Electronic Supplementary Material (ESI) for CrystEngComm.

Supporting Information

Polymer Fabricated Synthesis of Cerium Oxide Nanoparticles and Applications as a Green Catalyst Towards Multicomponent Transformation with Size Dependent Activity Studies

Boby Samai[a], Soumen Sarkar[b], Sayantani Chall[c], Soumyadipta Rakshit[a], Subhash Chandra Bhattacharya[a]*

Department of Chemistry, Jadavpur University, Kolkata-32

Department of Chemistry, University of Calcutta, Kolkata-32

Indian Institute of Chemical Biology,Jadavpur, Kolkata-32

*e-mail: sbjuchem@yahoo.com, scbhattacharyya@chemistry.jdvu.ac.in

Phone No: 033 2414 6223 / Fax: 91(033) 24146584

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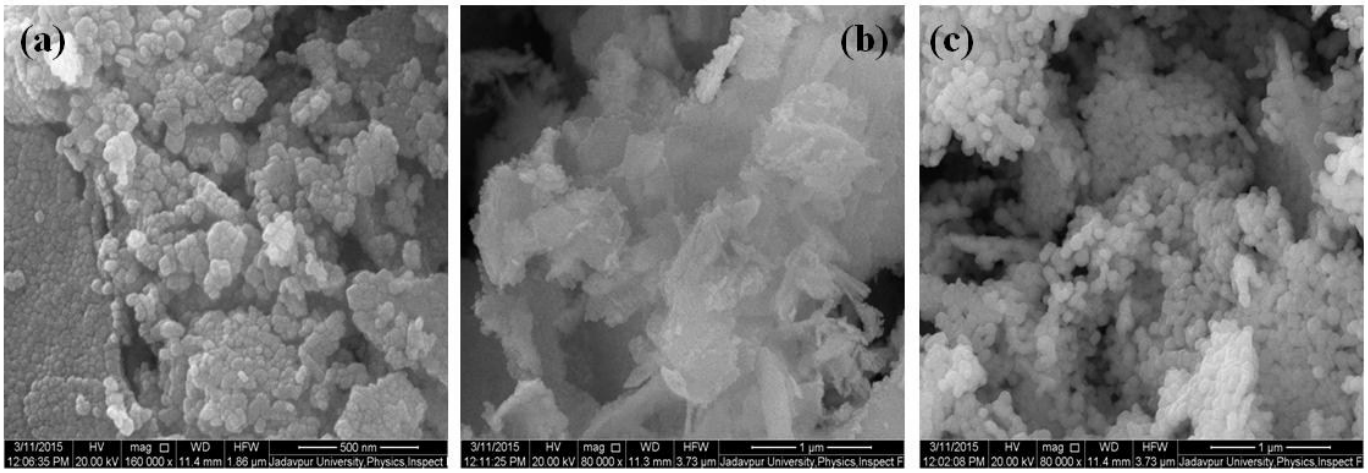


Fig. S1. FESEM images of CeONP, (a) CeO_2 - PVP, (b) CeO_2 - 17R4 and (c) CeO_2 - P123

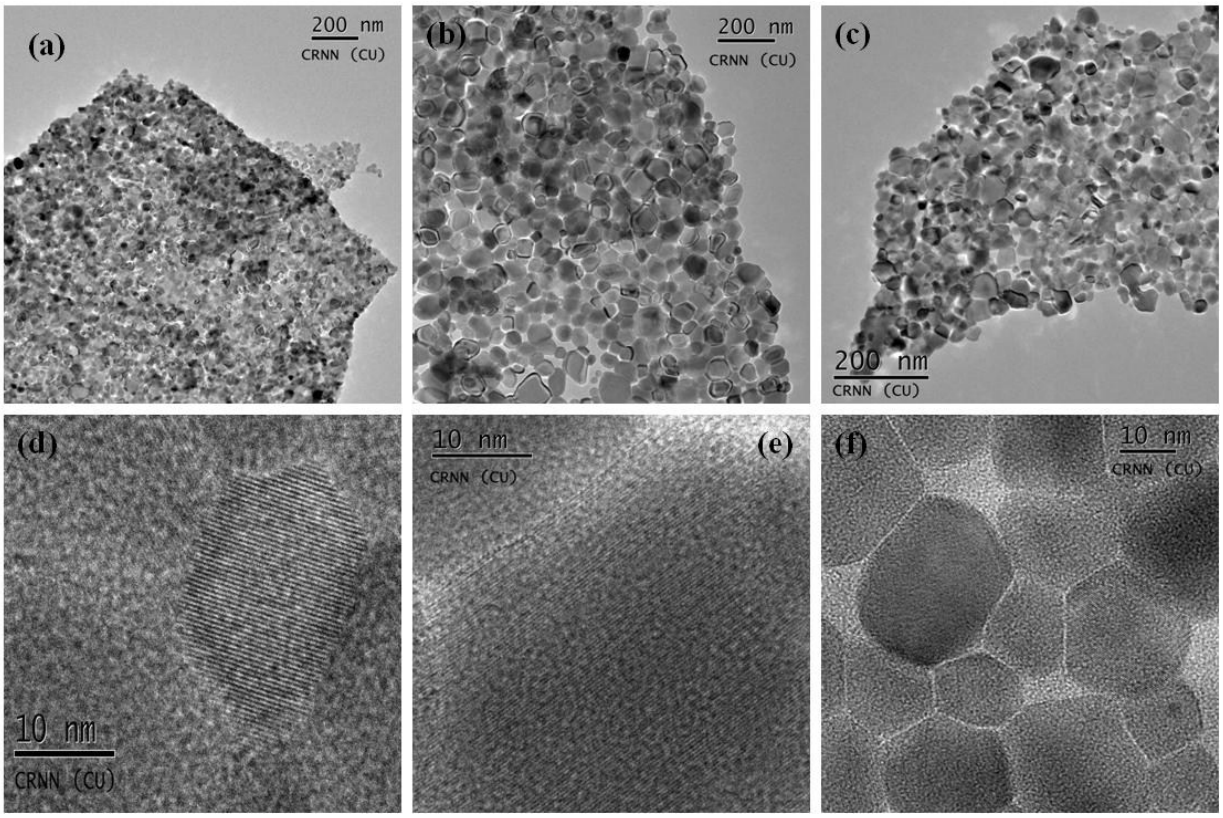


Fig. S2. TEM and HRTEM images of CeONP: (a & d) CeO_2 -17R4, (b & e) CeO_2 - PVP and (c & f) CeO_2 - P123

