Supporting Information

Control of metal-support interaction for tunable CO hydrogenation performance over Ru/TiO_2 nanocatalysts

Heyun Lin[1,2,3], Wenzhe Zhang[3], Huachen Shen[1,2], Hailing Yu[1,2], Yunlei An[1], Tiejun Lin[1,2,*] and Liangshu Zhong[1,2,3,*]

[1] Key Laboratory of Low-Carbon Conversion Science and Engineering, Shanghai Advanced Research Institute, Chinese Academy of Sciences, Shanghai, 201210, China

[2] University of the Chinese Academy of Sciences, Beijing 100049, P. R. China;

[3] School of Physical Science and Technology, ShanghaiTech University, Shanghai, 201210, China

* Corresponding authors: lintj@sari.ac.cn; zhongls@sari.ac.cn

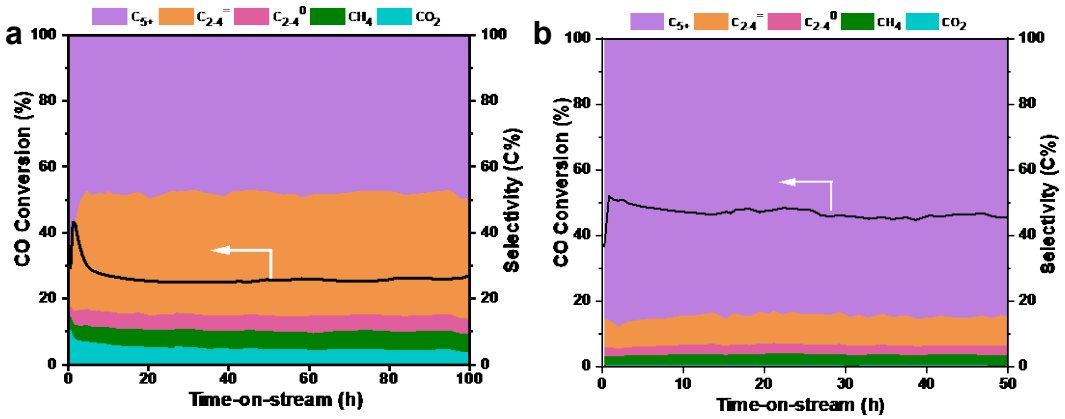

Fig. S1 The stability test of Ru/r-TiO_2-300R(a) and Ru/a-TiO_2(H_2)-300R(b)

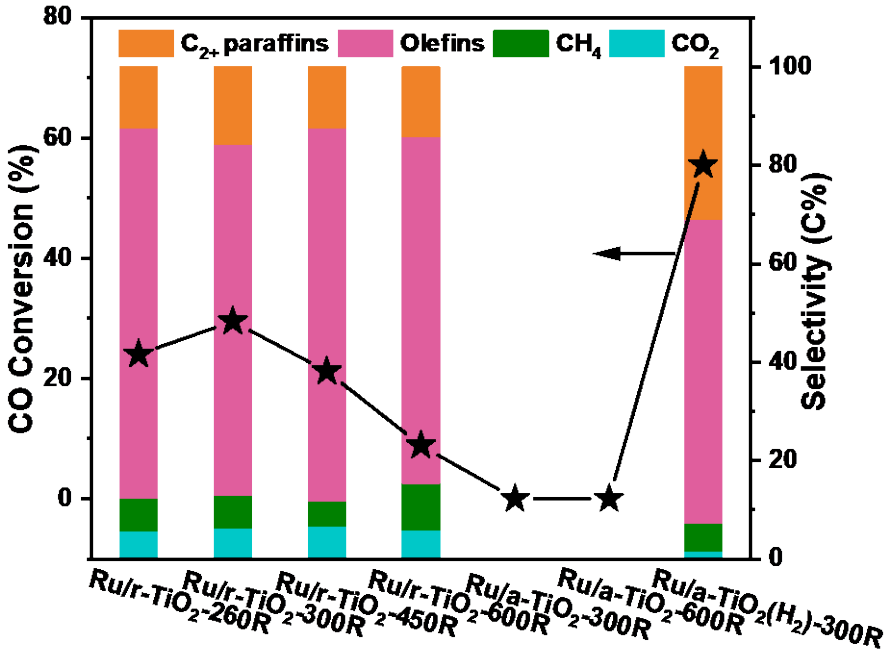

Fig. S2 Comparison of CO conversion and product selectivity of various Ru/TiO_2 catalysts reduced under different reaction temperatures. Reaction condition: 1 MPa, 3000 $mL \cdot g^{-1} \cdot h^{-1}$, H_2/CO=2, 260 °C.

