Electronic Supplementary Material (ESI) for RSC Advances.

Electronics Supporting Information

Efficient oxidation of hydrocarbons over nanocrystalline $Ce_{1-x}Sm_xO_2$ (x= 0-0.1) synthesized using supercritical water

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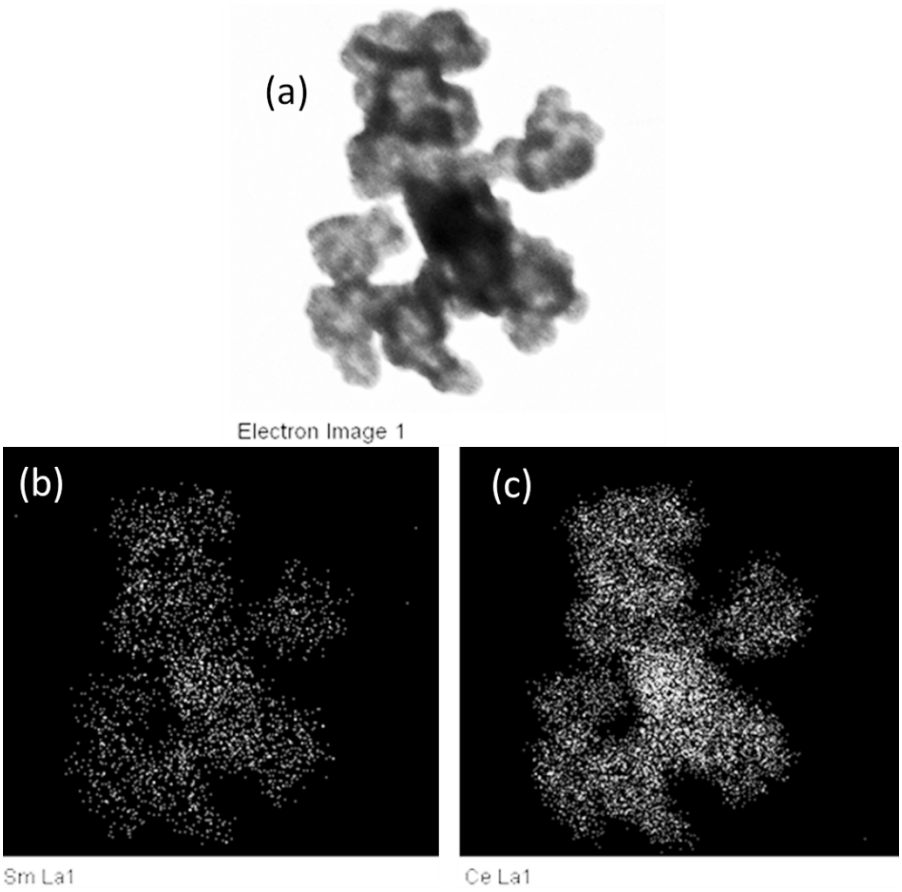

Fig. S1. (a) bright field image and corresponding STEM XEDS elemental maps of (b) Ce-L_α, (c) Sm- L_α.of the synthesized $Ce_{0.95}Sm_{0.05}O_2$.

