Supporting information

Boosting the catalytic behavior and stability of gold catalyst with structure regulated by ceria

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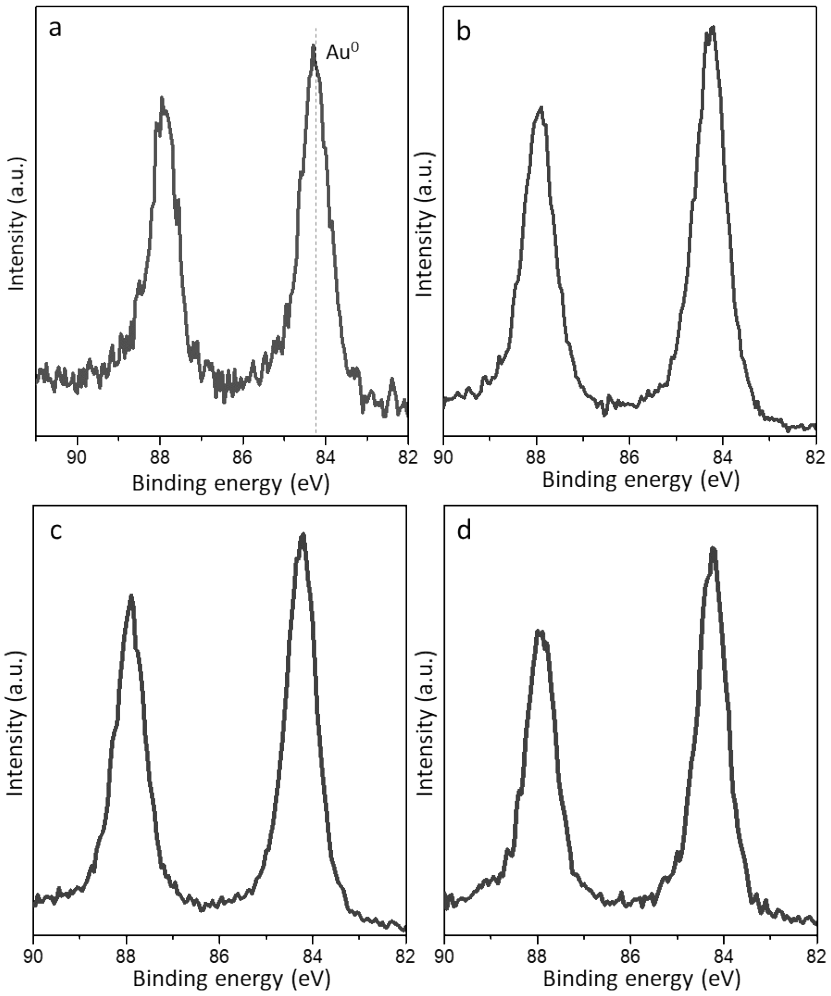

Figure S1. XPS spectra of Au4*f* region of (a) Au/CNT-A, (b) Au/CNT-T_H, (c) Au/CNT-T_L and (d) Au/CNT-Na catalysts.

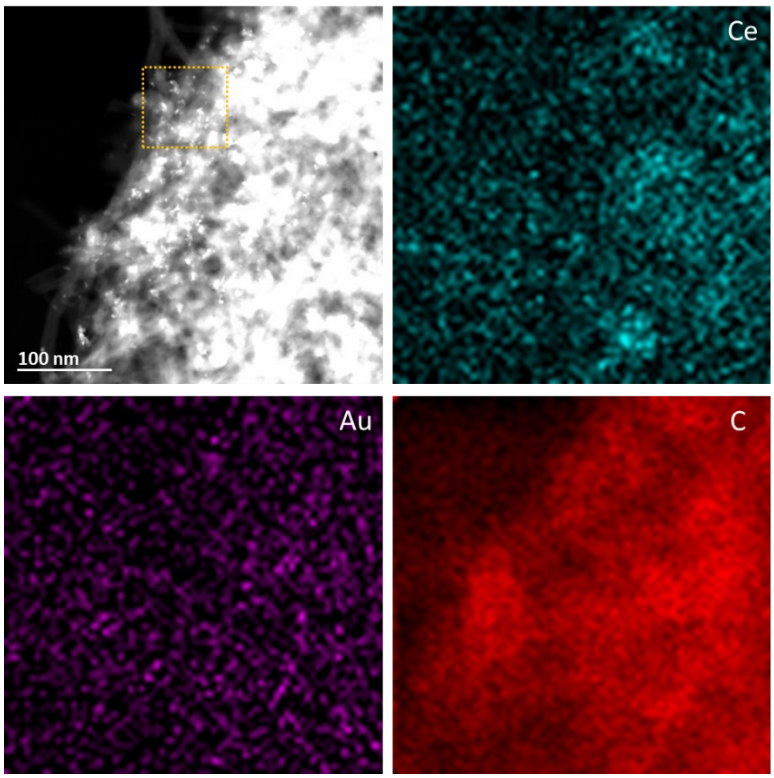

Figure S2. HAADF-STEM elemental-mapping of the Au-Ce_5/CNT sample.

Table S1. The TOF value based on each reaction and the related reaction conditions.[a]

Sample	Reaction time (h)	Conv. of BnOH[b] (%)	Mass of Catal.[c] (mg)	Distribution degree	TOF (h^{-1})
Au/CNT-A	3	11.0%	1.3	23.5%	583
Au/CNT-T_H	3	8.4%	2.1	12.6%	557
Au/CNT-T_L	3	6.4%	4.9	8.0%	271
Au/CNT-Na	3	3.4%	5.1	6.6%	163

[a] In order to lower the conversion of benzyl alcohol (BnOH), the reaction temperature was lowered to 40 °C with fewer amount of catalyst.

[b] Conversion of BnOH during the reaction.

[c] The quality of catalyst used for each reaction.

Table S2. Information of oxygen species based on XPS spectra of the O1*s* core level.

Sample	O1*s* (%)				O/C[b]
	C-O	O=C-O	C=O	Lattice O[a]	
CNT	1.0	0.4	0.4	-	1.8
Au/CNT-A	0.9	0.8	0.6	-	2.3
Au-$Ce_{2.5}$/CNT	1.8	1.1	0.7	1.3	4.9[d]
Au-Ce_5/CNT	0.8	1.5	1.7	2.3	6.3
Au-Ce_{10}/CNT	1.0	1.8	1.9	2.9	7.6

[a] Surface lattice oxygen species from CeO_2 in the series of Au-Ce_x/CNT samples.

[b] Atomic ratio between O and C elements detected by XPS spectra.

Table S3. Information of reaction rate for different samples.

Sample	React. rate[a]	Particle sizes (nm)		Sample	React. rate		Particle sizes (nm)	
	80 °C	XRD[b]	TEM[c]		40 °C	50 °C	XRD	TEM
Au/CNT-A	15.1	5.8	4.9	Au-$Ce_{2.5}$/CNT	13.8	12.5	5.9	
Au/CNT-T_H	14.0	9.4	9.1	Au-Ce_5/CNT	15.7	18.6	5.0	3.8
Au/CNT-T_L	8.5	18.2	14.3	Au-$Ce_{7.5}$/CNT	10.4	15.8	9.1	
Au/CNT-Na	5.3	17.3	21.9	Au-Ce_{10}/CNT	9.4	14.7	10.2	

[a] Reaction rate in mmol/g_{Au}/min;

[b] Average particles sizes calculated by XRD;

[c] Average particles sizes calculated by TEM images based on more than 200 particles.