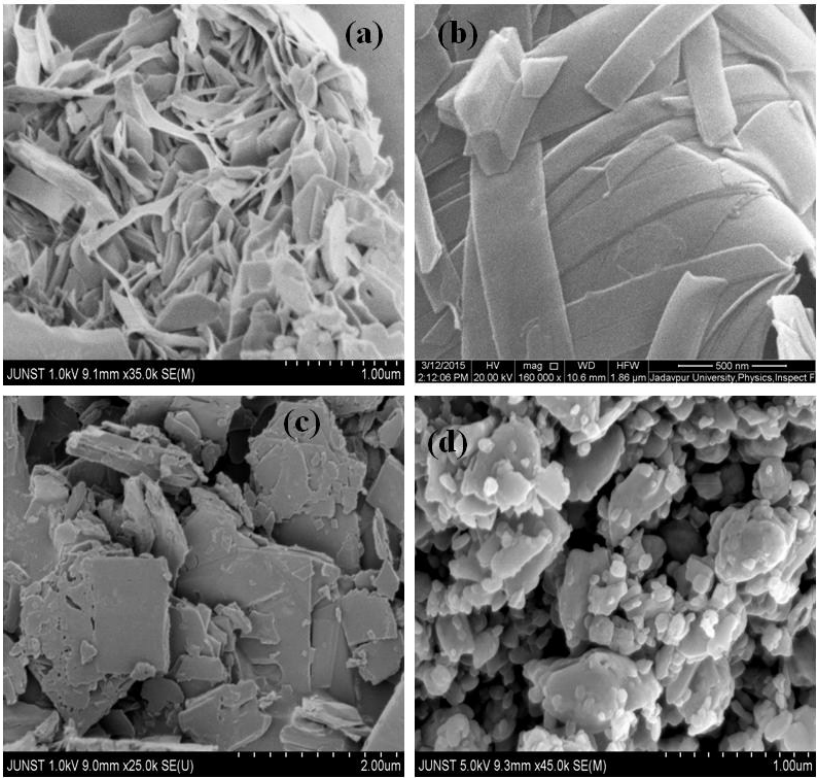


Fig. S3. FESEM images of CeOX nanoparticles, (a) CeOX- PVP (b) CeOX-17R4 and (c) CeOX-P123 (concentration of polymers, $C_{PVP}=C_{17R4}=C_{P123}=1g/L$) and (d) CeOX synthesized without polymer

