

1 **Non-mercury catalytic acetylene hydrochlorination over**  
2 **activated carbon-supported Au catalysts promoted by CeO<sub>2</sub>**

3

4

5

Guangbi Li,<sup>a,b</sup> Wei Li<sup>a</sup>, and Jinli Zhang<sup>\*a</sup>

6

7 (<sup>a</sup> School of Chemical Engineering and Technology, Tianjin University, Tianjin 300072, P. R.

8 China; <sup>b</sup> College of Chemical Engineering and Materials Science, Tianjin University of

9 Science and Technology, Tianjin 300457, P. R. China)

10 \*Corresponding Author: Tel: +86-22-27890643; Fax: +86-22-27890643

11

E-mail: zhangjinli@tju.edu.cn

12

**Supplementary Information**

13 **Contents:**

14 **Table S1** The loss ratio of Au in the catalysts, determined by AAS.

15 **Table S2** Size of Au nanoparticles in Au-based catalysts, determined by XRD.

16 **Fig. S1** TEM image of the fresh catalyst 1Au–5CeO<sub>2</sub>/AC (red arrow indicates ceria  
17 particle) (a), the particle size distribution of the fresh catalyst 1Au–5CeO<sub>2</sub>/AC (b),  
18 HRTEM image of the region around small particles in Fig. S1a (c) and the region  
19 marked by the red arrow in Fig. S1a for the fresh catalyst 1Au–5CeO<sub>2</sub>/AC (d).

20 **Fig. S2** TGA and DTG curves of the fresh and used Au/AC (a), and 1Au–5CeO<sub>2</sub>/AC  
21 (b) catalysts.

22 **Fig. S3** TEM images and particle size distributions of (a) the used Au/AC and (b) the  
23 used 1Au–5CeO<sub>2</sub>/AC.

24 **Fig. S4** Representative wide XPS spectra of the fresh Au/AC and fresh 1Au–

1 5CeO<sub>2</sub>/AC.

2 **Fig. S5** Deconvolution profiles of XPS Au 4f spectra for (a) fresh Au/AC, (b) used  
3 Au/AC, (c) fresh 1Au-5CeO<sub>2</sub>/AC, and (d) used 1Au-5CeO<sub>2</sub>/AC catalyst.

4 **Fig. S6** TEM image of the fresh catalyst 1Au-5CeO<sub>2</sub>/AC (a), HRTEM image of the  
5 region marked by the red arrow in Fig. S6a (b), EDS spectrum of the same sample (c),  
6 and the particle size distribution of the cerium oxide on the activated carbon support  
7 (d), respectively.

8 **Fig. S7** TEM image of the fresh catalyst 1CeO<sub>2</sub>/AC (a), and the particle size  
9 distribution of the cerium oxide on the fresh catalyst 1CeO<sub>2</sub>/AC (b).

10

1 **Table S1** The loss ratio of Au in the catalysts, determined by AAS.

Catalyst	Au loading, wt. %		Weight loss of Au, %
	Fresh	Used	
Au/AC	0.910	0.901	0.99
1Au–1CeO <sub>2</sub> /AC	0.912	0.903	0.97
1Au–3CeO <sub>2</sub> /AC	0.913	0.904	0.94
1Au–5CeO <sub>2</sub> /AC	0.911	0.903	0.90
1Au–10CeO <sub>2</sub> /AC	0.909	0.901	0.92