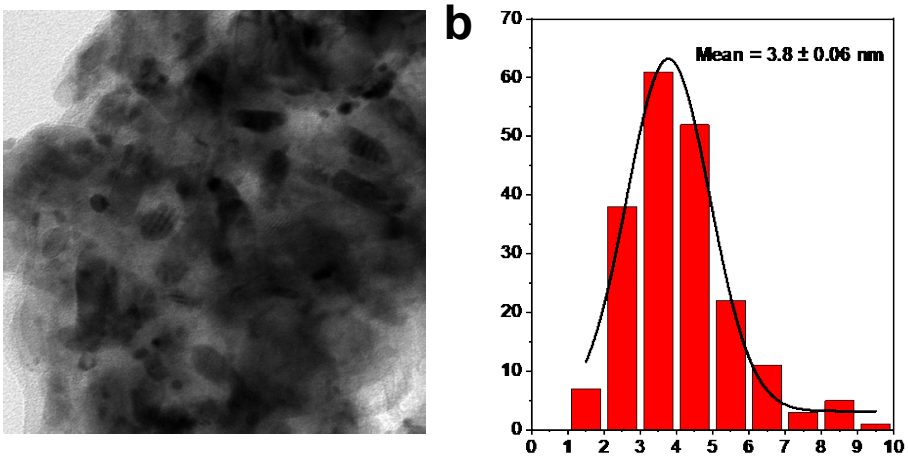

Fig. S3 TEM images of Ru/r-TiO_2-600R(a) and the corresponding particle size distribution bar charts with the Gaussian fitted curves (b).