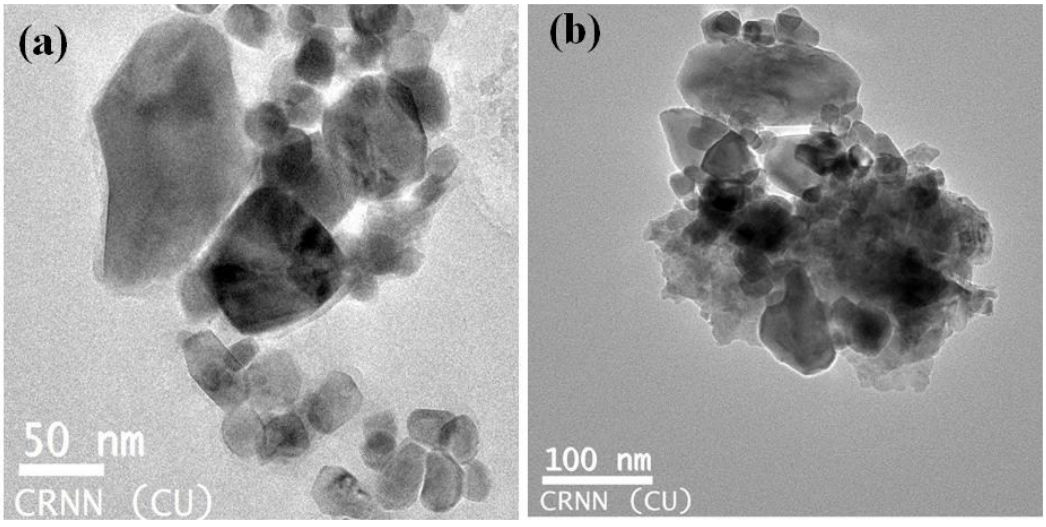


Fig. S4. TEM of CeONP synthesized without polymer

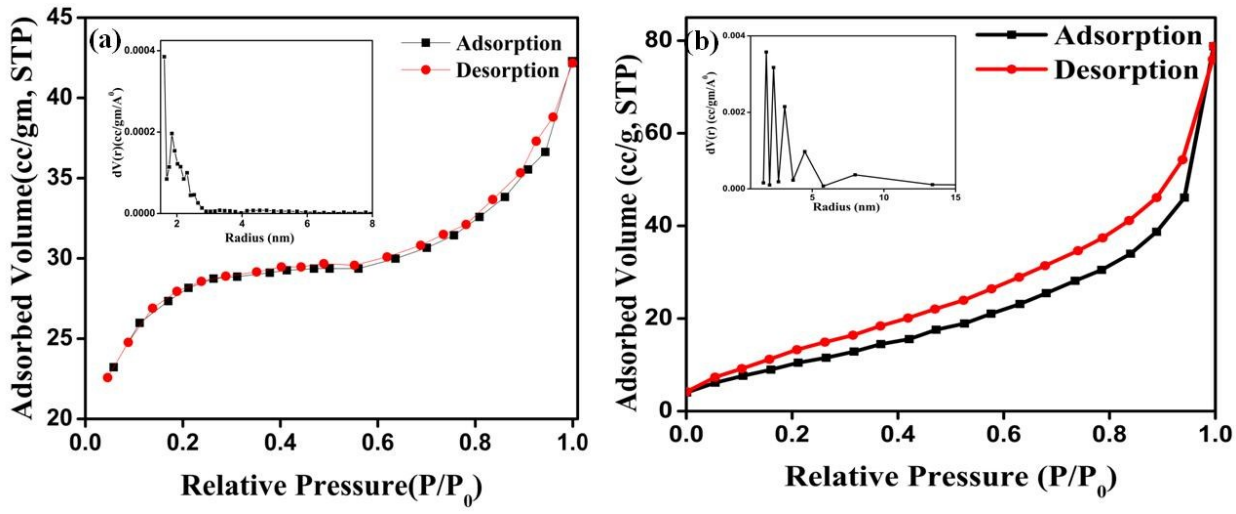


Fig. S5. N_2 adsorption-desorption isotherm and BJH pore size distribution curve (inset) of (a) CeO_2-17R4 and (b) CeO_2-P123

S6:

^{1}H- NMR data of all nitrostyrene (1A, 1B, 1C) and N-aryl pyrrole (4A, 4B, 4C, 4D, 4E)

(E)-(2-Nitrovinyl)benzene (1A): ^{1}H NMR ($CDCl_3$, 300 MHz) δ 7.43–7.49 (m, 2 H), 7.53–7.54 (m, 1 H), 7.57 (s, 2 H), 7.61 (s, 1 H), 8.01 (d, J = 13.7 Hz, 1 H) ppm.

(E)-1-Methyl-4-(2-nitrovinyl)benzene (1B): ^{1}H NMR ($CDCl_3$, 300 MHz) δ 2.40 (s, 3 H), 7.25 (d, J = 8 Hz, 1 H), 7.44 (d, J = 8.1 Hz, 2 H), 7.56 (d, J = 13.6 Hz, 2 H), 7.98 (d, J = 13.6 Hz, 2 H) ppm.

(E)-1-Chloro-4-(2-nitrovinyl)benzene (1C): ^{1}H NMR ($CDCl_3$, 300 MHz) δ 7.46 (dd, J = 6.6 Hz, 18.8 Hz, 4 H),7.56 (d, J = 13.7 Hz, 1H) 7.95 (d, J = 13.7 Hz, 1 H) ppm.

1-(2-methyl-1,4-diphenyl-1H-pyrrol-3-yl)ethanone **(4A):** ^{1}H NMR ($CDCl_3$, 300 MHz) δ 2.09 (s, 3H, C$\underline{H}_3$), 2.42 (s, 3H, C$\underline{H}_3$), 6.68 (s, 1H, pyrrole-$\underline{H}$), 7.31-7.43 (m, 7H, Ar-$\underline{H}$), 7.45-7.50 (m, 3H, Ar-$\underline{H}$) ppm.

1-(1-(4-chlorophenyl)-2-methyl-4-p-tolyl-1H-pyrrol-3-yl)ethanone (4B): ^{1}H NMR ($CDCl_3$, 300 MHz) δ 2.08 (s, 3H, C$\underline{H}_3$), 2.39 (s, 6H, 2C$\underline{H}_3$), 6.62 (s, 1H, pyrrole-$\underline{H}$), 7.18-7.29 (m, 6H, Ar-$\underline{H}$), 7.44-7.48 (m, 2H, Ar-$\underline{H}$) ppm.

1-(4-(4-chlorophenyl)-1-(4-methoxyphenyl)-2-methyl-1H-pyrrol-3-yl)ethanone (4C): ^{1}H NMR ($CDCl_3$, 300 MHz) δ 2.24 (s, 3H, C$\underline{H}_3$), 3.88 (s, 3H, OC$\underline{H}_3$), 6.80 (s, 1H, pyrrole-$\underline{H}$), 7.00-7.06 (m, 5H, Ar-$\underline{H}$), 7.20-7.36 (m, 6H, Ar-$\underline{H}$), 7.73 (d, J = 8.1 Hz, 2H, Ar-$\underline{H}$) ppm.