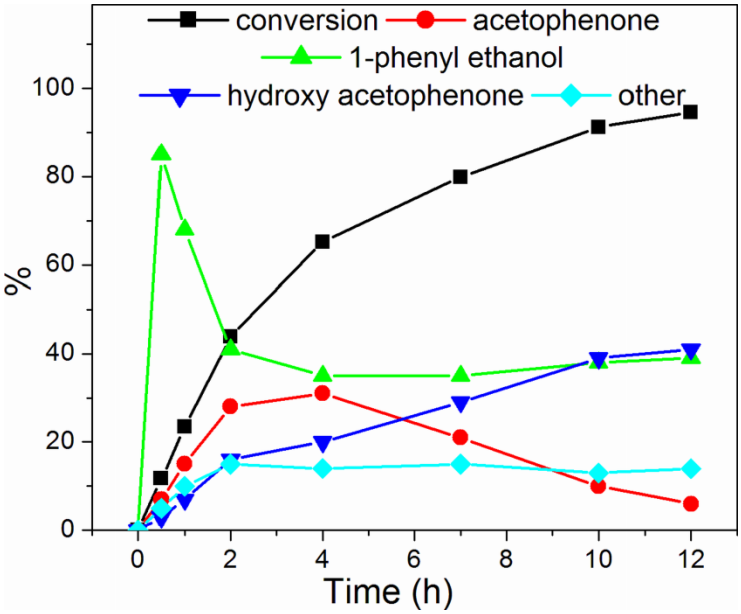

Fig. S2. Reaction profile (conversion of ethyl benzene and selectivity of different products) obtained for the allylic oxidation of ethyl benzene over the prepared pure CeO_2 catalyst.

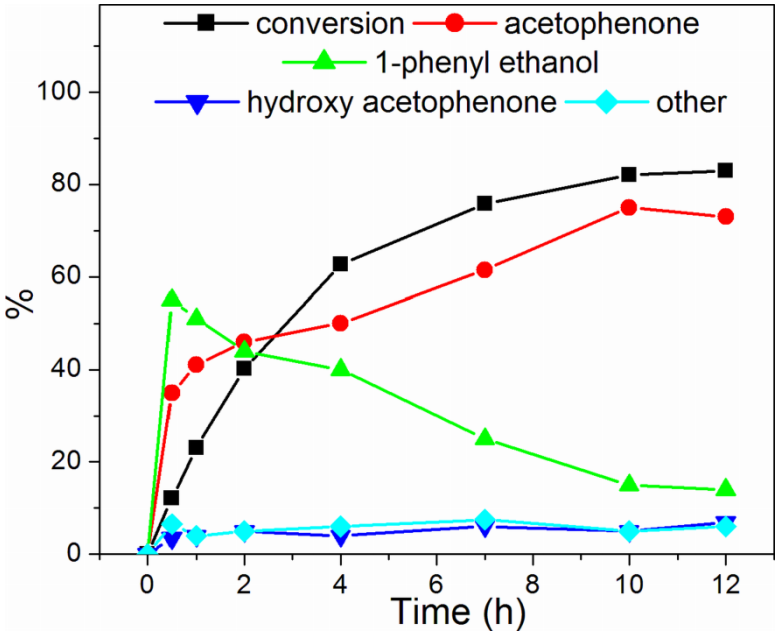

Fig. S3. Reaction profile (conversion of ethyl benzene and selectivity of different products) obtained for the allylic oxidation of ethyl benzene over the prepared pure CeO_2 - 2.5%Sm catalyst.

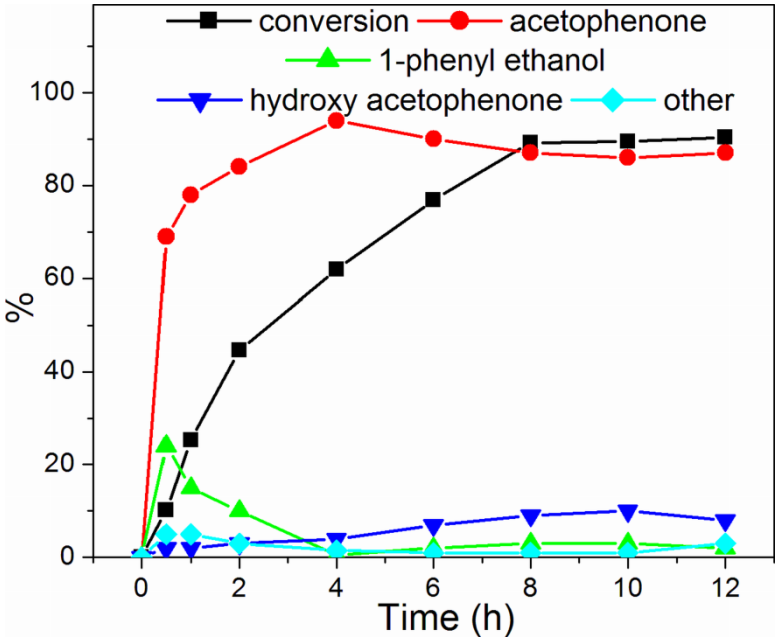

Fig. S4. Reaction profile (conversion of ethyl benzene and selectivity of different products) obtained for the allylic oxidation of ethyl benzene over the prepared pure CeO_2 - 5%Sm catalyst.

