

Electronic Supplementary Information

Identification of flattened Pd-Ce oxide cluster highly efficient for low temperature CO oxidation

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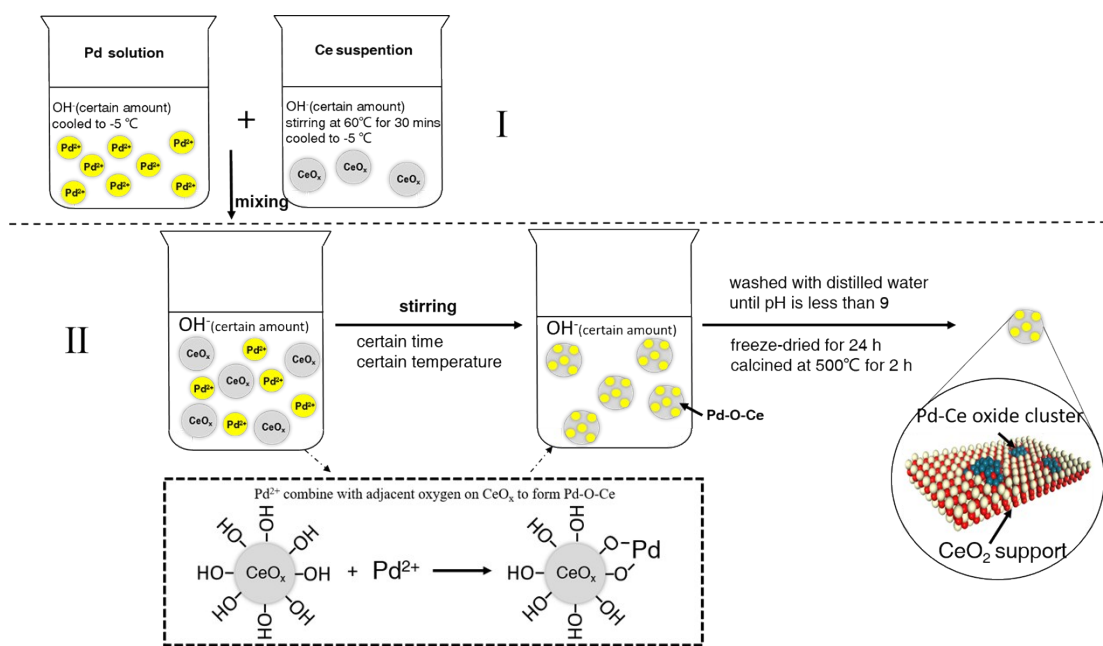


Fig.S1 Preparation process.

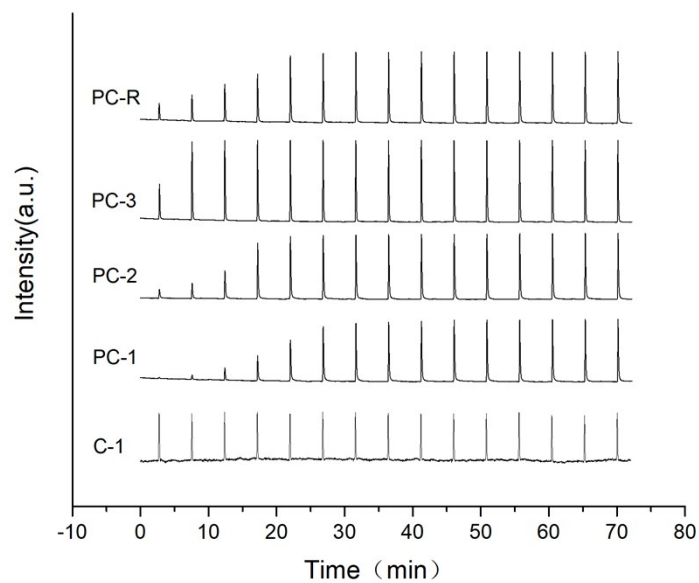


Fig.S2 CO-Pluse injection profile for PC-1, PC-2, PC-3, PC-R and C-1.

Table S1 Pd concentration, Dispersion, surface area, Pore Volume, and TOFs of Pd/CeO₂.