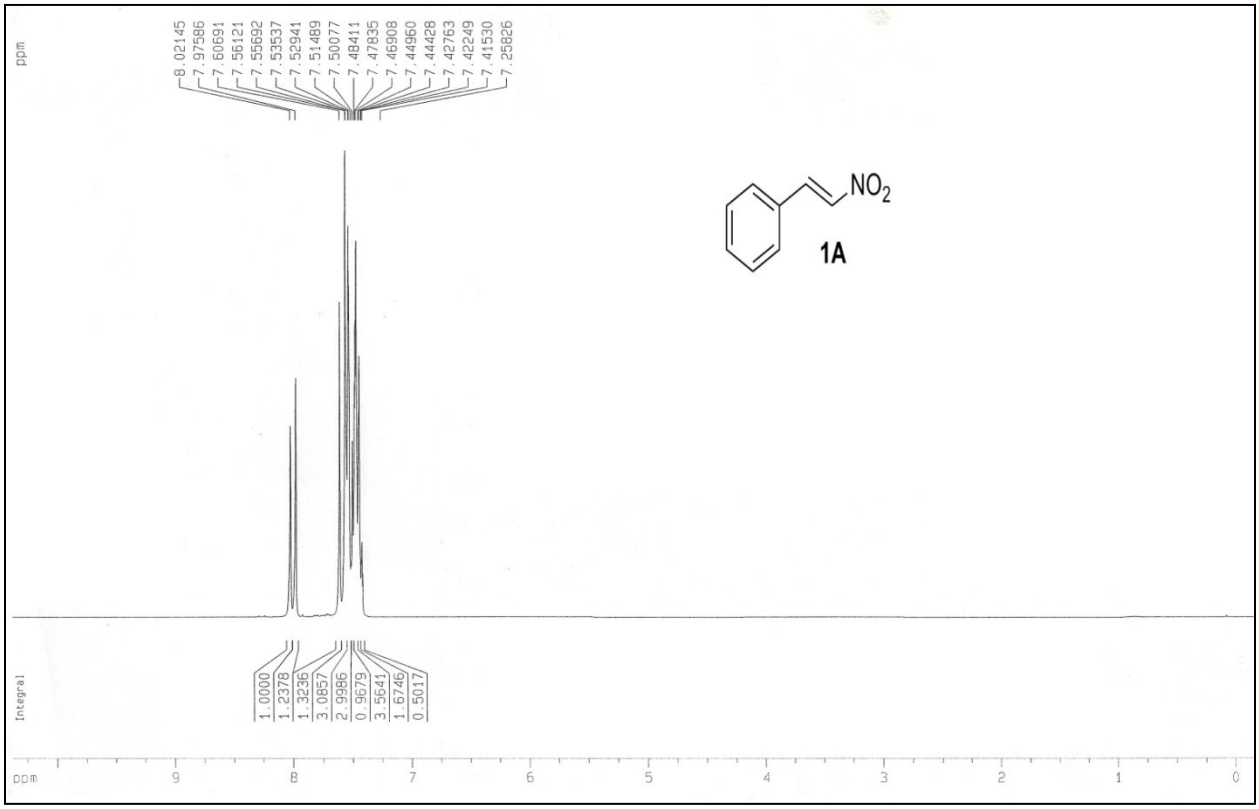
1-(1-(4-methoxyphenyl)-2-methyl-4-phenyl-1H-pyrrol-3-yl)ethanone (4D): ^{1}H NMR ($CDCl_3$, 300 MHz) δ 2.07 (s, 3H, C$\underline{H}_3$), 2.38 (s, 3H, C$\underline{H}_3$), 3.86 (s, 3H, OCH_3), 6.63 (s, 1H, pyrrole-$\underline{H}$), 7.0 (d, J = 8.9 Hz, 2H, Ar-$\underline{H}$), 7.25 (d, J = 8.9 Hz, 2H, Ar-$\underline{H}$), 7.29-7.35 (m, 1H, Ar-$\underline{H}$), 7.37-7.39 (m, 4H, Ar-$\underline{H}$) ppm.

1-(2-methyl-1-(naphthalen-2-yl)-4-phenyl-1H-pyrrol-3-yl)ethanone (4E): ^{1}H NMR ($CDCl_3$, 300 MHz) δ 2.17 (s, 3H, C$\underline{H}_3$), 2.24 (s, 3H, COC$\underline{H}_3$), 6.72 (s, 1H, pyrrole-$\underline{H}$), 7.32-7.38 (m, 1H, Ar-$\underline{H}$), 7.40-7.59 (m, 9H, Ar-$\underline{H}$), 7.85 (t, J = 7.3 Hz, 2H, Ar-$\underline{H}$) ppm .

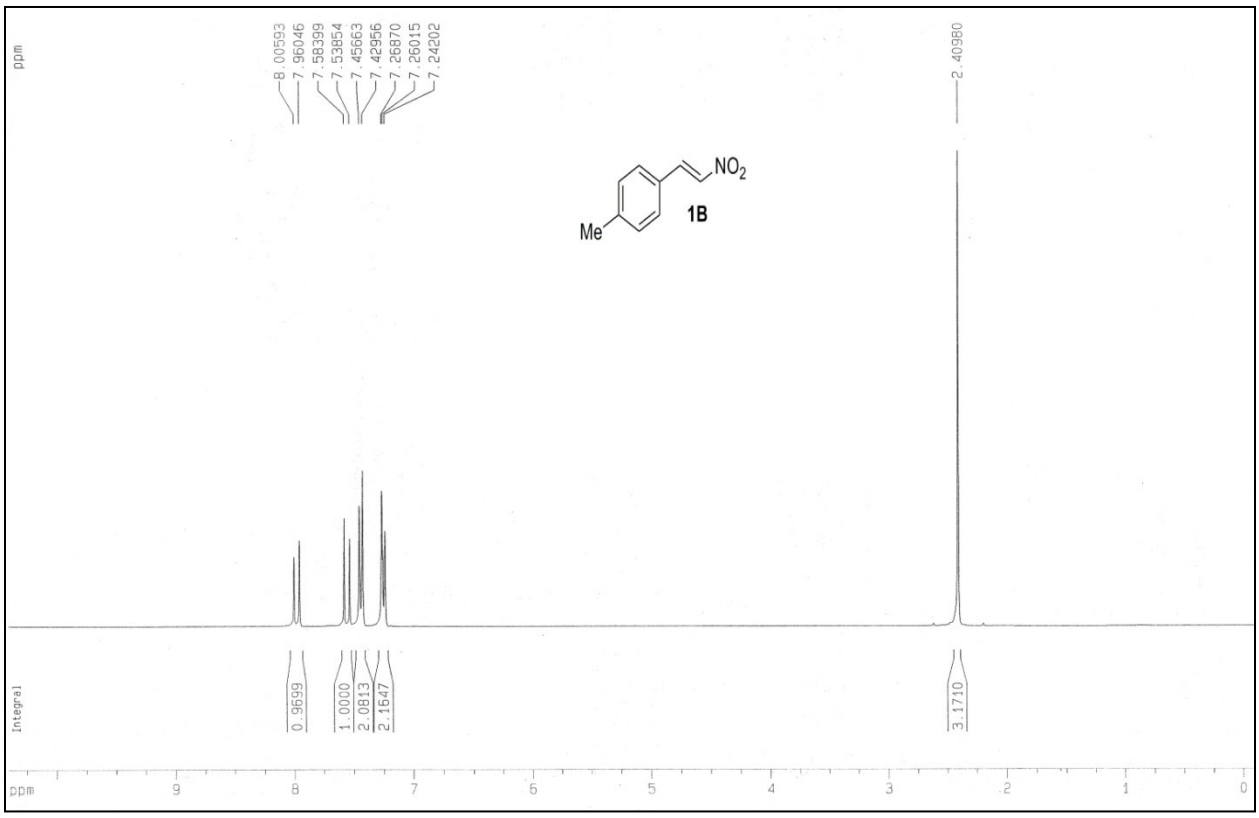
S7.

