Supplementary Infromation

Selective hydrodeoxygenation of lignin oil to valuable phenolics over Au/Nb_2O_5 in water

Lin Dong [a], Yu Xin [a], Xiaohui Liu [a]*, Yong Guo [a] and Yanqin Wang [a]*, Chih-Wen Pao[b], Jeng-Lung Chen[b]

[a]Shanghai Key Laboratory of Functional Materials Chemistry, Research Institute of Industrial Catalysis, School of Chemistry and Molecular Engineering, East China University of Science and Technology, Shanghai, 200237,（P.R. China）

[b]National Synchrotron Radiation Research Center, Hsinchu, 30076, Taiwan

E-mail: xhliu@ecust.edu.cn; wangyanqin@ecust.edu.cn

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Ⅰ. Figures

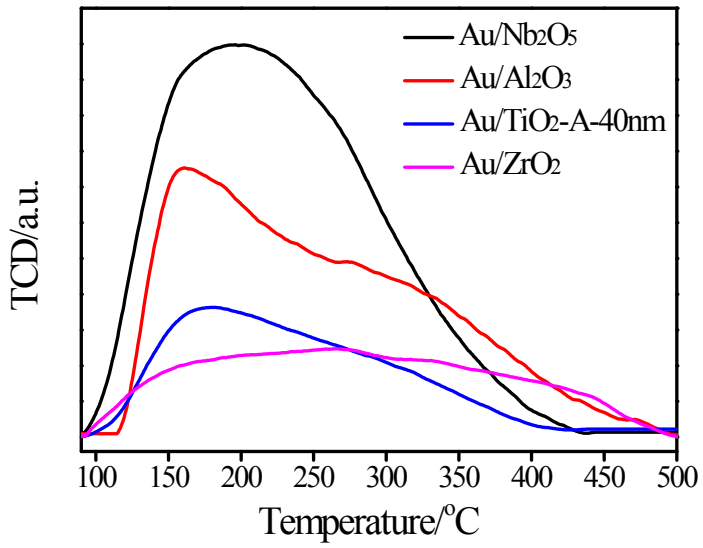


Fig. S1 NH_3-TPD profiles of Au/Nb_2O_5, Au/Al_2O_3, Au/TiO_2-A-40nm and Au/ZrO_2.

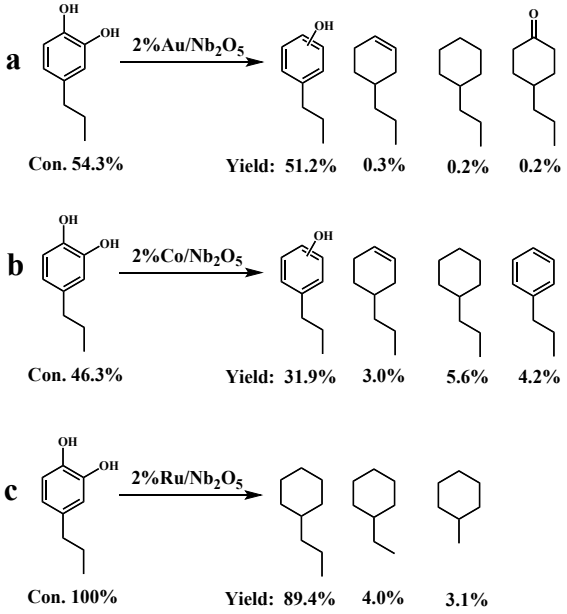


Fig. S2 Reaction results for the hydrodeoxygenation of 4-propylcatechol over different Au-based catalysts in a batch reactor. Reaction condition: 4-propylcatechol (0.5 g), catalyst (0.2 g), deionized water (10 mL), 300 °C, 2 h and initial H_2 pressure of 6.5 MPa.

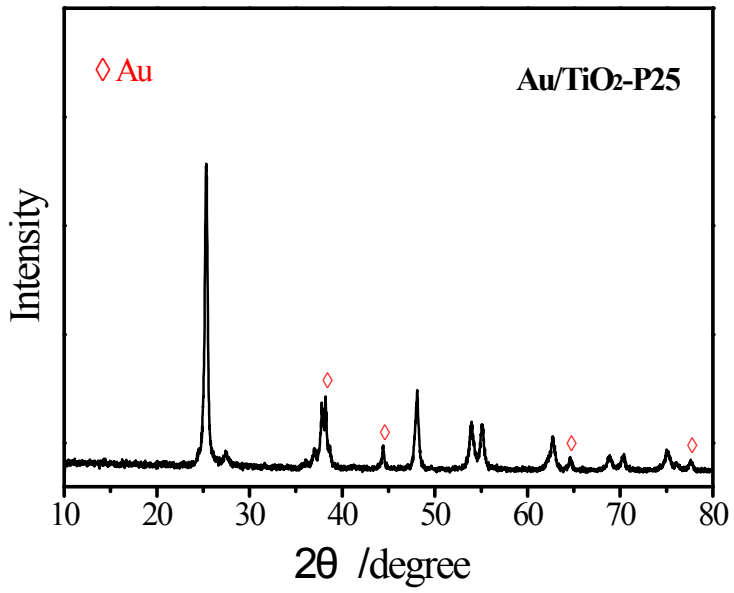


Fig. S3. XRD patterns of Au/TiO_2-P25.