Sample	Concentration wt. %	Dispersion (%)	S _{BET} (m ² • g ⁻¹)	Pore Volume (cm ³ • g ⁻¹)	TOF (s ⁻¹ , 25°C)	TOF (s ⁻¹ , 50°C)
PC-1	0.95%	72.0	141	0.45	0.59	-
PC-2	1.23%	35.1	112	0.33	0.53	-
PC-3	1.10%	12.6	95	0.29	0.41	1.9
PC-R	1.00%	28.9	17	0.07	-	0.11

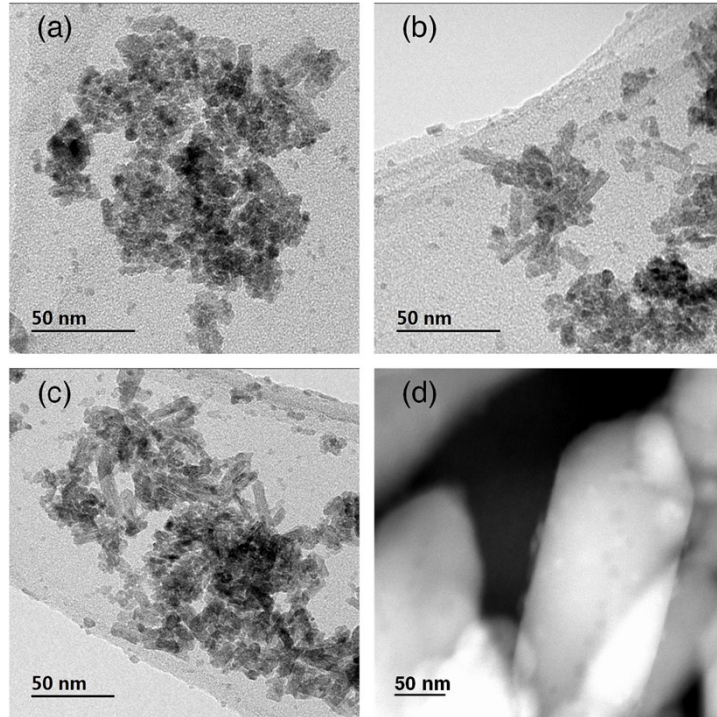


Fig.S3 TEM images of (a)PC-1, (b)PC-2, (c)PC-3, and STEM images of (d)PC-R.