<u>^{1}H- NMR spectra of all nitrostyrene (1A, 1B, 1C) and N-aryl pyrrole (4A, 4B, 4C, 4D, 4E)</u>

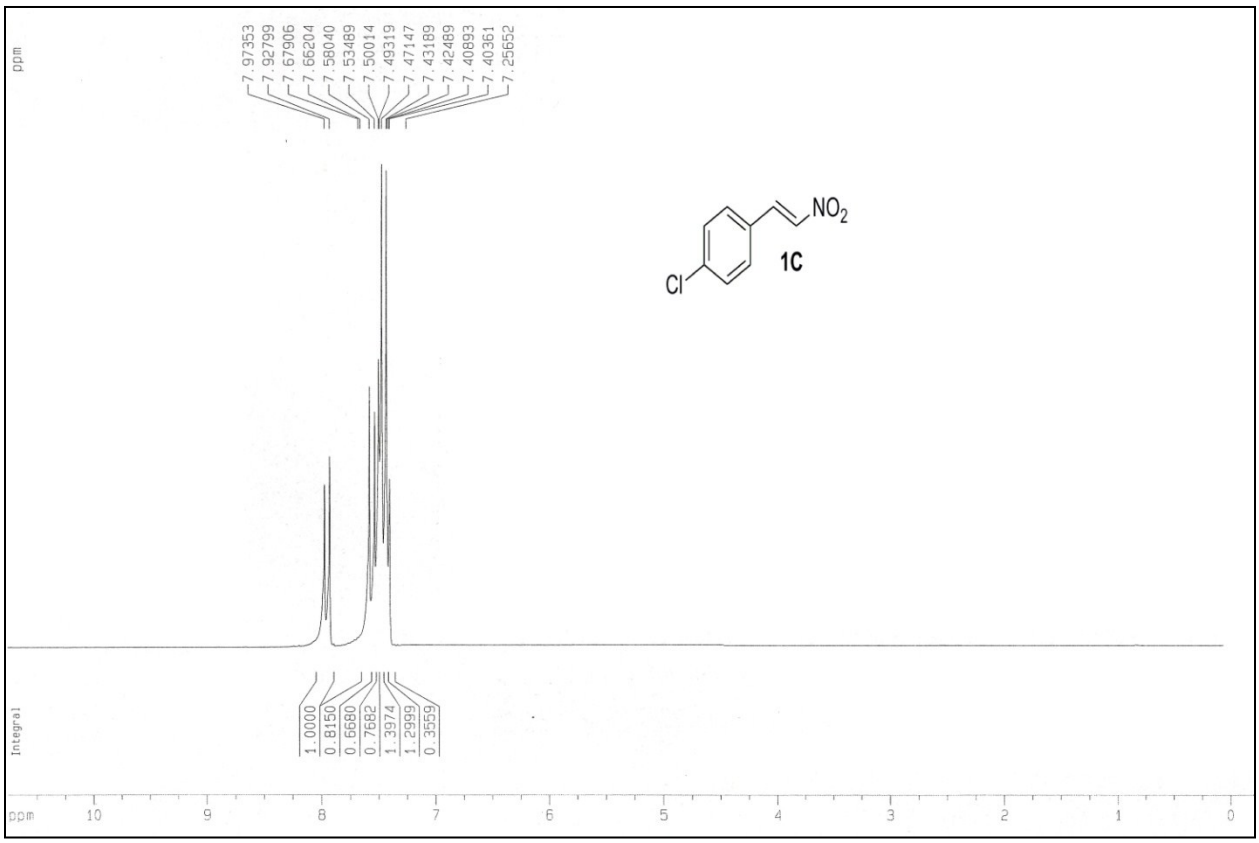
^{1}H- NMR of (E)-(2-Nitrovinyl)benzene (1A):