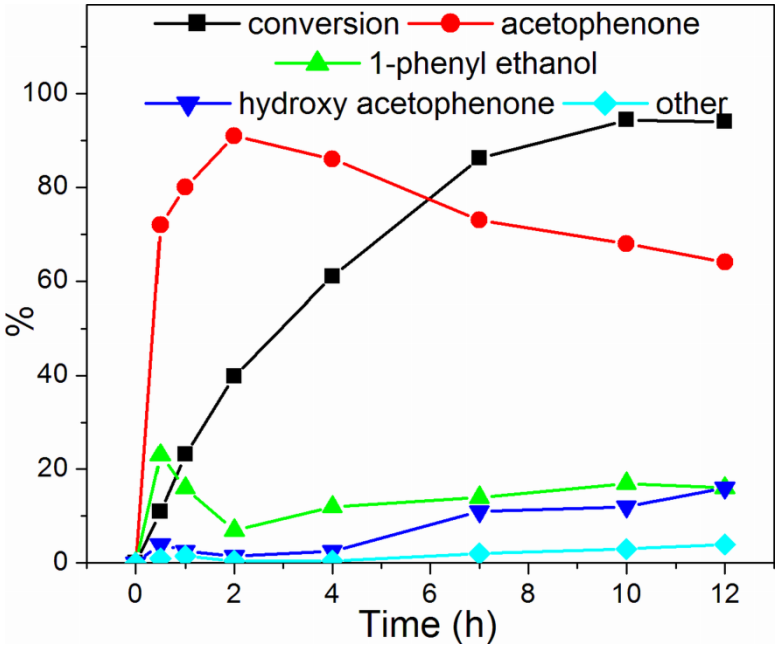

Fig. S5. Reaction profile (conversion of ethyl benzene and selectivity of different products) obtained for the allylic oxidation of ethyl benzene over the prepared pure CeO_2 - 7.5%Sm catalyst.

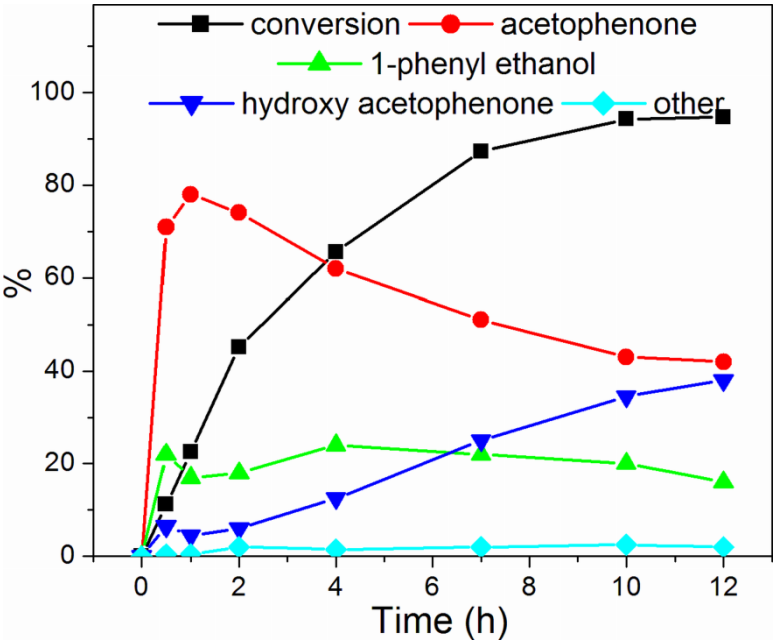

Fig. S6. Reaction profile (conversion of ethyl benzene and selectivity of different products) obtained for the allylic oxidation of ethyl benzene over the prepared pure CeO_2 - 10%Sm catalyst.