2

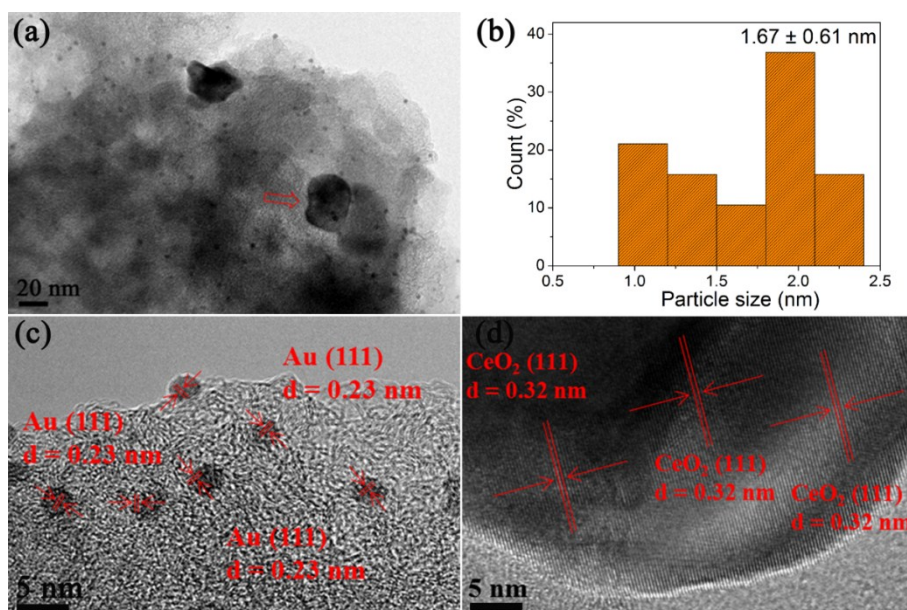
1 **Table S2** Size of Au nanoparticles in Au-based catalysts, determined by XRD <sup>a</sup>.

Catalyst	Au particles Size (nm)	
	Fresh	Used
Au/AC	<4 <sup>b</sup>	12±2
1Au–5CeO <sub>2</sub> /AC	<4 <sup>b</sup>	<4 <sup>b</sup>

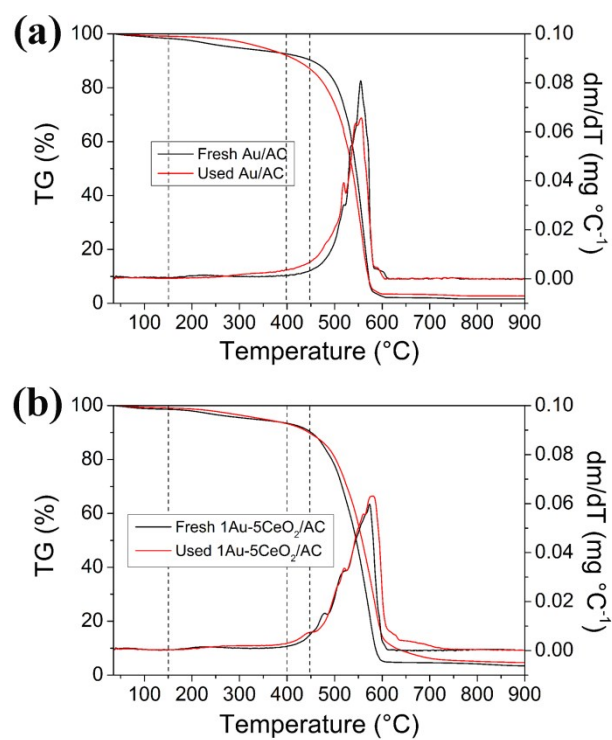
2

<sup>a</sup> Error estimated from XRD peak broadening of 0.06° at the Au (111) reflection at 38.04° (2θ).

<sup>b</sup> It was not possible to assign any error band below 4 nm, as this size is below the XRD method.



1  
2 **Fig. S1** TEM image of the fresh catalyst 1Au-5CeO<sub>2</sub>/AC (red arrow indicates ceria particle) (a),  
3 the particle size distribution of the fresh catalyst 1Au-5CeO<sub>2</sub>/AC (b), HRTEM image of the region  
4 around small particles in Fig. S1a (c) and the region marked by the red arrow in Fig. S1a for the  
5 fresh catalyst 1Au-5CeO<sub>2</sub>/AC (d).

