Supporting Information

Probing the role of surface activated oxygen species of CeO_2 nanocatalyst during the redox cycle in CO oxidation

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Figures and tables

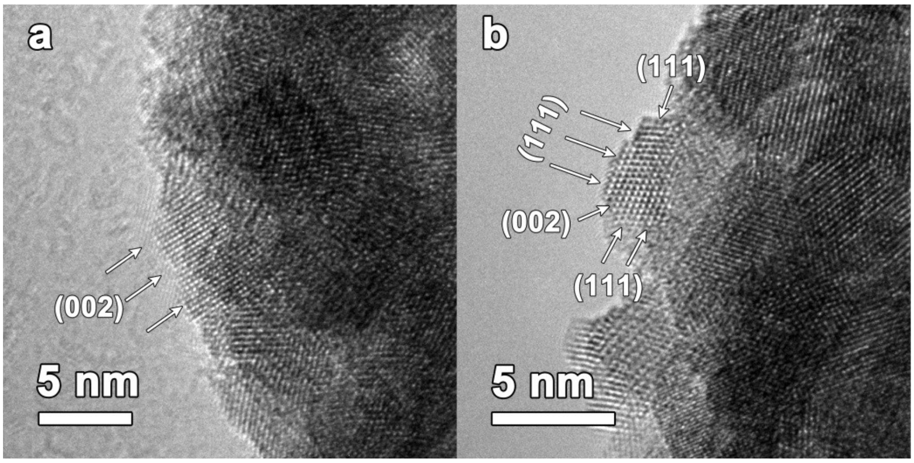

Figure S1. (a, b) HRTEM images of HT-CeO_2;

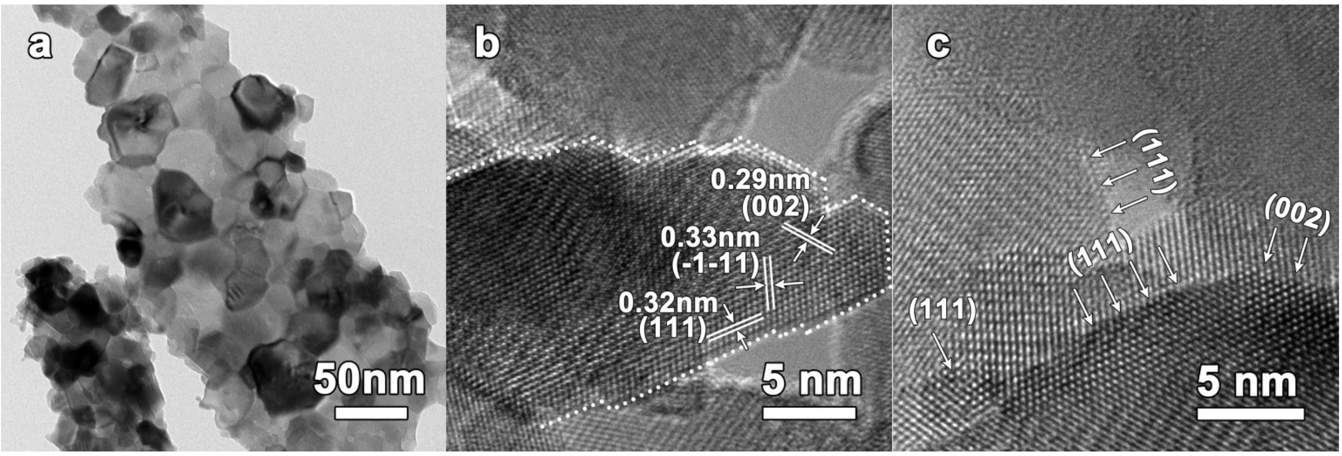

Figure S2. (a) Bright field TEM image of HT-CeO_2 after 650˚C annealing; (b, c) HRTEM images of HT-CeO_2 after 650˚C annealing;