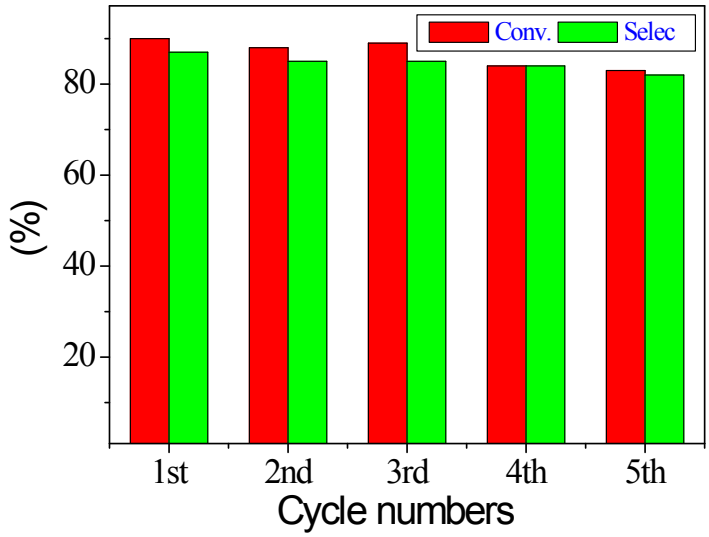

Fig. S7. Reusability (conversion of ethyl benzene and selectivity of Acetophenone) obtained for the allylic oxidation of ethyl benzene over the prepared pure CeO_2 -5%Sm catalyst.