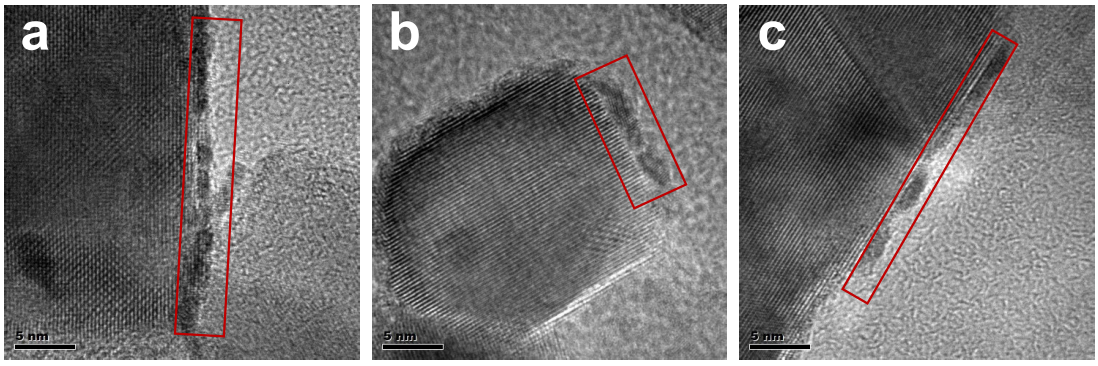

Fig. S4 HRTEM images of Ru/r-TiO_2-300R

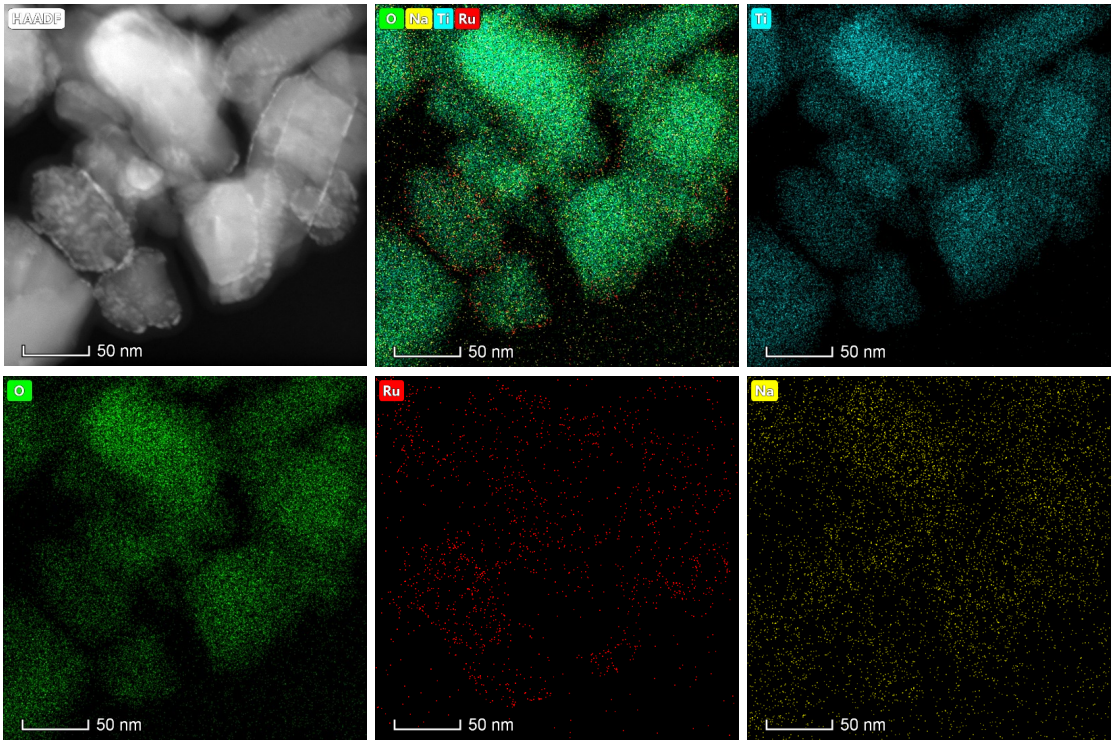

Fig. S5 HAADF-STEM images and element mapping of Ru/r-TiO_2-300R

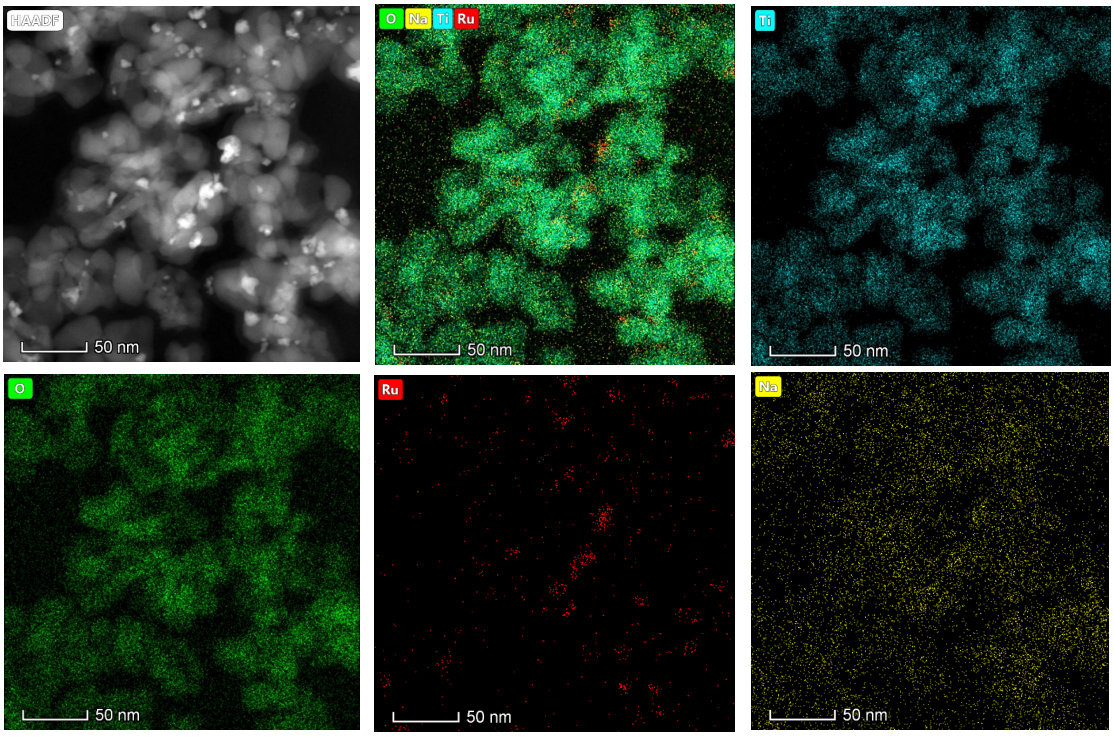

Fig. S6 HAADF-STEM images and element mapping of Ru/a-TiO_2-300R

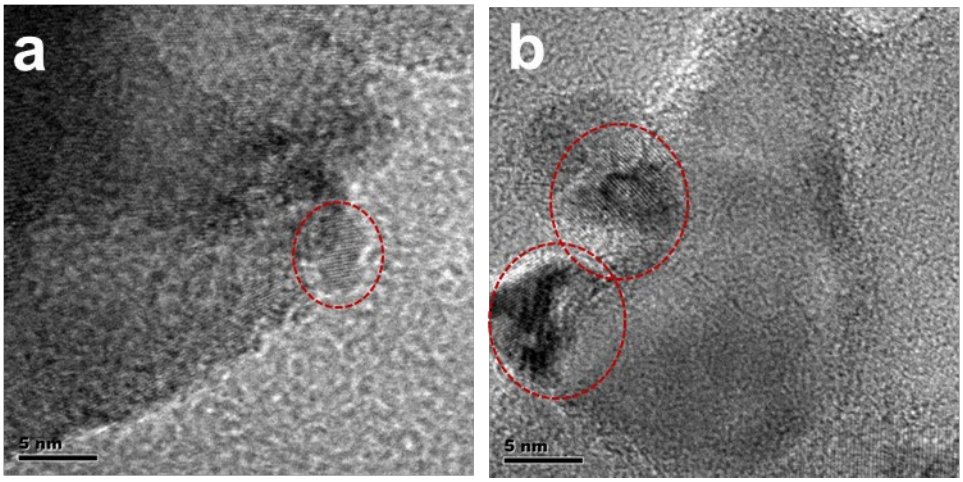

Fig. S7 HRTEM images of Ru/a-$TiO_2(H_2)$-300R

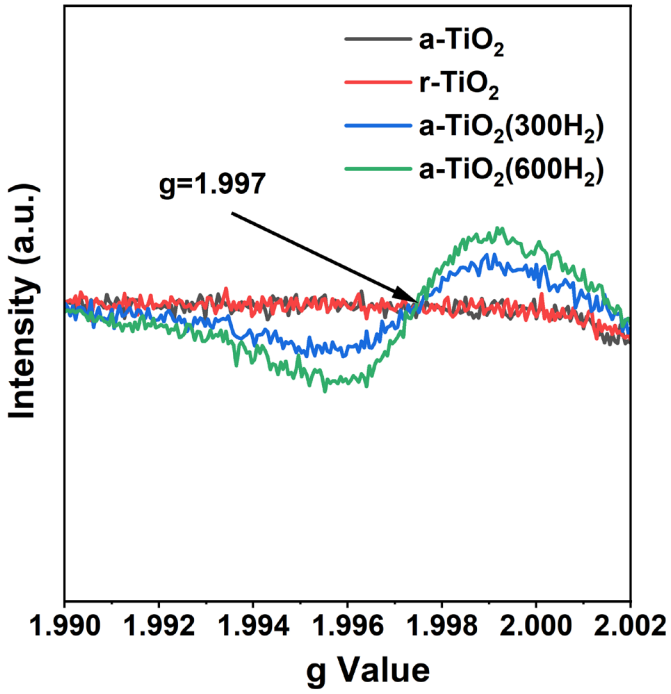

Fig.S8 Low-temperature EPR result of various TiO_2 support

