Supporting Information

Design of Meso-structured Pd/NiO Catalyst for Highly Efficient Low temperature CO Oxidation under Ambient Condition

Gengnan Li [a], Liang Li [a,], Dong Jiang [b], Jianlin Shi [a, c*]*

[a] *Key Laboratory for Ultrafine Materials of Ministry of Education, School of Materials Science and Engineering, East China University of Science and Technology, Shanghai 200237, China*

[b] *Research Center of Analysis and Test, East China University of Science and Technology, Shanghai 200237, China*

[c] *State Key Laboratory of High Performance Ceramic and Superfine Microstructure, Shanghai Institute of Ceramics, Chinese Academy of Sciences, Shanghai 200050, China*

E-mail: liliang@ecust.edu.cn; jlshi@mail.sic.ac.cn; Tel: +86-21-64252599; Fax: +86-21-64250740

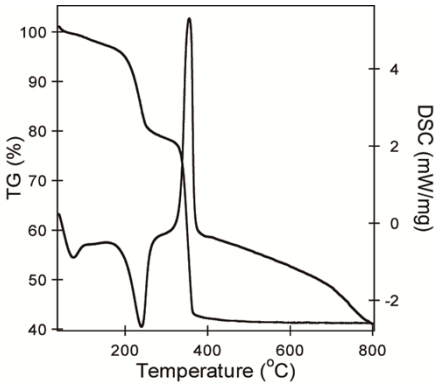


Fig. S1 The TG-DSC curves of the $NiC_2O_4 \cdot 2H_2O$ precursor.

Table S1 The physicochemical properties of supported Pd catalysts

Sample	BET surface area (m^2/g)	Average pore diameter (nm)	Pore volume (cm^3/g)
NiO support	272	3.0	0.4
1.0 wt% Pd loaded Pd/NiO catalyst	209	2.0	0.2
2.8 wt% Pd loaded Pd/NiO catalyst	202	2.1	0.2
5.3 wt% Pd loaded Pd/NiO catalyst	234	2.0	0.2
7.3 wt% Pd loaded Pd/NiO catalyst	218	2.0	0.2

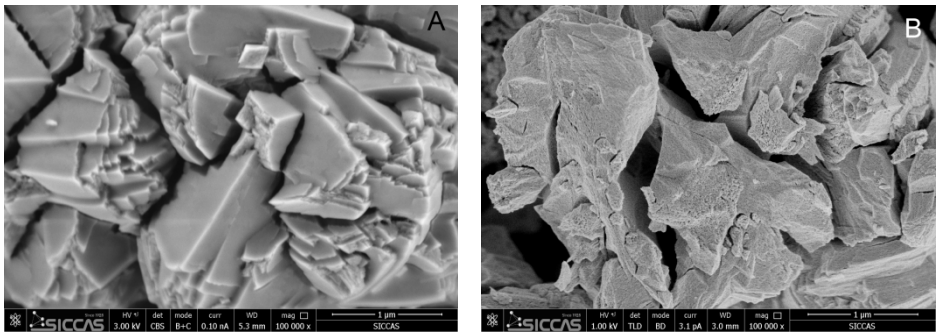


Fig. S2 The SEM images of the $NiC_2O_4 \cdot 2H_2O$ precursor (A) and NiO support (B).