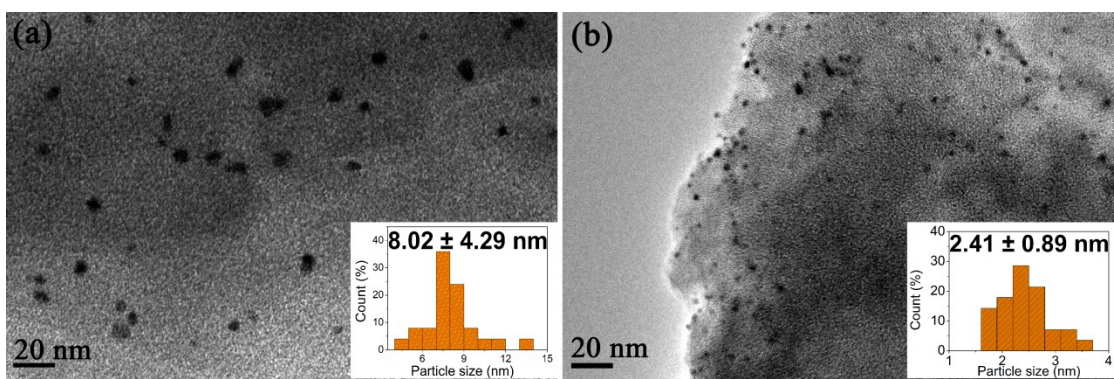


1

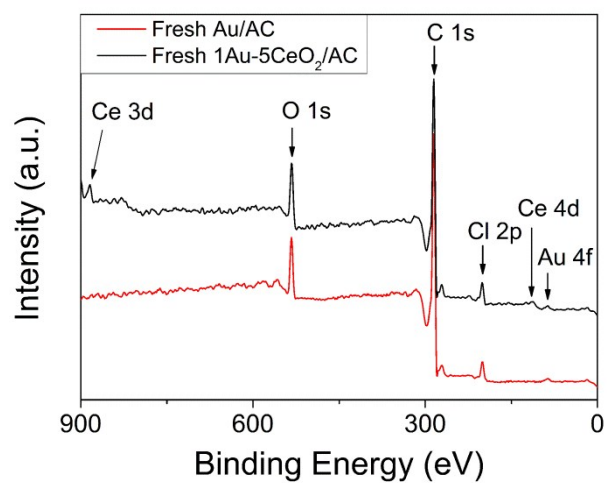
2 **Fig. S2** Typical TGA and DTG curves of the fresh and used Au/AC (a), and 1Au–5CeO<sub>2</sub>/AC (b)

3

catalysts.