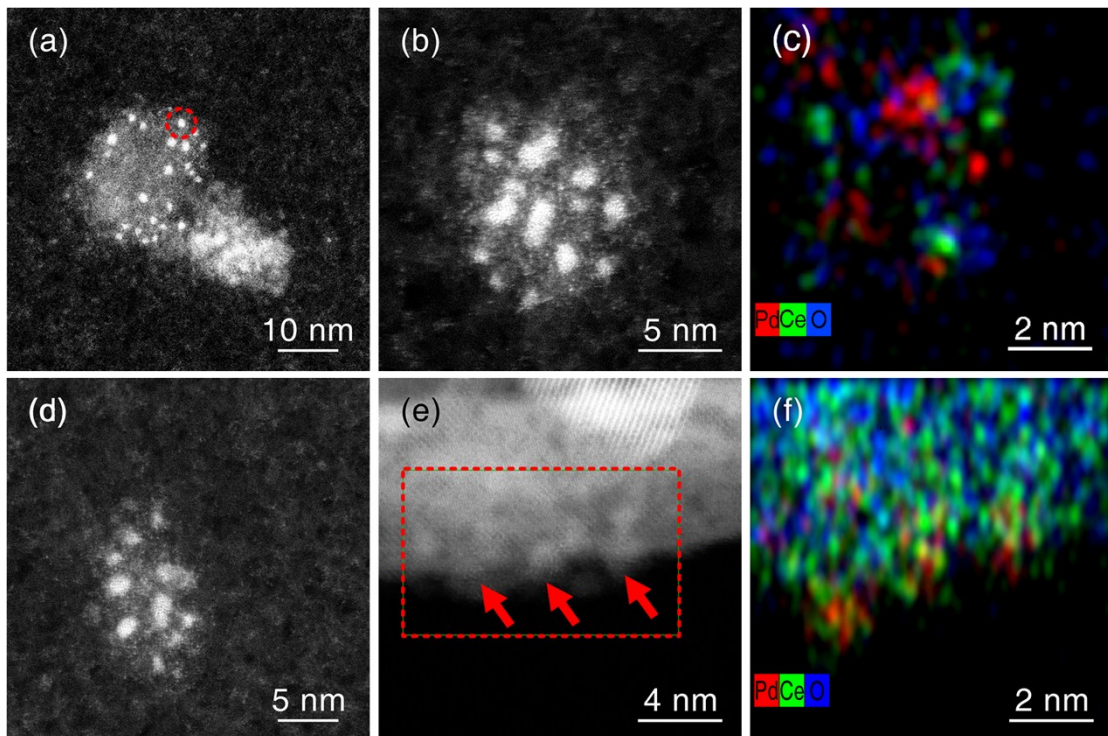


Fig. S4 Characterization of the PC-2 and PC-3: (a, b) HAADF-STEM of PC-2 under different resolution; (c) EDX mapping pattern of the red frame patch of (a); (d, e) HAADF-STEM of the PC-3 under different resolution(three red arrows point to three spots); (f) EDX mapping pattern of the red frame patch of (e).

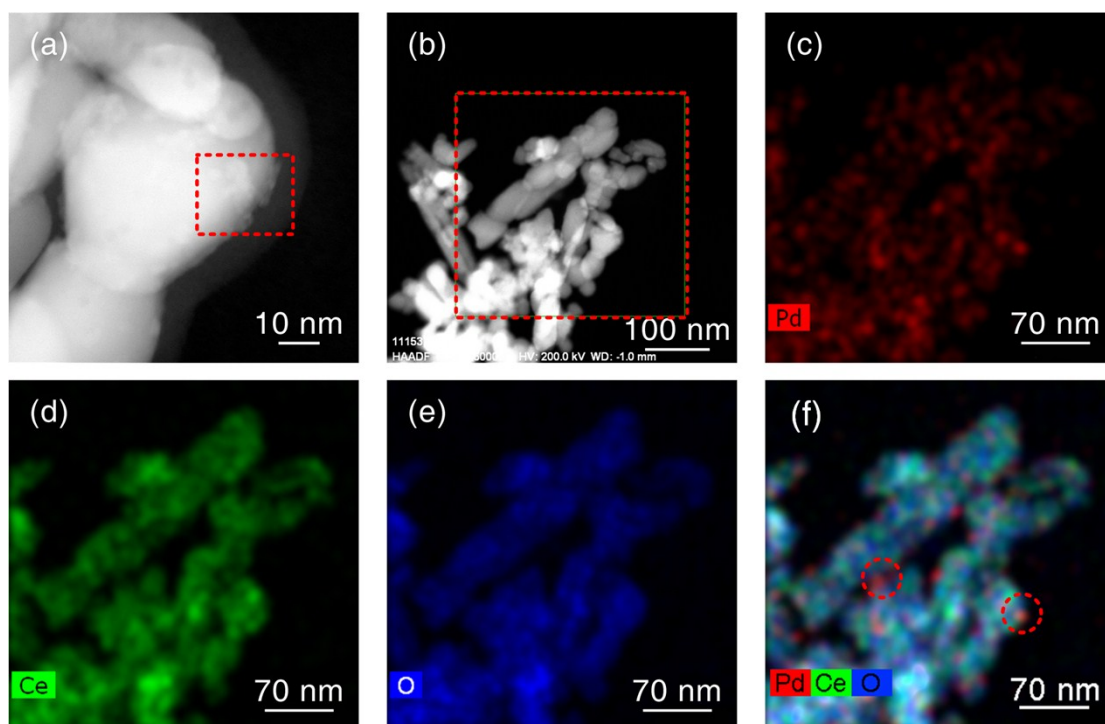


Fig. S5 Characterization of the PC-R: (a,b) HAADF-STEM of the PC-R under different resolution; EDX mapping pattern of Pd (c), Ce (d), O (e) and all element (f) corresponding to the red frame patch of (b).