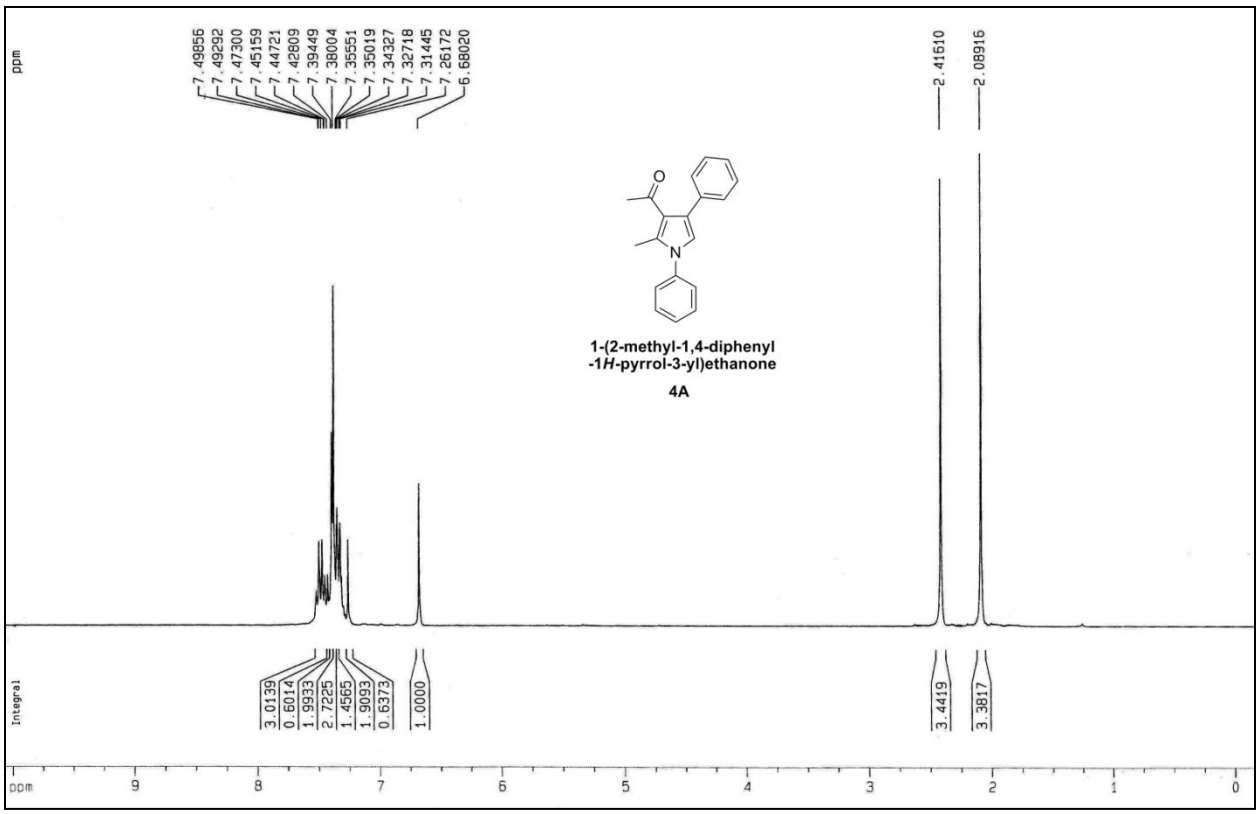
[1]H- NMR of (E)-1-Methyl-4-(2-nitrovinyl)benzene (1B):



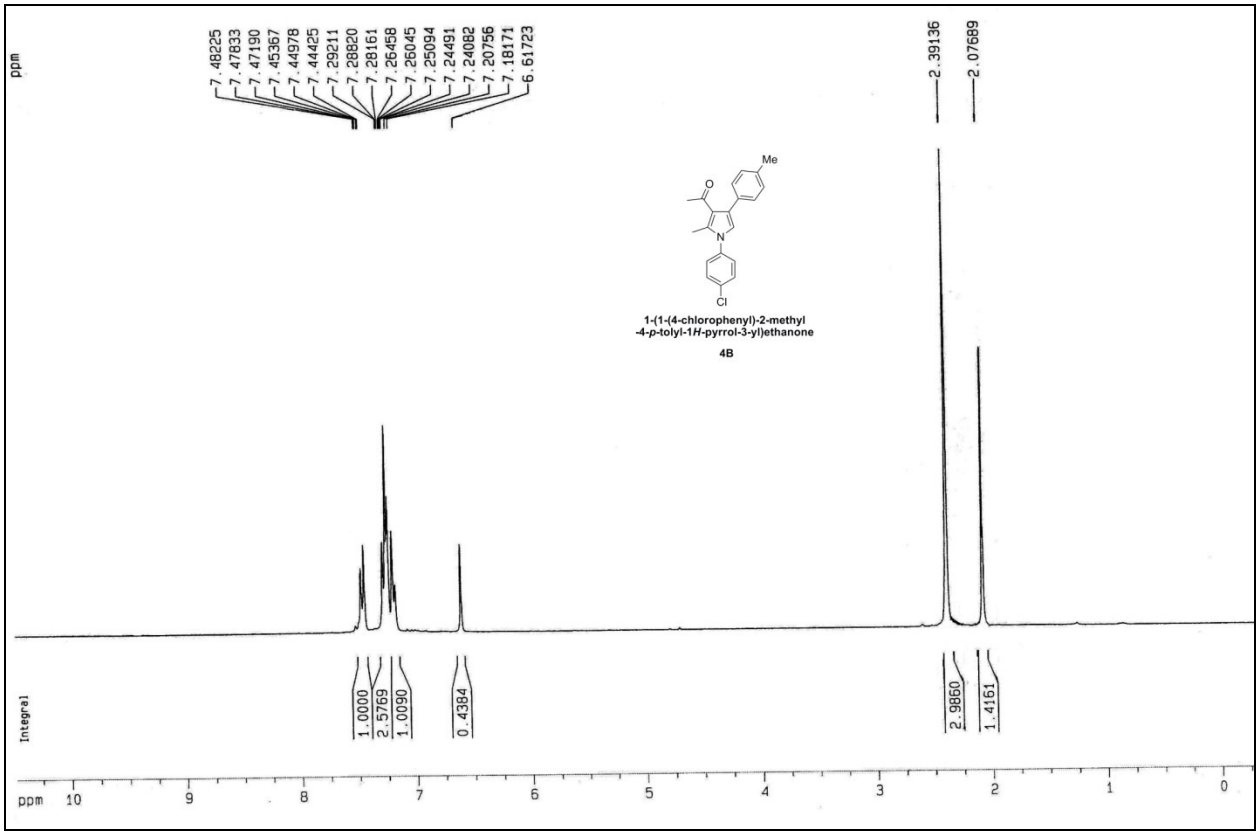
[1]H- NMR of (E)-1-Chloro-4-(2-nitrovinyl)benzene (1C):