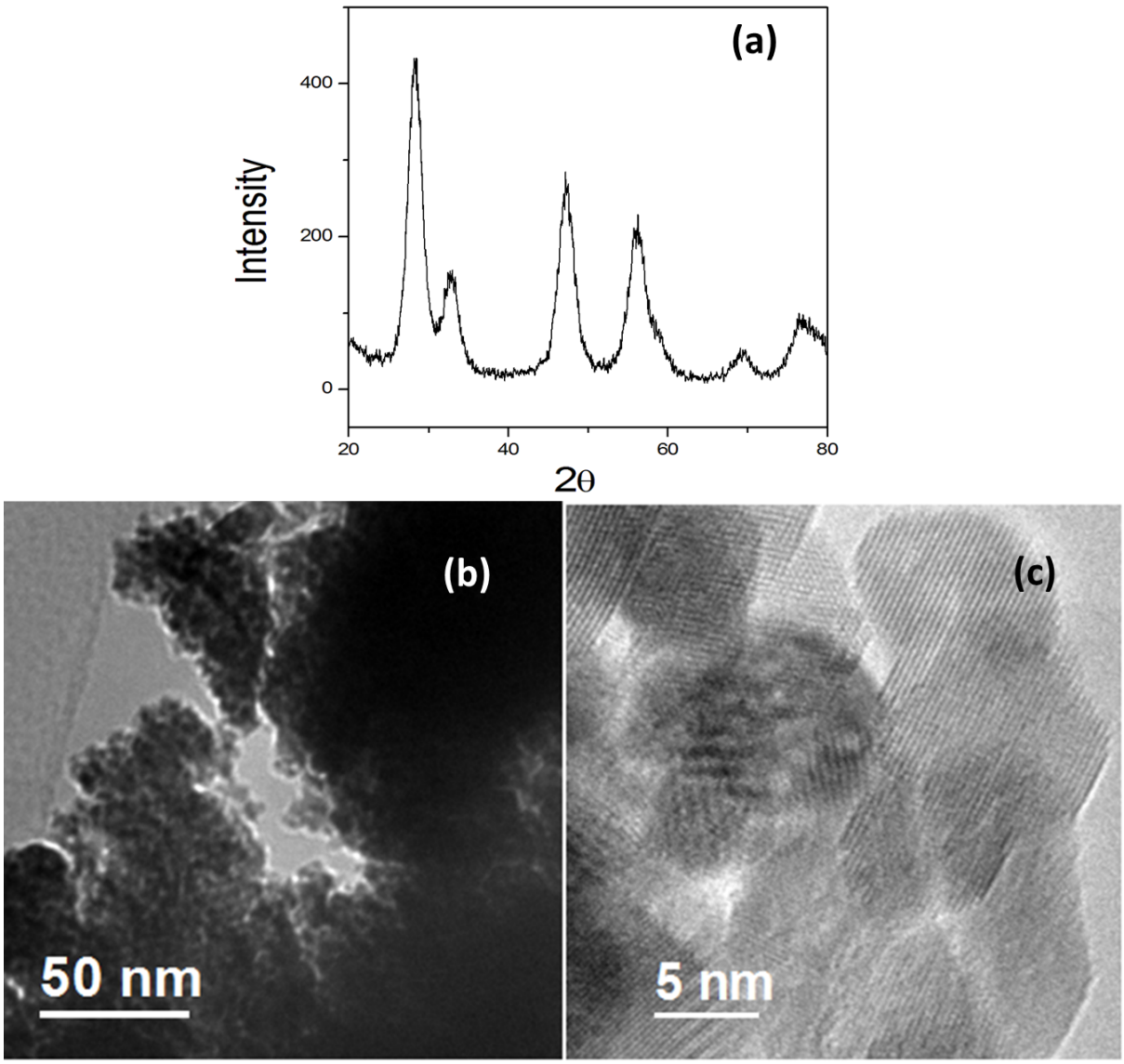

Fig. S7. (a) XRD pattern, (b) TEM and (c) HR-TEM of the reused (after 5 time) catalyst.

From the TEM image it looks like the porosity has been decreased compared to the fresh catalyst. It is most probably due to the adsorbed organic substrate. However, from the HR-

TEM image it is evident that the crystallinity and morphology remained same as fresh caralyst.

Table S1 Comparative study of catalytic activity of the synthesized $Ce_{0.95}Sm_{0.05}O_2$ catalyst with other reported catalyst towards ethyl benzene oxidation.

Catalyst	**Oxidant**	**Conversion (%)**	**Selectivity (%)**	**Yield (%)**	**Ref.**
$Ce_{0.95}Sm_{0.05}O_2$	**30 wt.% aqueousH_2O_2**	**90**	**87**	**78.3**	**Present work**
Supported cobalt (II) Salen complex	oxygen/acetic acid	84 [(a)]	90	76	1
Ti-MCM-41	30 wt.% aqueousH_2O_2	12	80	9.6	2
V-MCM-41	30 wt.% aqueousH_2O_2	18	21	3.7	2
Metalloporphyrin covalently bound to silica	30 wt.% aqueousH_2O_2	30.3	95.1	28.8	3
Pd (0) and Pd (II) nanotubes and nanoparticles on modified bentonite	tert-butylhydroperoxide(80%)	92.3	95.5	88.1	4
Mn catalyst supported on a modified nanosized SiO2/Al2O3	tert-butylhydroperoxide(80%)	84	86	72.2	5
Ni/13USY	molecular O_2	21.5	76.4	16.3	6
Manganese containing MCM-41	tert-butylhydroperoxide(80%)	57.7	82	47.3	7
Vanadia supported on ceria	30 wt.% aqueousH_2O_2	20.5	72.2	14.8	8
MnO_4^{-1} exchanged Mg–Al	molecular O_2	22.6	98.4	22.2	9

hydrotalcite					
Ni-Al hydrotalcite	molecular O_2	47	99.3	46.6	10
Nanocrystalline CeO_2 (hydrothermal)	30 wt.% aqueousH_2O_2	85	77	65.4	11

[(a)] The conversion has been calculated based on selectivity and yield.

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