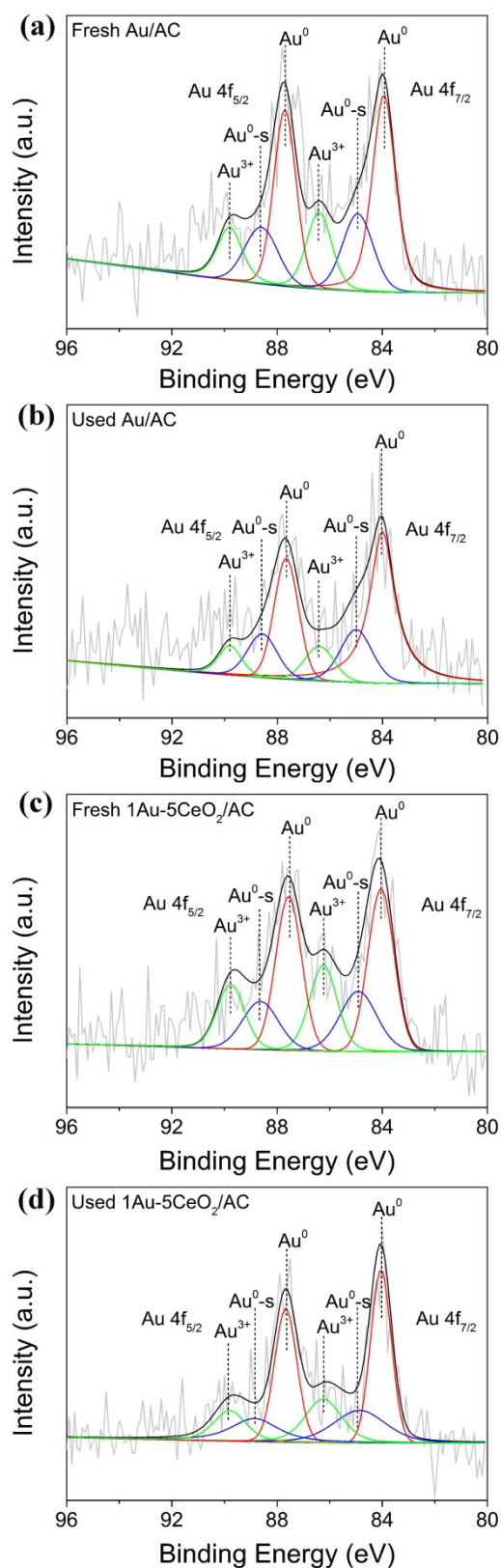


**Fig. S3** TEM images and particle size distributions of (a) the used Au/AC and (b) the used 1Au-5CeO<sub>2</sub>/AC.



1  
2 **Fig. S4** Representative wide XPS spectra of the fresh Au/AC and fresh 1Au-5CeO<sub>2</sub>/AC  
3



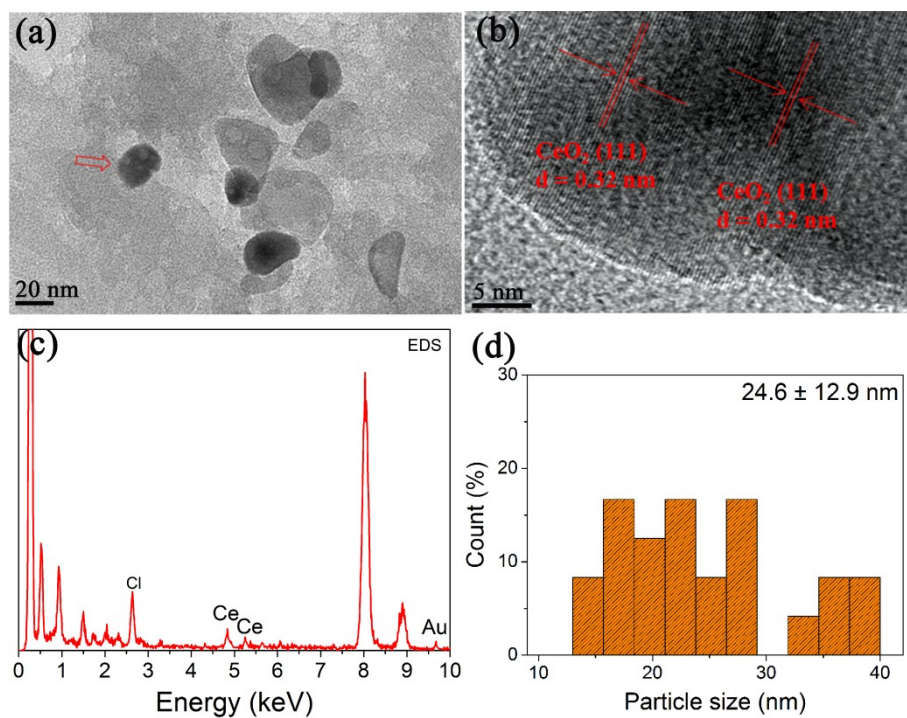


1

2 **Fig. S5** Deconvolution profiles of XPS Au 4f spectra for (a) fresh Au/AC, (b) used Au/AC, (c)  
 3 fresh 1Au-5CeO<sub>2</sub>/AC, and (d) used 1Au-5CeO<sub>2</sub>/AC catalyst.

