

Electronic Supplementary Information

Oxidative conversion of lignin and lignin model compounds catalyzed by CeO₂-supported Pd nanoparticles

Weiping Deng,^a Hongxi Zhang,^b Xuejiao Wu,^a Rongsheng Li,^a Qinghong Zhang^{*a} and Ye Wang^{*a}

1. XPS spectra for Pd species loaded on several metal oxides

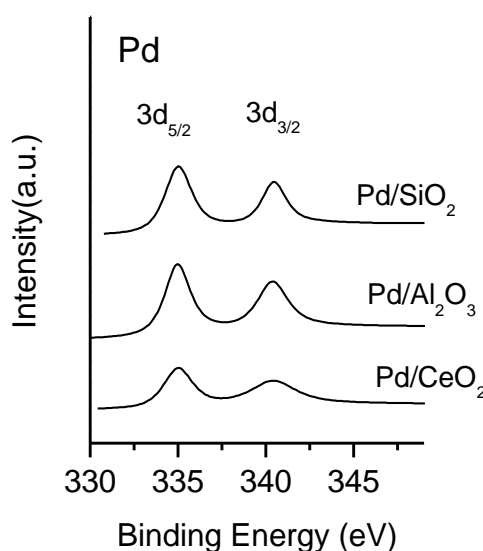


Fig. S1. XPS spectra of Pd 3d for several metal oxide-supported Pd catalysts.

2. H₂ chemisorption results for supported Pd catalysts

Table S1 The dispersion and the estimated mean particle diameters for Pd loaded on several metal oxides

Catalyst	Dispersion ^a (%)	Mean diameter of Pd nanoparticles ^b (nm)
Pd/SiO ₂	52	2.1
Pd/Al ₂ O ₃	46	2.4
Pd/CeO ₂	52	2.1
Pd/MgO	27	4.2

^a Obtained from H₂ chemisorption measurements.

^b Estimated by using the following equation: Pd diameter = 1.12/Pd dispersion (nm).¹

3. HPLC spectra of soluble products from the conversion of Organosolv lignin over the Pd/CeO₂ catalysts

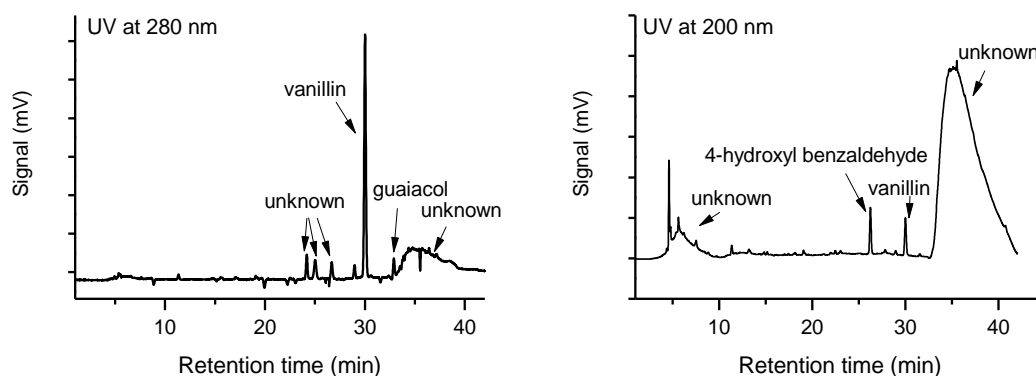


Fig. S2 HPLC spectra of soluble products from the conversion of Organosolv lignin over the Pd/CeO₂ catalyst. Reaction conditions: Organosolv lignin, 0.10 g; catalyst, 0.20 g; MeOH, 50 mL; O₂, 0.1 MPa; 458 K; 24 h.

4. Effect of O₂ pressure on catalytic performances of Pd/CeO₂ for the conversion of 2-phenoxy-1-phenylethanol

Table S2 Catalytic conversion of 2-phenoxy-1-phenylethanol under different O₂ pressures^a





2-phenoxy-1-phenylethanol (PP-ol) + Catalyst (methanol, O₂) → PPone + AP + Phol + MB + BA

Entry	O ₂ pressure (MPa)	Conv. (%)	Yield (%)				
1 ^b	0	6.7	0	0	0	3.4	4.7
2 ^c	0.02	10	0	0	3.1	5.7	4.8
3	0.1	64	12	0.03	14	38	48

^a Reaction conditions: PP-ol, 0.125 g (0.6 mmol); catalyst, 0.2 g; MeOH, 50 mL; 458 K; 24 h.
^b N₂, 0.1 MPa. ^c N₂ was added to keep the total pressure at 0.1 MPa.

5. Catalytic performances of Pd/CeO₂ for the conversion of 2-phenoxy-1-phenylethanone under different atmospheres

Table S3 Catalytic conversion of 2-phenoxy-1-phenylethanone under N₂ and O₂^a

Entry	Atmosphere	Conv. (%)	Yield (%)			
						
1	N ₂	27	0	0	20	18
2	O ₂	53	0.1	17	28	42

^aReaction conditions: PP-ol, 0.125 g (0.6 mmol); catalyst, 0.2 g; MeOH, 50 mL; N₂ or O₂, 0.1 MPa; 458 K; 2 h.

6. Conversion of methanol over Pd/CeO₂ in the absence of O₂

Table S4 The gaseous component in the conversion of methanol over the Pd/CeO₂ catalyst under N₂^a

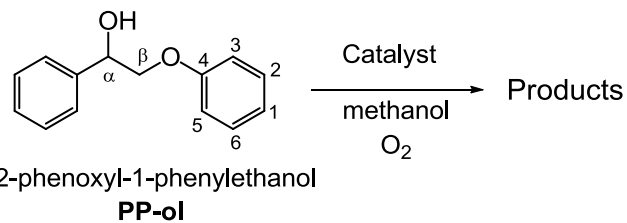
N ₂	Gaseous component ^b (mol%)		
	H ₂	CO	CO ₂
93.9	4.0	2.0	0.10

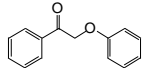
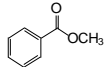


^aReaction conditions: MeOH, 50 mL; Pd/CeO₂, 0.1 g; N₂, 0.1 MPa; 458 K; 2 h.

^bH₂ was analyzed by an Agilent Micro 3000-GC equipped with a Molecular Sieve 5A column and a high-sensitivity thermal conductivity detector. CO and CO₂ were separated by a carbon molecular sieve (TDX-01), and were further converted to CH₄ by a methanation reactor, and were then analyzed by a flame ionization detector (FID).

7. CeO₂-supported Pd, Au and Pt catalysts for the conversion of 2-phenoxy-1-phenylethanol

Table S5 Catalytic performances of CeO₂-supported Pd, Au and Pt catalysts for the conversion of 2-phenoxy-1-phenylethanol^a



Catalyst	Conv. (%)	Yield (%)			
					
CeO ₂	9.1	0	3.2	0	0
Pd/CeO ₂	64	12	14	38	48
Au/CeO ₂	58	11	24	24	46
Pt/CeO ₂	42	7.0	19	11	28

^a Reaction conditions: PP-ol, 0.125 g (0.6 mmol); catalyst, 0.2 g; MeOH, 50 mL; O₂, 0.1 MPa; 458 K; 24 h.

Reference

1. N. Mahata and V. Vishwanathan, *J. Catal.*, 2000, **196**, 262.