Defect engineering and spilt-over hydrogen in Pt/(WO_3-TH_2) for selective hydrogenation of C=O bond

(Supporting Information)

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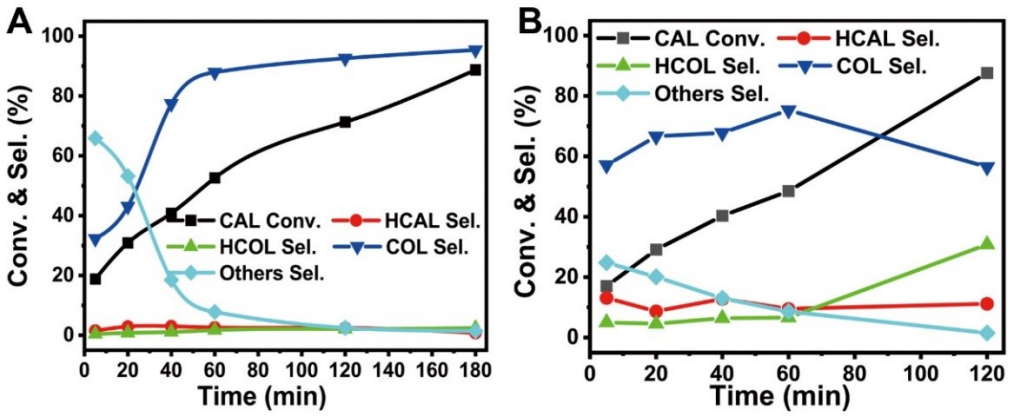

Figure S1. The time-conversion-selectivity curves of CAL on (A) Pt/(WO_3-450H_2) and (B) Pt/WO_3-450H_2 catalysts. Reaction conditions: 3.0 mmol cinnamaldehyde, 10 mL isopropanol, 100 mg catalyst, 100 °C, 4 MPa H_2.

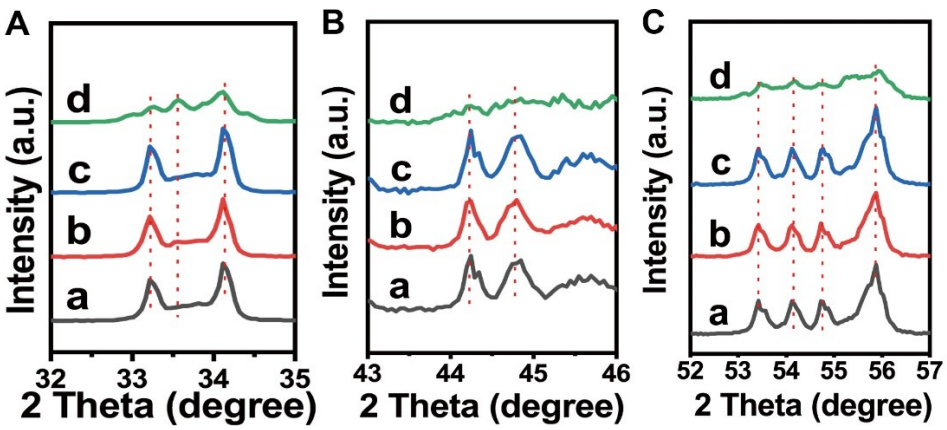

Figure S2. The enlarged XRD patterns of (a) WO_3, (b) WO_3-$150H_2$, (c) WO_3-$300H_2$ and (d) WO_3-$450H_2$ at different 2θ range in Figure 2A.