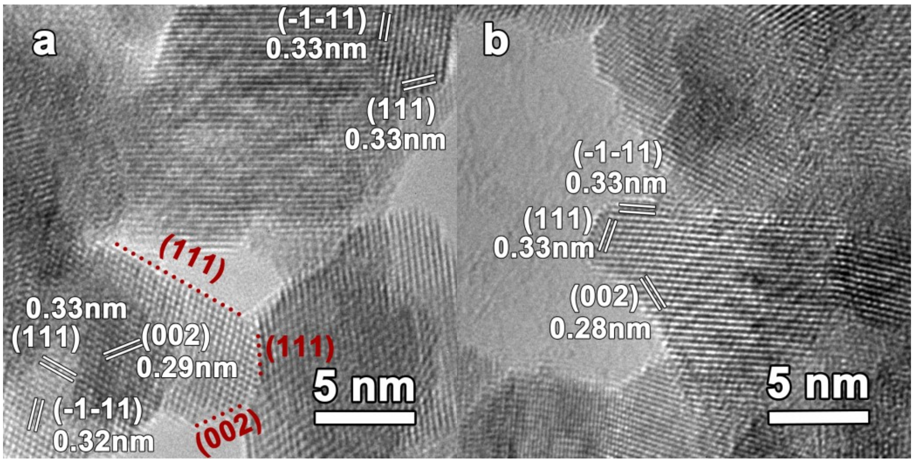

Figure S3. (a, b) HRTEM images of P-CeO_2;

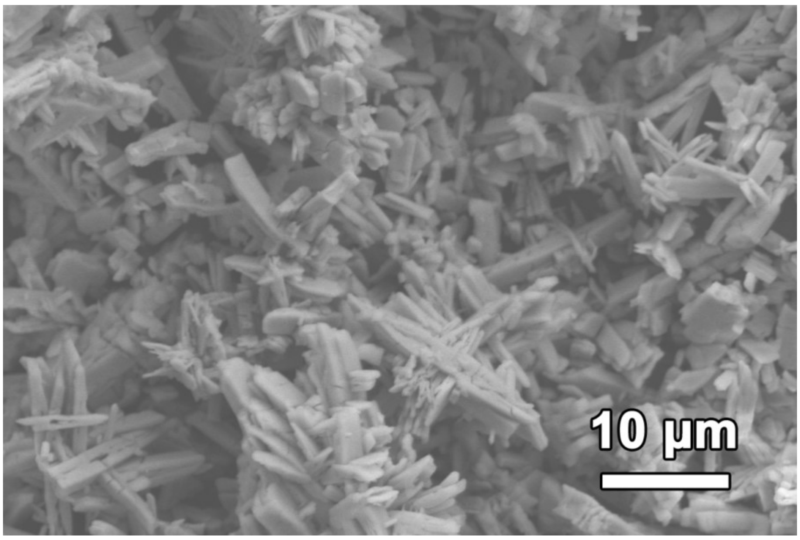

Figure S4. SEM image of C-CeO_2

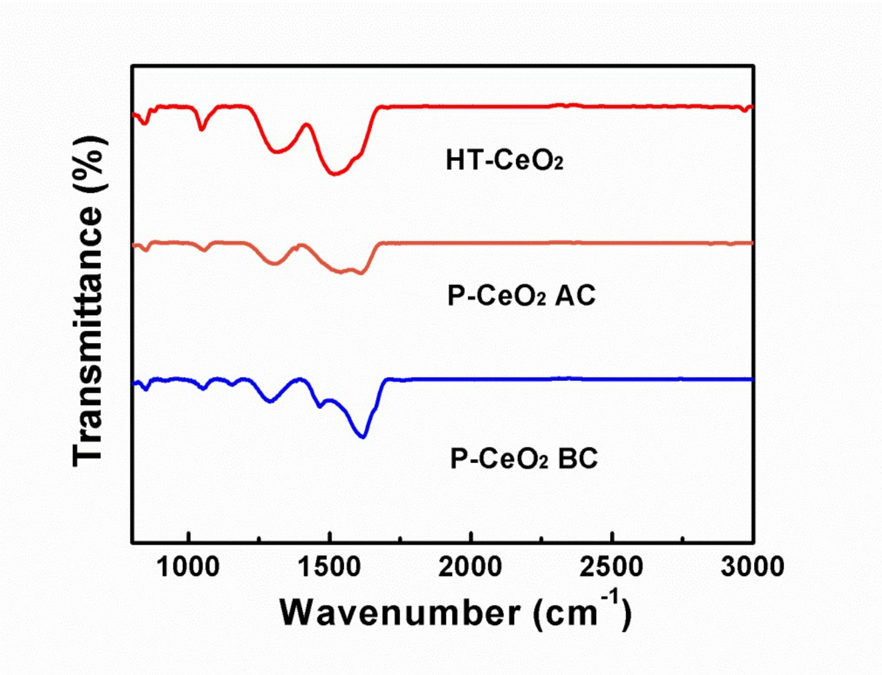

Figure S5. IR spectra of P-CeO_2 before catalytic test (P-CeO_2 BC), after catalytic test (P-CeO_2 AC) and HT-CeO_2 in the carbonate region;