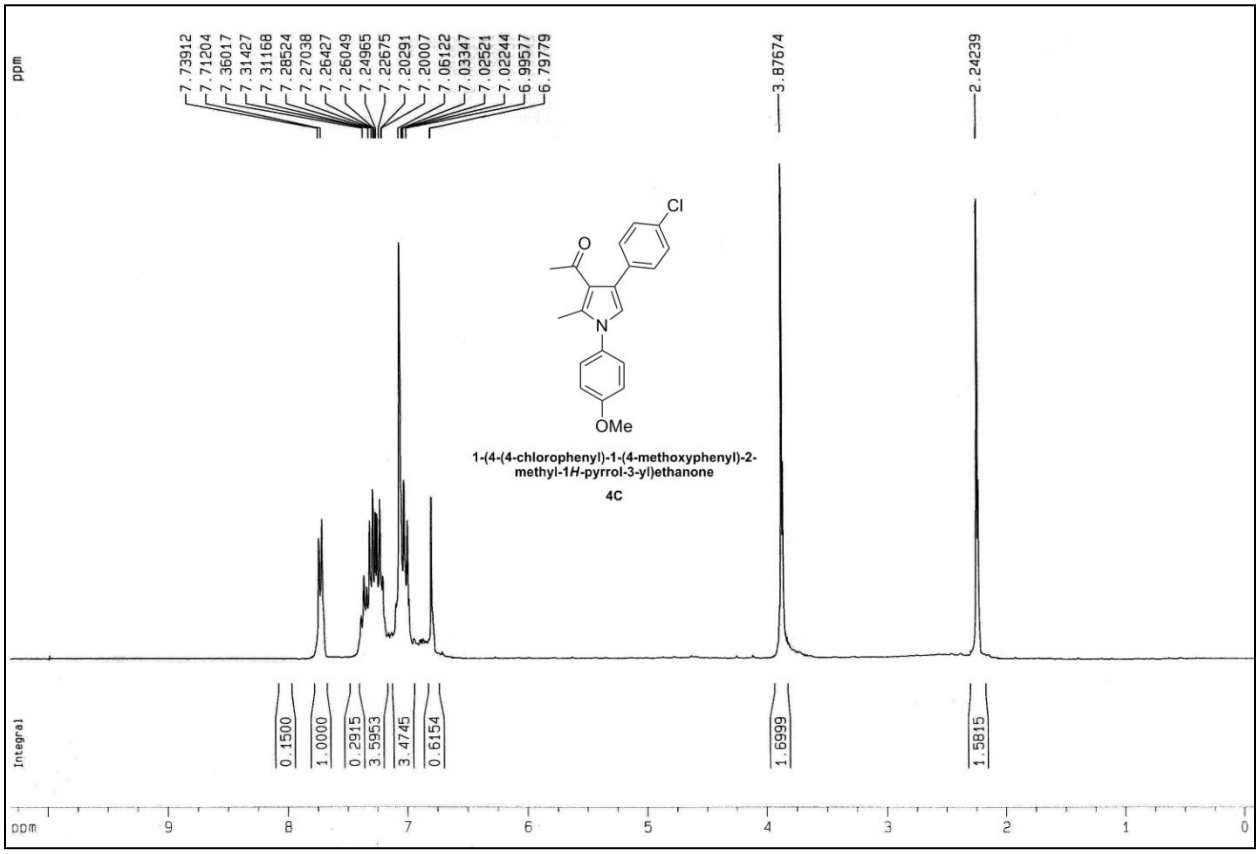
[1]H- NMR of 1-(2-methyl-1,4-diphenyl-1H-pyrrol-3-yl)ethanone (4A):



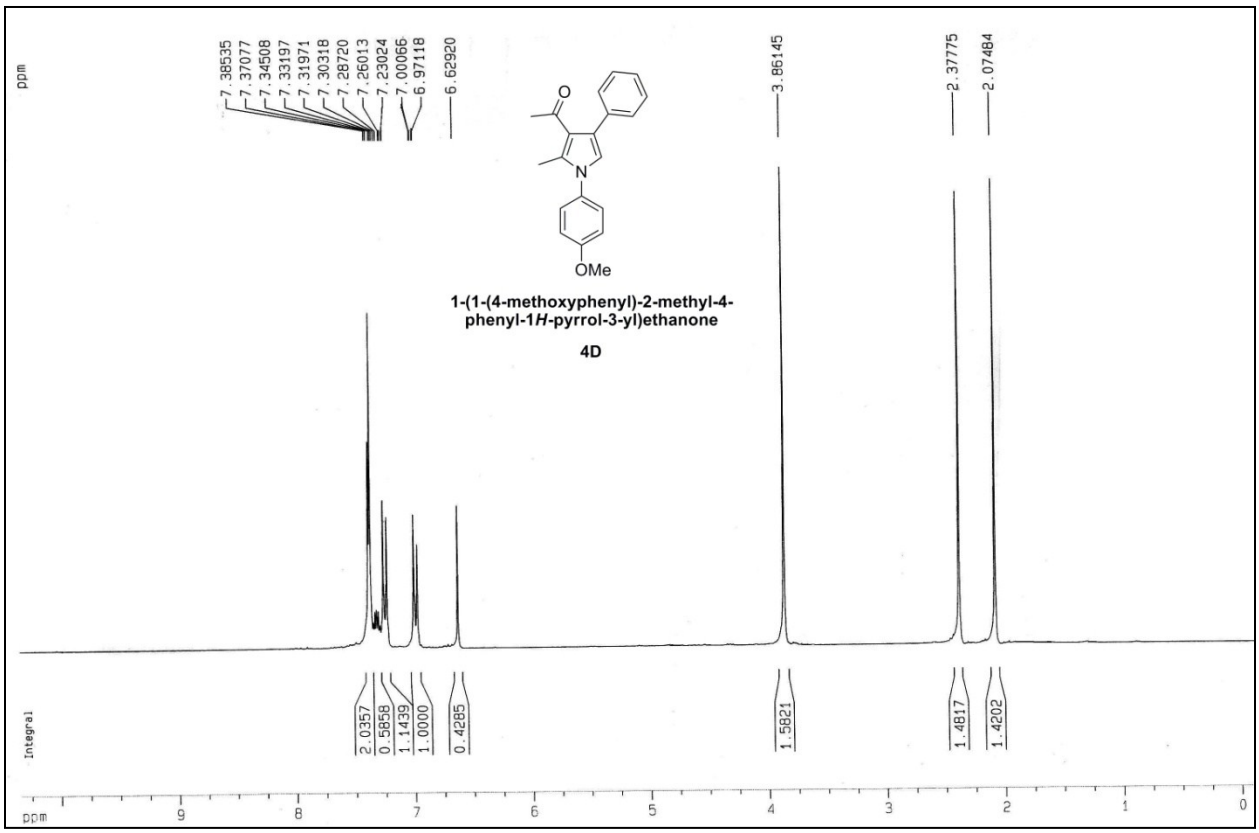
[1]H- NMR of 1-(1-(4-chlorophenyl)-2-methyl-4-p-tolyl-1H-pyrrol-3-yl)ethanone (4B):