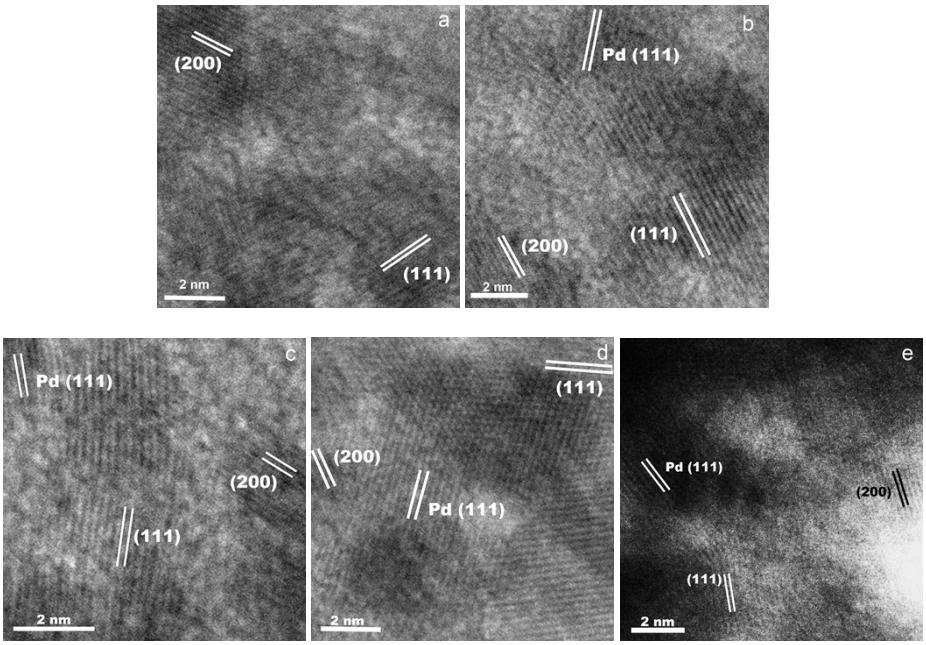
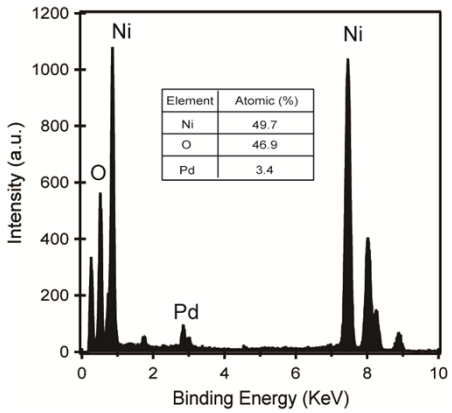


Fig. S3 The HRTEM images of NiO support (a) and Pd/NiO catalysts with different Pd loading contents: 1.0 wt% (b), 2.8 wt% (c), 5.3 wt% (d) and 7.3 wt% (e).