Fig. S6 displays the TEM image, HRTEM image and EDS spectrum of the fresh catalyst 1Au–5CeO<sub>2</sub>/AC, and the particle size distribution of the cerium oxide on the activated carbon support. Fig. S6 shows some areas of overlapped particles, which are comprised of dominant cerium oxide and small amount of gold species, as confirmed by HRTEM image and EDS spectrum of 1Au–5CeO<sub>2</sub>/AC (Fig. S6b, S6c). According to these discerned ceria particles, the average particle size is determined as 24.6 nm (Fig. S6d). In addition, the crystal size of ceria is calculated as 28 nm according to the plane (111) in XRD pattern of 1Au–5CeO<sub>2</sub>/AC (indicated by ☆ in Fig. 6), which is in accord with the result in Fig. S6d. Fig. S7 shows the TEM image and the particle size distribution of the fresh catalyst 1CeO<sub>2</sub>/AC. As shown in Fig. S7, irregular ceria particles are dispersed on the surface of activated carbon support with an average particle size about 29.1 nm, which is slightly larger than the average size of ceria particles on the fresh catalyst 1Au–5CeO<sub>2</sub>/AC (Fig. S6d).

14

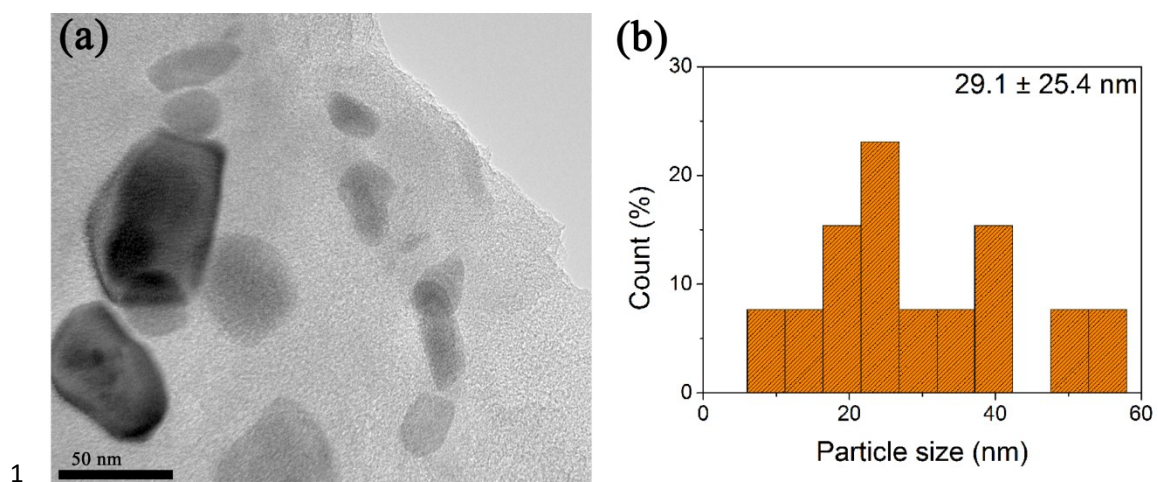


1

2 **Fig. S6** TEM image of the fresh catalyst 1Au-5CeO<sub>2</sub>/AC (a), HRTEM image of the region

3 marked by the red arrow in Fig. S6a (b), EDS spectrum of the same sample (c), and the particle

4 size distribution of the cerium oxide on the activated carbon support (d), respectively.



**Fig. S7** TEM image of the fresh catalyst 1CeO<sub>2</sub>/AC (a), and the particle size distribution of the cerium oxide on the fresh catalyst 1CeO<sub>2</sub>/AC (b).