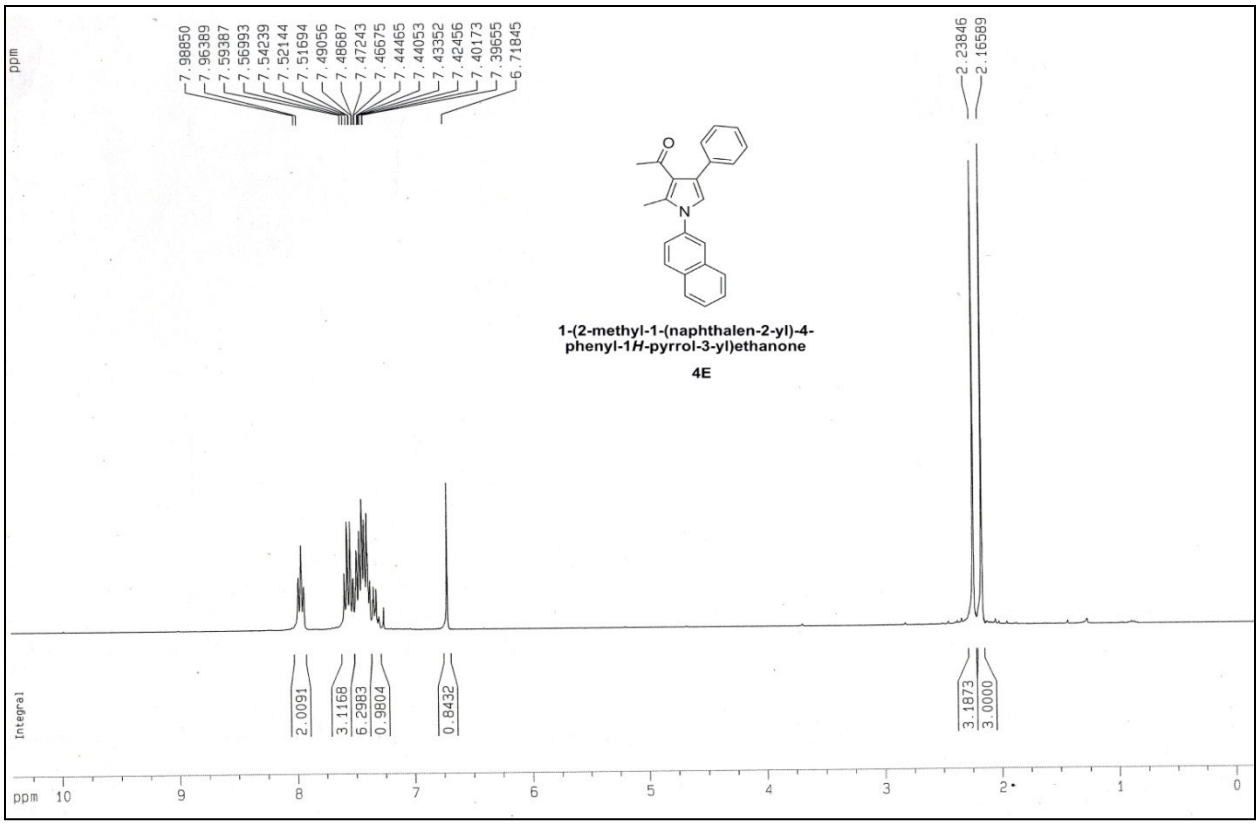
[1]H- NMR of 1-(4-(4-chlorophenyl)-1-(4-methoxyphenyl)-2-methyl-1H-pyrrol-3-yl)ethanone (4C):



[1]H- NMR of 1-(1-(4-methoxyphenyl)-2-methyl-4-phenyl-1H-pyrrol-3-yl)ethanone (4D):



[1]H- NMR of 1-(2-methyl-1-(naphthalen-2-yl)-4-phenyl-1H-pyrrol-3-yl)ethanone (4E):



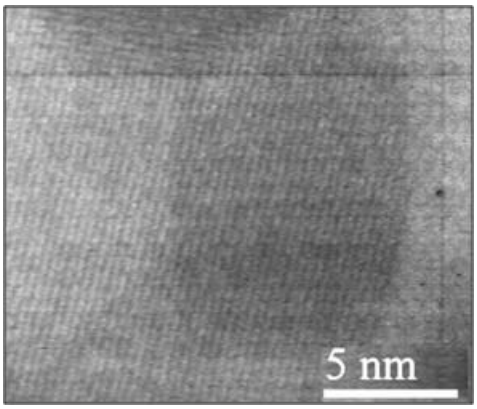


Fig. S8. HRTEM of CeO_2-PVP after catalysis