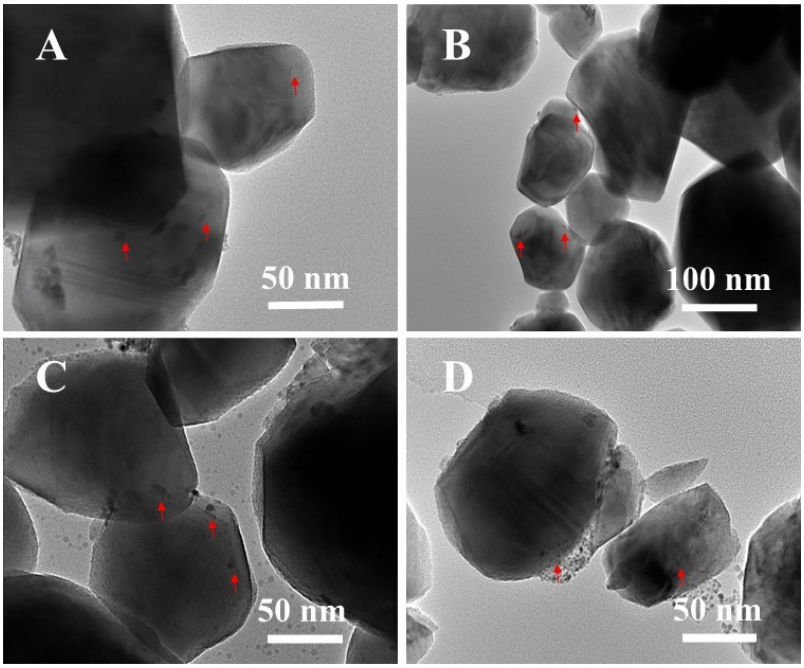

Figure S3. TEM images of the as prepared catalysts. (A) Pt/WO_3, (B) Pt/(WO_3-150H_2), (C) Pt/(WO_3-300H_2) and (D) Pt/(WO_3-450H_2).

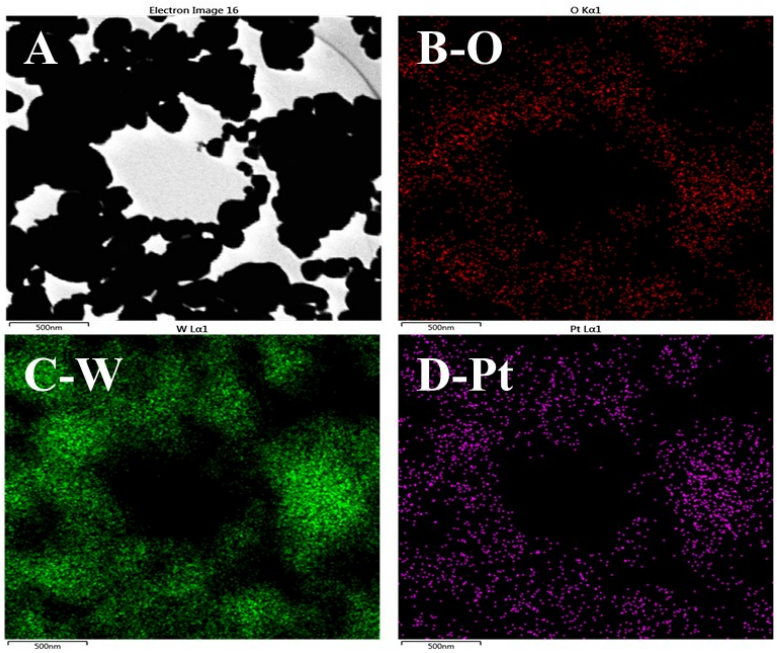

Figure S4. EDS mapping of corresponding elements of Pt/(WO_3-300H_2).

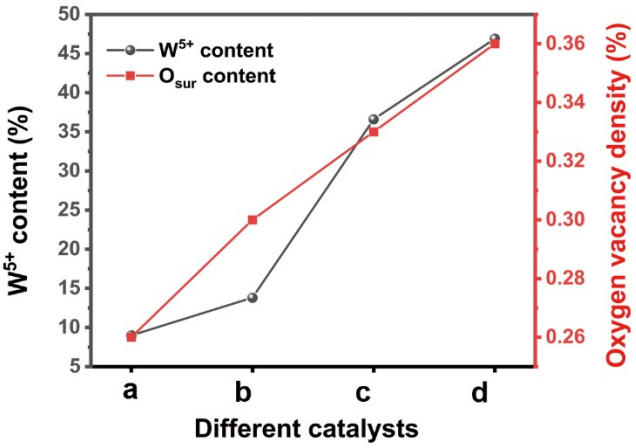

Figure S5. W^{5+} content and Oxygen vacancy density on (a) Pt/WO_3, (b) Pt/WO_3-$150H_2$, (c) Pt/WO_3-$300H_2$ and (d) Pt/WO_3-$450H_2$, respectively.