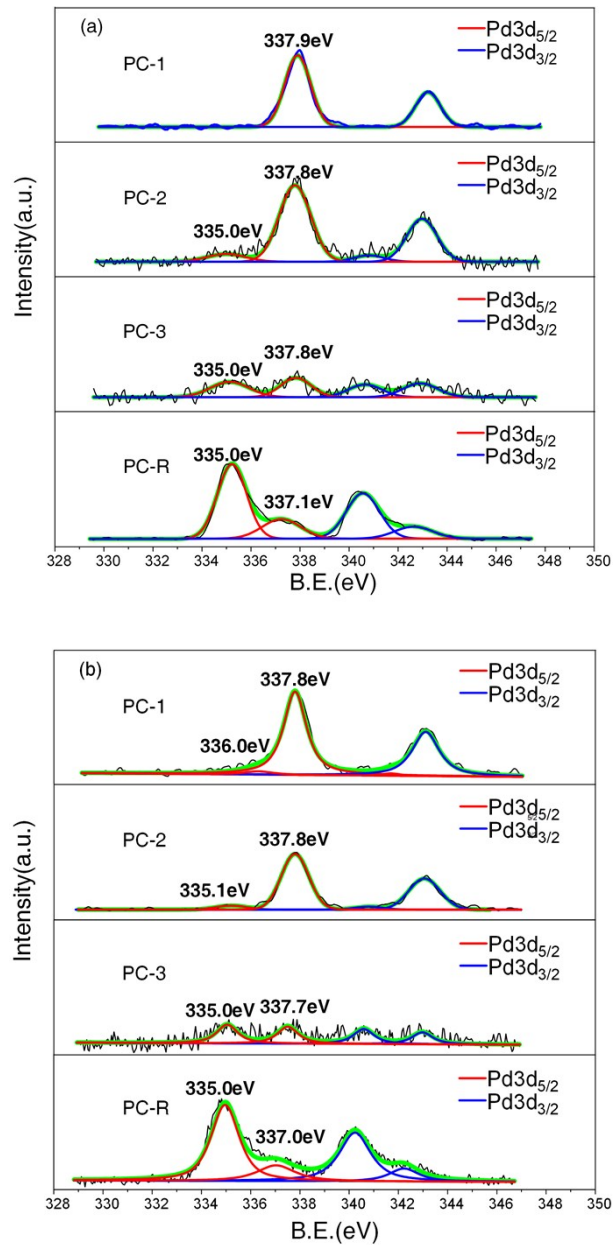


Fig. S6 XPS Pd3d spectra of (a) catalyst after activation, and (b) catalyst after CO reaction.

Table S2 H₂-TPR temperature peaks and the amount of H₂ consumption.

Sample	Peak Temperature (°C)		H ₂ consumption(umol/g _{catalyst})		Pd:O (mol:mol) ^b
	Low peak	High peak	Low peak ^a	High peak	
PC-1	81	372	446	105	1:4.7
PC-2	48	370	303	99	1:3.2
PC-3	27	380	250	72	1:2.7
PC-R	9	380	100	47	1:1.1
C-1	-	420	-	220	-
C-2	-	450	-	196	-
C-3	-	422	-	171	-
C-R	-	400	-	48	-

^aPd loading for four fresh catalyst are all converted to 1wt.%.

^bH₂ consumption for reduction of typical PdO to Pd is 94 umol/g_{catalyst}, H₂ consumption is also converted to mole amount of O consumption, and it is compared with mole amount of Pd.

Table S3 Calculation of O₂ uptake during activation and sequence O₂-CO pulse consumption.

Sample	Activation	First Sequence O ₂ -CO		Second Sequence O ₂ -CO			Third Sequence O ₂ -CO			
	O ₂ uptake(umol/g _{catalyst})	O ₂ supply(umol/g _{catalyst})	CO consumption(umol/g _{catalyst})	CO:O ₂ (mol:mol)	O ₂ supply(umol/g _{catalyst})	CO consumption(umol/g _{catalyst})	CO:O ₂ (mol:mol)	O ₂ supply(umol/g _{catalyst})	CO consumption(umol/g _{catalyst})	CO:O ₂ (mol:mol)
PC-1	226	220	321	1.5	142	272	1.9	129	256	2.0
PC-2	143	146	88	0.6	44	76	1.8	35	59	1.8
PC-3	119	125	60	0.5	18	34	1.9	10	22	2.2
PC-R	56	19	39	2.1	18	35	1.9	19	39	2.0