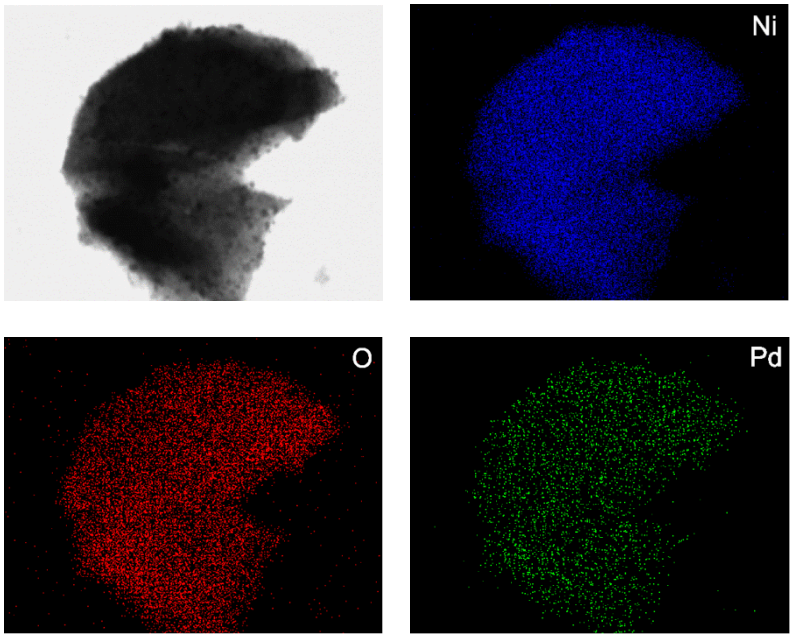


Fig. S4 The EDX mapping of 5.3 wt% Pd loaded catalyst

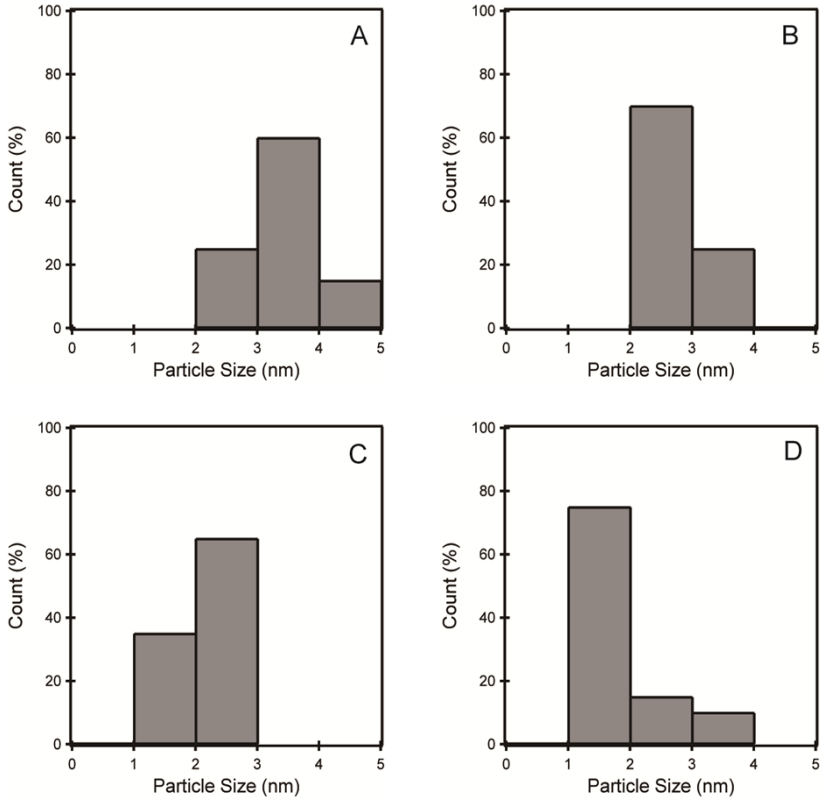


Fig. S5 The particle size distributions of Pd in Pd/NiO catalysts with different Pd loading contents: 1.0 wt% (A), 2.8 wt% (B), 5.3 wt% (C) and 7.3 wt% (D).

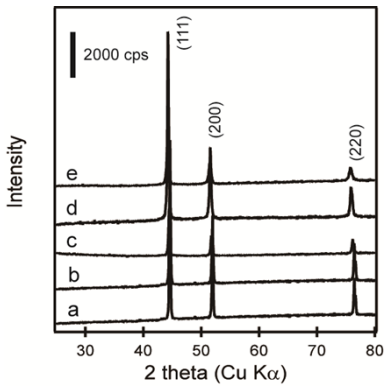


Fig. S6 The XRD patterns of Pd/NiO catalysts with different Pd loading contents after TPR analysis: 0 wt% (a) 1.0 wt% (b), 2.8 wt% (c), 5.3 wt% (d) and 7.3 wt% (e).

Table S2 The catalytic performance of Pd/NiO catalysts

Sample	Dry condition		Moisture condition		TOFs (s^{-1})	
	T_{40} °C	T_{100} °C	T_{40} °C	T_{100} °C	Dry condition (25 °C) ($\times10^{-4}$)	Moisture condition (-25 °C) ($\times10^{-4}$)
NiO support	-	-	-	-	-	-
1.0 wt% Pd loaded Pd/NiO catalyst	75	90	35	60	8.82	8.71
2.8 wt% Pd loaded Pd/NiO catalyst	35	55	-12	5	14.12	16.65
5.3 wt% Pd loaded Pd/NiO catalyst	25	50	<-25	-20	14.14	31.69
7.3 wt% Pd loaded Pd/NiO catalyst	26	50	<-25	-15	8.16	25.95

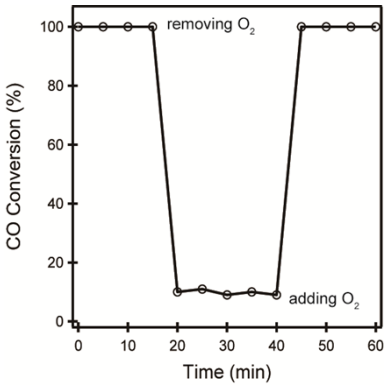


Fig. S7 The effect of O_2 (Water gas shift reaction) on the low temeprature CO oxidation over 5.3 wt% Pd/NiO catalyst at 10 °C.