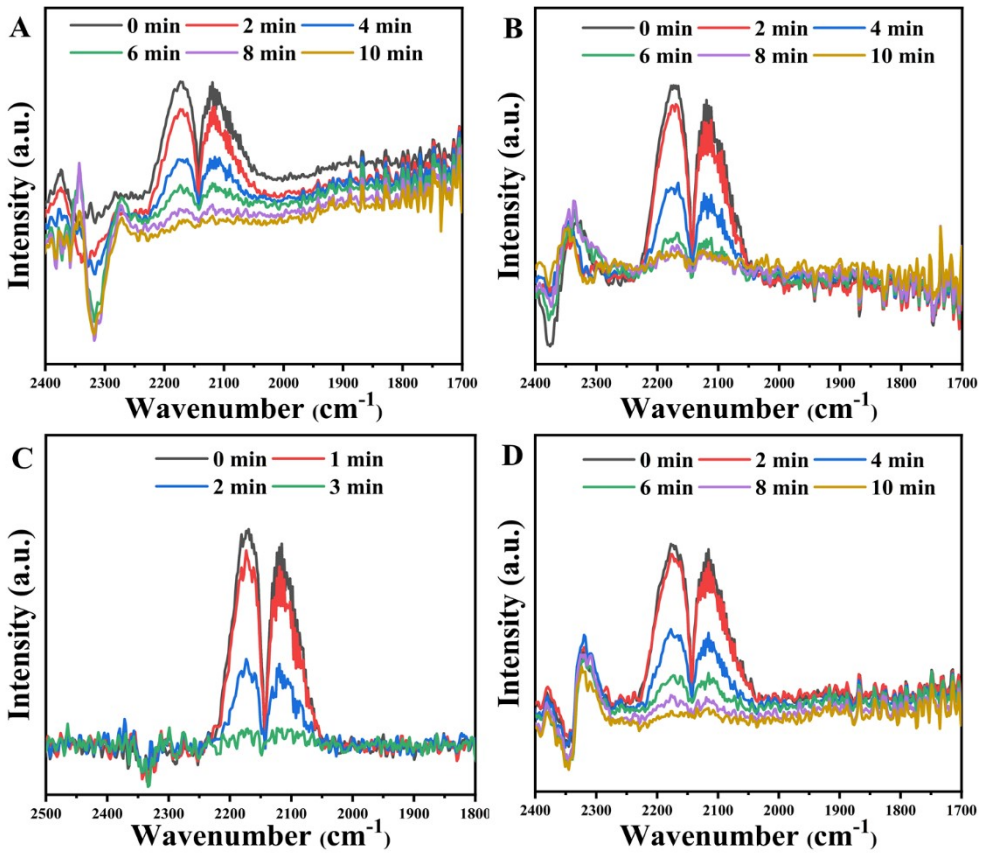

Figure S6. In-situ DRIFT spectra of CO molecular adsorbed on (A) Pt/WO_3, (B) Pt/(WO_3-150H_2), (C) Pt/(WO_3-300H_2), (D) Pt/(WO_3-450H_2) catalysts after the pre-reduction treatment with H_2 at 150°C for 30 min.

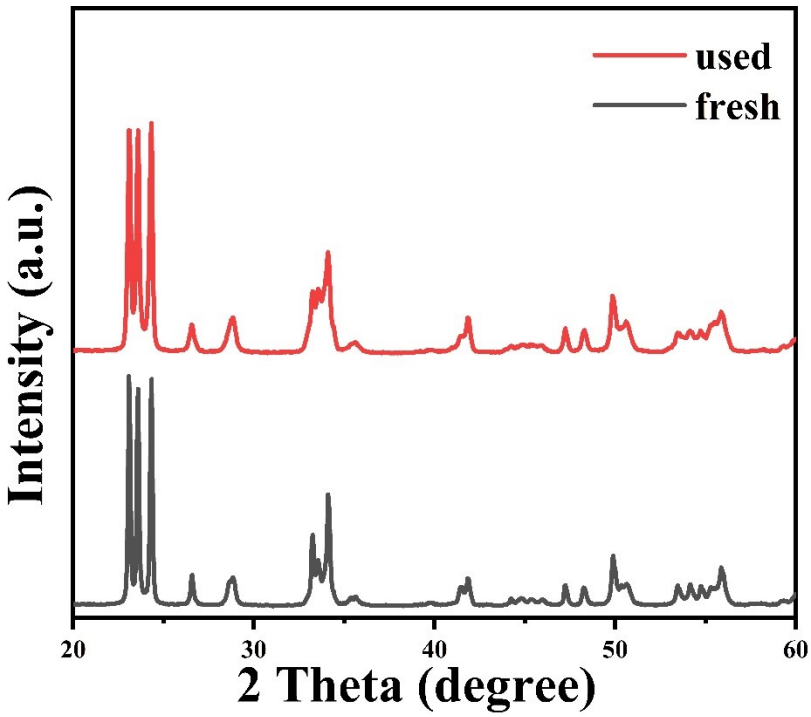

Figure S7. XRD patterns of Pt/(WO_3-300H_2): fresh catalyst (black), and used catalyst after three cycling tests (red).

