double necked round bottom flask fitted with a reflux condenser. In each experiment 10 mmol styrene (1g) was taken with 10 ml of acetonitrile as solvent containing 0.01g of prepared CeO $_2$ -SiO $_2$ catalyst. Oxidant (H $_2$ O $_2$) 3.5 ml 50% hydrogen peroxide was added slowly. Aliquot were withdrawn after regular interval using a syringe from the reaction mixture for analysis. At the end of the reaction the solid particles (catalyst) were separated by filtration and the products were identified by GC-MS (HP 5890 GC coupled with 5972 MSD) equipped with CP-SIL-5 capillary column. The products were analyzed in an Agilent GC-7890, fitted with a capillary column (HP-5 column, 30m X 0.28mm i.d., 0.25 μ m film thicknesses).