(1.0 vol% CO and 1.2 vol% water, space velocity: 15000 ml g^{-1} h^{-1})

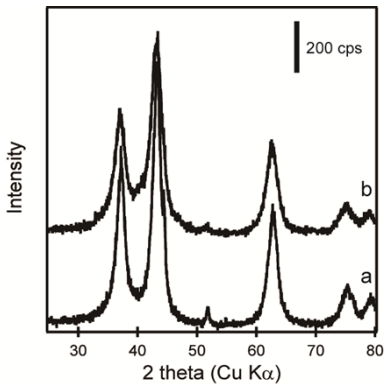


Fig. S8 The XRD patterns of the 5.3 wt% Pd/NiO catalyst after reaction under dry (a) and moisture (b) conditions.

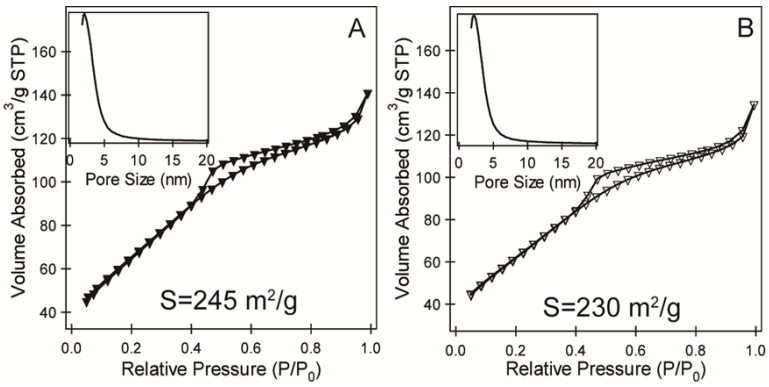
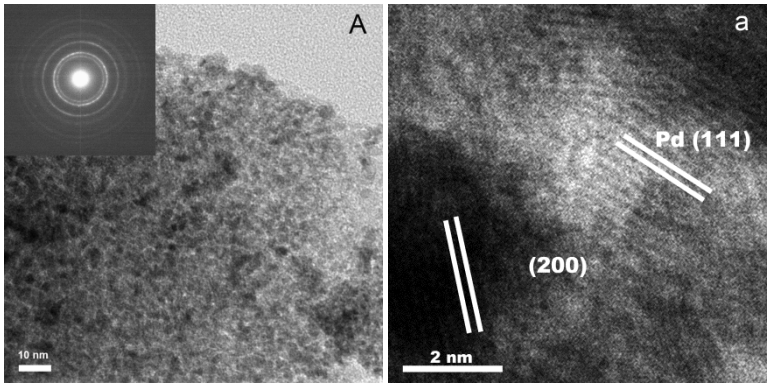


Fig. S9 The BET patterns of the 5.3 wt% Pd/NiO catalyst after reaction under dry (A) and moisture (B) conditions.



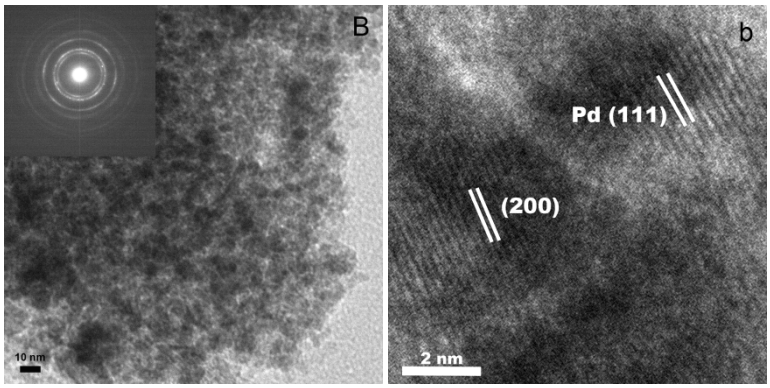


Fig. S10 The TEM and HRTEM images of the 5.3 wt% Pd/NiO catalyst after reaction under dry (A and a) and moisture (B and b) conditions.