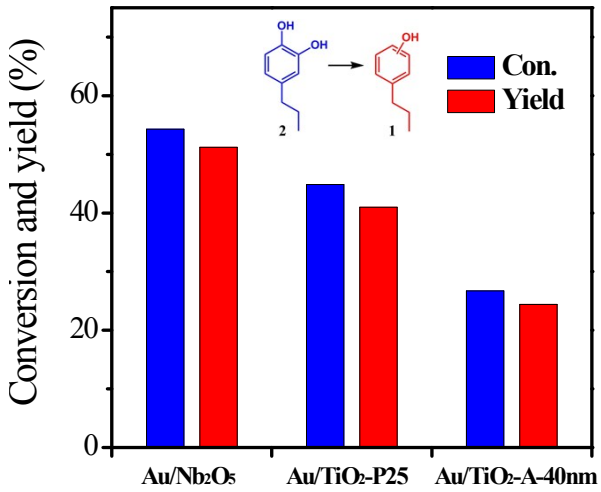
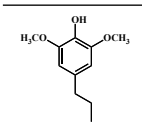
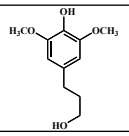
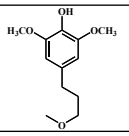
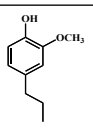
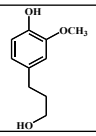
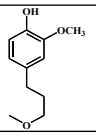


Fig. S4 Reaction results for the hydrodeoxygenation of 4-propylcatechol over different Au-based catalysts in a batch reactor. Reaction condition: 2-methoxy-4-propylphenol (0.5 g), catalyst (0.2 g), deionized water (10 mL), 300 ^oC, 2h and initial H_2 pressure of 6.5MPa.

Ⅱ. Tables

Table S1. The component of various lignin oils.

Entry	Lignin oil	Component (wt %)						Total
								(wt %)
1	beech	54.5	0.7	0.5	18.3	0.4	0.4	74.8
2	birch	45.6	2.0	0.7	17.6	1.2	0.4	67.4
3	pine	35.4	1.6	0.5	35.6	1.2	0.6	74.9
4	cornstalk	23.1	3.7	0.7	21.9	1.7	0.8	52.0

The other components of lignin oil are polyhydric alcohols.

Table S2. Summary of physicochemical properties and ICP analysis results of Au/TiO_2-P25.

Catalyst	Surface area (m^2g^{-1})	Pore volume (cm^3g^{-1})	Pore size (nm)	Au loading[a] (wt%)
Au/TiO_2-P25	21	0.207	17.4	2.0

[a] Determined by ICP-AES.

Table S3. Results of full conversion of various types of lignocellulose

Lignocellulose		beech	birch	pine	cornstalk
Lignin oil (mg)[a]		98	152	100	84
Monomer yield (%)[b]		76	67	75	52
Monomer	1S	25	26	48	50
distribution[c]	2S	0	2	2	3
(%)	3S	0	1	0	2

1G	73	68	47	37
2G	1	3	2	7
3G	1	1	1	1

Reaction conditions: lignocellulose (1.0 g), 5%Ru/C (0.1 g), methanol (20 mL), 250^{o}C, 3h, and initial H_2 pressure of 3MPa.

[a]Calculated based on weighed of electronic scales.

[b]Monomeryield=weightmonomers/weightllignin oil×100%

[c]"1S", "2S", "3S", "1G", "2G" and "3G" sign 2-methoxy-4-propylphenol, 4-(3-hydroxypropyl)-2-methoxyphenol, 2-methoxy-4-(3-methoxypropyl)phenol, 2,6-dimethoxy-4-propylphenol, 4-(3-hydroxypropyl)-2,6-dimethoxyphenol and 2,6-dimethoxy-4-(3-methoxypropyl)phenol, respectively.

Ⅲ. Experimental procedures.

The preparation process of lignin oil

Lignin oil was derived from raw lignocellulosic biomass by reductive depolymerization. In a typical experiment, 1.0 g of raw lignocellulosic biomass sawdust (beech, birch, pine or cornstalk), 0.1 g Ru/C and 20 mL methanol were loaded into a 50 mL Teflon-lined stainless-steel autoclave. The reactor was sealed, purged with H_2 three times and pressurized with 3 MPa at room temperature. The mixture was stirred at 800 rpm and the temperature was increased to 250 ^{o}C for 3h. After reaction, the autoclave was cooled in ice-water bath immediately. The lignin oil was obtained from reaction mixture by vacuum distillation to remove solvent.