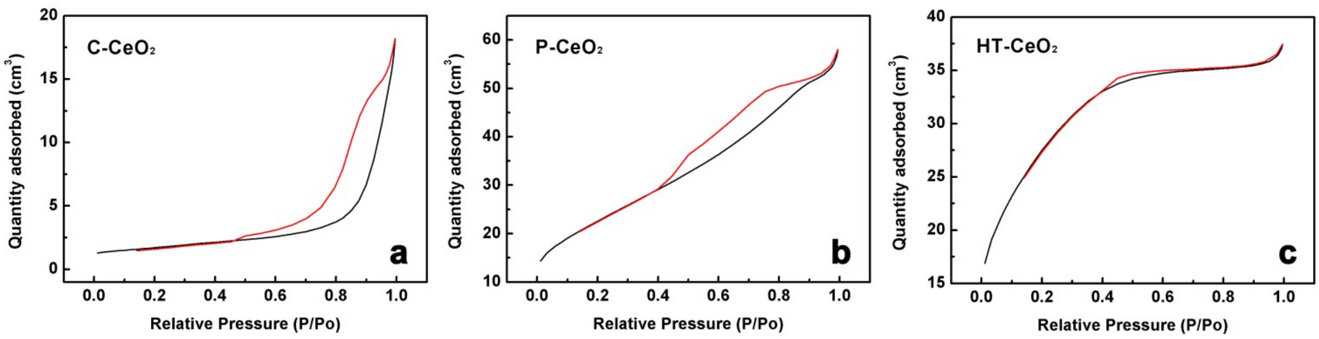

Figure S6. Isothermal adsorption desorption curves of (a) C-CeO_2; (b) P-CeO_2 and (c) HT-CeO_2. The curves of C-CeO_2 show a type IV characteristic, the hysteresis loop is caused by the sheet-like pores of C-CeO_2 which matches well with the SEM morphology of C-CeO_2 (Figure S4);

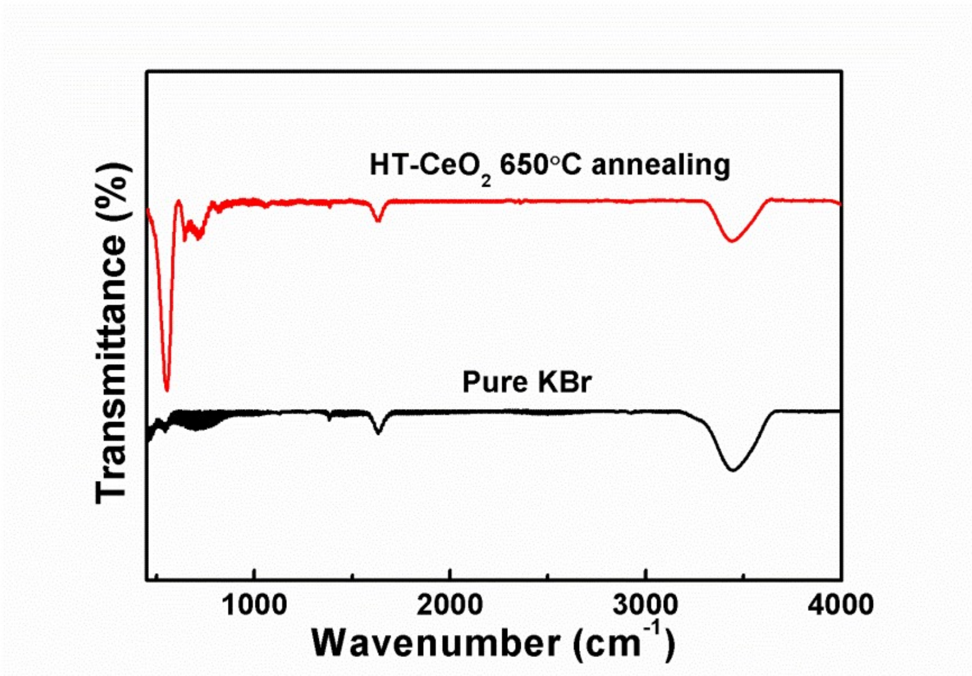

Figure S7. IR spectra of HT-CeO_2 after annealing in Ar at 650˚C for 2 h;