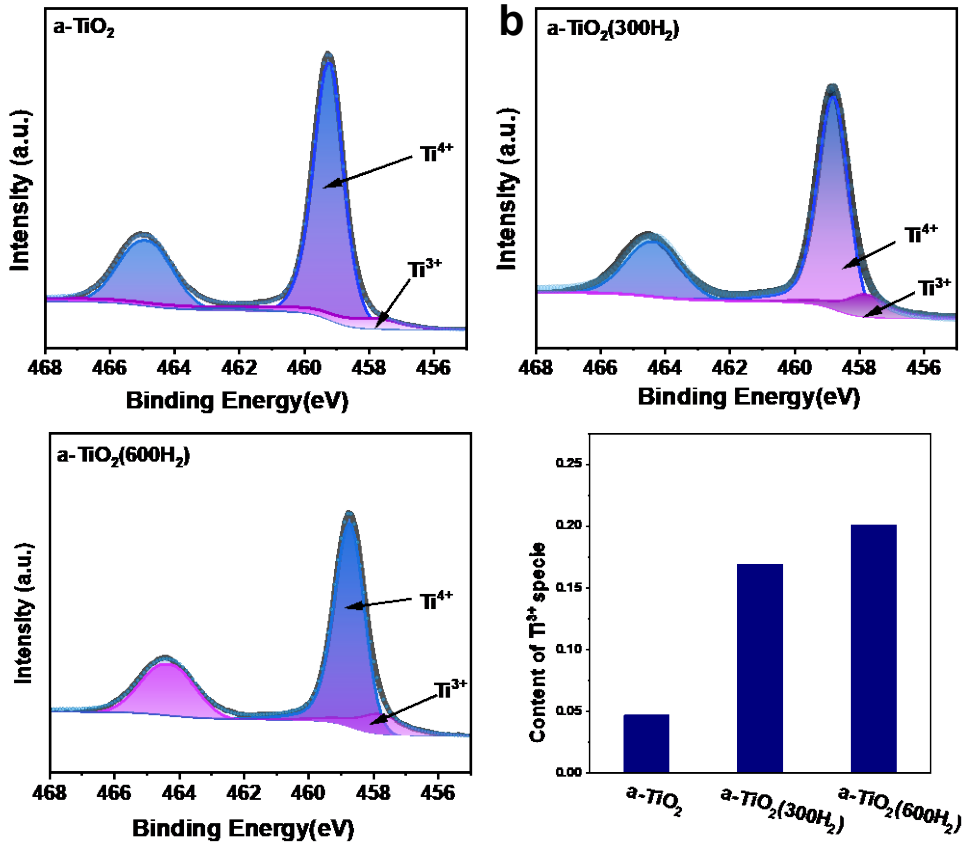

Fig. S9 Ti 2p spectra of various anayase-TiO_2 support (a~c) and the corresponding content of Ti^{3+} (d)

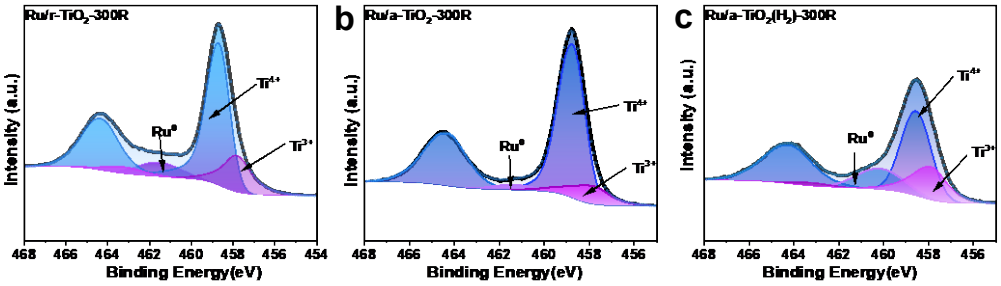

Fig. S10 XPS spectra of various reduced Ru/TiO_2 catalysts. (a) Ru/r-TiO_2-300R; (b) Ru/a-TiO_2-300R; (c) Ru/a-TiO_2(H_2)-300R

Table S1 Catalytic performance of various supported catalysts.

Entry	Sample	CO Conv. (%)	Selectivity (C%)			
			Olefins	C_{2+} paraffins	CO_2	CH_4
1	5Ru/r-TiO_2-300R	26.4	69.4	17.7	7.0	5.9
2	2Ru/a-TiO_2-300R[a]	0	-	-	-	-
3	5Ru/a-TiO_2-300R	0	-	-	-	-
4	5Ru/a-TiO_2-300R(0Na)[b]	0	-	-	-	-
5	5Ru/a-TiO_2(H_2)-300R	55.5	61.9	30.9	1.5	5.7

Reaction condition: 1 MPa, 3000 $mL \cdot g^{-1} \cdot h^{-1}$, $H_2/CO=2$, 260 ℃

2Ru/a-TiO_2-300R[a]: The Ru/a-TiO_2 catalyst with Ru loading of 2.0 wt% and Na loading of 0.2 wt%.

5Ru/a-TiO_2-300R(0Na)[b]: The Ru/a-TiO_2 catalyst with Ru loading of 5.0 wt% and Na loading of 0 wt%.