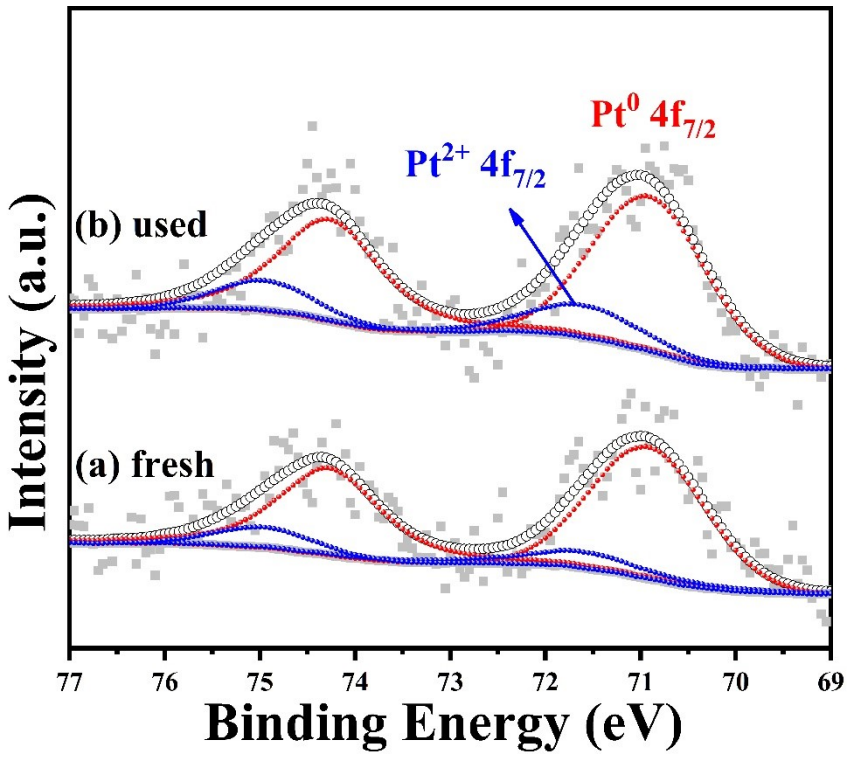

Figure S8. High resolution XPS spectra of Pt over the Pt/(WO_3-300H_2) catalyst: (a) fresh catalyst, and (b) used catalyst after three cycling tests.

Table S1. Degree of metal dispersion and average diameter of metal particles for the various Pt/(WO_3-TH_2) catalysts.

Entry	Catalysts	D_{Pt} (%)[a]	d_{Pt} (nm)[b]	d_{Pt} (nm)[c]	Loading (%)[d]
1	Pt/WO_3	33.45	3.39	4.23	0.926
2	Pt/(WO_3-150H_2)	23.15	4.89	4.96	1.07
3	Pt/(WO_3-300H_2)	29.92	3.79	4.11	0.744
4	Pt/(WO_3-450H_2)	39.63	2.86	3.62	0.823

a. Degree of Pt dispersion determined by CO pulse adsorption.
b. Average diameter of the Pt particles determined by CO pulse adsorption.
c. Average diameter of the Pt particles determined by TEM results.
d. The exactly Pt loading tested by ICP.

Table S2. Assignment of in-situ DRIFTS absorption bands observed in **Figure 8** and **Figure 9**.

Entry	Peak position (cm^{-1})	Vibration mode	Reference
1	1449, 1492, 1600 cm^{-1}	C=C stretching of phenyl ring	[1, 2]
2	1625 cm^{-1}	stretching of C=C in -CH-CH-	[1, 3, 4]
3	1673-1681 cm^{-1}	stretching vibration of -C=O	[1, 3, 4]

References

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