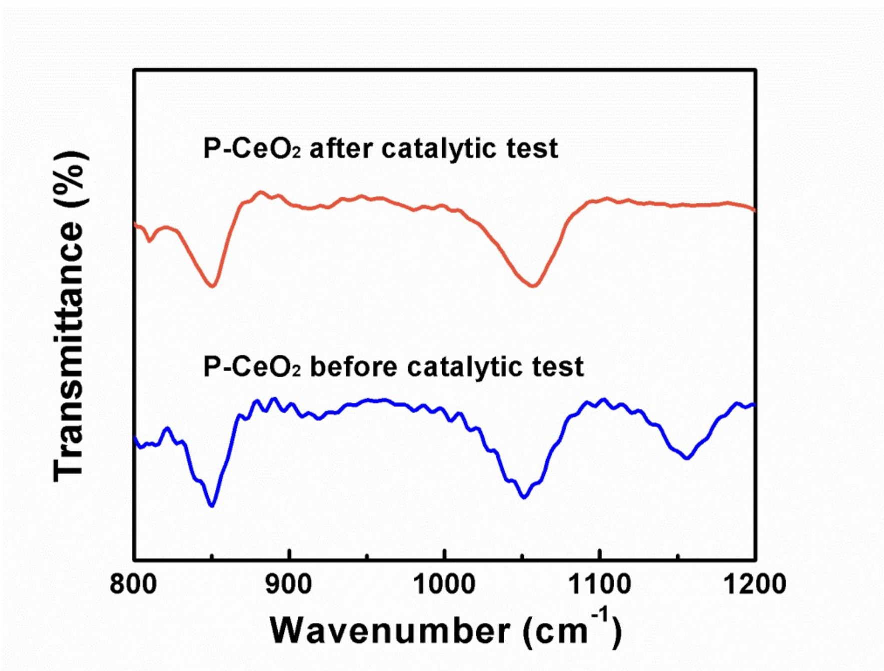

Figure S8. IR spectra of P-CeO_2 before & after CO catalytic test in the O- 2 region;

Table S1. Binding energies of Ce 3d and Ce^{3+}/Ce ratios of HT-CeO_2, P-CeO_2 and C-CeO_2;

Sample	u^0(eV)	v^0(eV)	u'(eV)	v'(eV)	u(eV)	v(eV)	u''(eV)	v''(eV)	u'''(eV)	v'''(eV)	Ce^{3+}/Ce
HT-CeO_2	**899.3**	**881.4**	**903.2**	**885.0**	**901.1**	**882.7**	**907.3**	**888.5**	**916.9**	**898.3**	**28.15%**
P-CeO_2	**898.6**	**880.9**	**902.7**	**884.7**	**900.3**	**882.1**	**907.0**	**888.2**	**916.4**	**897.9**	**28.43%**
C-CeO_2	**899.1**	**880.9**	**903.4**	**885.2**	**901.0**	**882.4**	**907.3**	**888.5**	**916.5**	**898.1**	**7.97%**

The Ce^{3+}/Ce ratios are calculated through the following equation:

$$\frac{Ce^{3+}}{Ce} = 100\% \times \frac{A(u^0) + A(v^0) + A(u^{'}) + A(v^{'})}{A(u) + A(v) + A(u^0) + A(v^0) + A(u^{'}) + A(v^{'}) + A(u^{''}) + A(v^{''}) + A(u^{'''}) + A(v^{'''})}$$

The fitting details of XPS curves used by “XPSPEAK software” are presented as below. First, the number of average points at end points and the background type are generally set to “ten” and “Shirley” for the fitting of background curves. After that, the characteristic peaks are then added for the fitting of XPS curves. The number and position of characteristic peaks are mainly referred to the data in the XPS database or the references. Generally, in the fitting process, the position of added characteristic peaks is fixed and the FWHM, the area and the percentage of Lorentzian-Gaussian (about 80%) are unfixed. Finally, all the added characteristic curves are simultaneously and repeatedly optimized to get a perfect overall curve, which almost coincides with the original tested curve.

Table S2. T_{50} and activation energy (E_a) of HT-CeO_2, P-CeO_2 and C-CeO_2;

Sample	T_{50} (°C)	E_a (eV)
HT-CeO_2	**273**	**48.6**
P-CeO_2	**287**	**55.4**
C-CeO_2	**404**	**--**