Supporting Information

Preparation of Cu-Ru/Carbon nanotube catalyst for hydrogenolysis of glycerol to 1, 2-propanediol via hydrogen spillover

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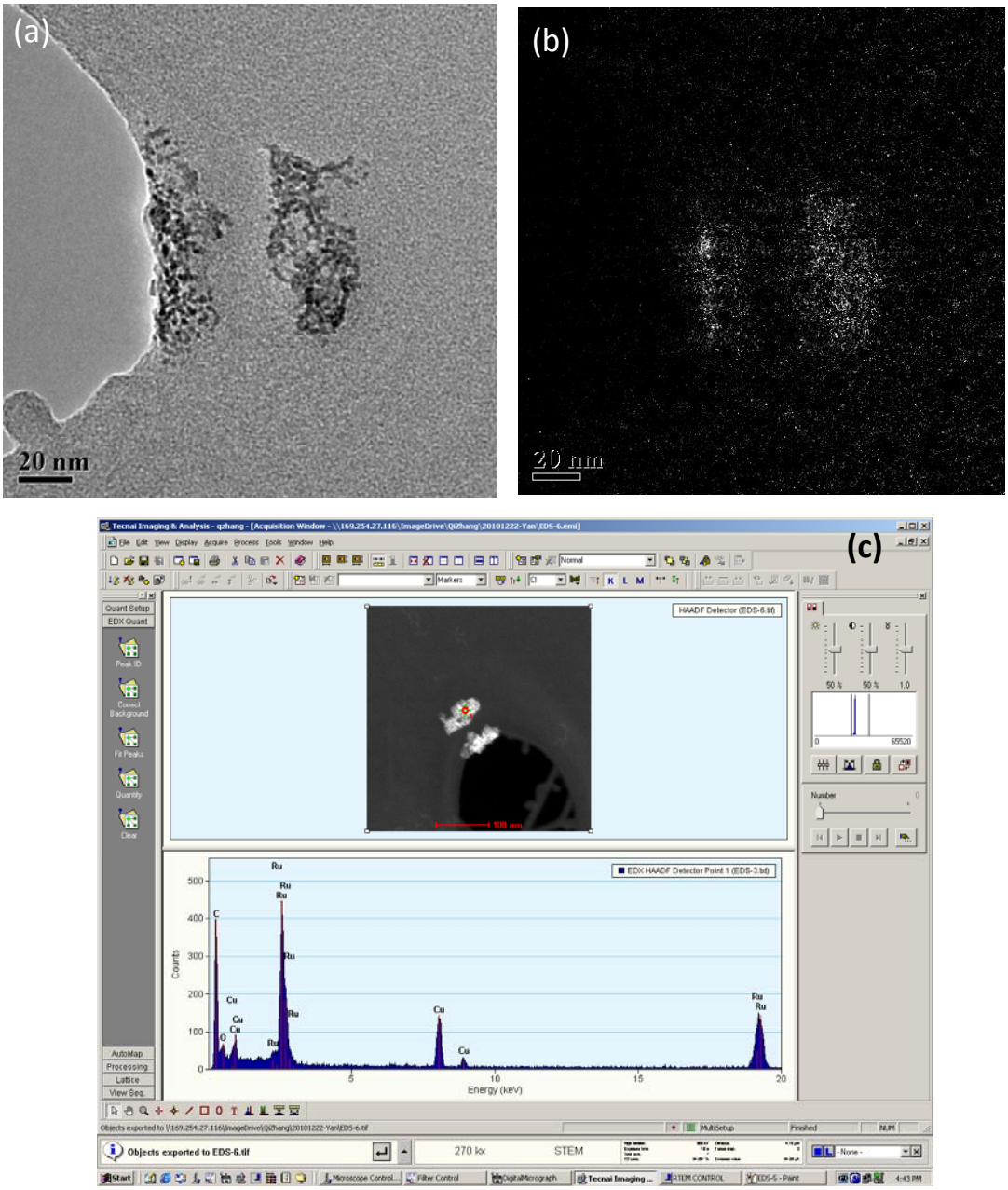

Figure S1 The TEM results of Cu-Ru samples (PHILIPS TECHNAI F30 TEM, 200KV). (a) The TEM image of Cu-Ru clusters, (b) the EELS mapping of copper element in Cu-Ru clusters, and (c) EDS analysis of Cu-Ru clusters.

The TEM image of the Cu-Ru clusters sample was shown in Figure S1(a). For the EELS

mapping of element (Figure S1(b)), Ru has very high energy level, and is not able to map the element. EDS (Figure S1(c)) shows that both element Ru and Cu are existed. Combined with the process of catalyst preparation, the Ru species should be located on the surface of Cu metal.

Table S1 shows the gas phase glycerol hydrogenolysis rates and selectivities on Ru catalyst. The turnover rate of glycerol hydrogenolysis decreases by reducing the cluster size of Ru crystallites, suggesting the size requirement of Ru metal in which the larger cluster exhibits high hydrogenolysis activity.

Table S1 Gas phase glycerol hydrogenolysis activities and selectivities on Ru catalysts.

Samples [a]	Ru Cluster Size (nm) [b]	Turnover Rate (TOR, $mol/mol_{surf\text{-}metal}/s$) [c]	Selectivities (mol %)				
			1,2- propanediol	Glycol	Ethanol	Methanol	Alkanes
0.3 wt.%-Ru/SiO_2	1.1	0.0097	35.2	7.8	3.7	12.1	32.0
0.3 wt.%-Ru/SiO_2	2.5	0.032	36.7	8.2	4.2	14.2	35.2
0.3 wt.%-Ru/SiO_2	4.8	0.091	40.7	7.5	4.1	15.1	31.1
1.0 wt.%-Ru/SiO_2	6.5	0.11	36.5	6.4	4.1	14.0	37.6

[a] The Ru samples were prepared as the ref[1].
[b] The mean cluster sizes were estimated from metal dispersion via hydrogen chemisorptions by assuming spherical structures and the atomic density in bulk Ru metal (13.65×10^{-3} nm^3)
[c] The reaction was carried at 200 ^oC, 1.0 kPa glycerol, 99 kPa H_2 with 1~5 % conversion.

Reference

[1] H. M. Wang, E. Iglesia, *J. Catal.* 2010, **273**, 245-256.