Supporting information for

Selective 5-hydroxymethylfurfural hydrogenolysis to 2,5-dimethylfuran over bimetallic Pt-FeO_X/AC catalysts

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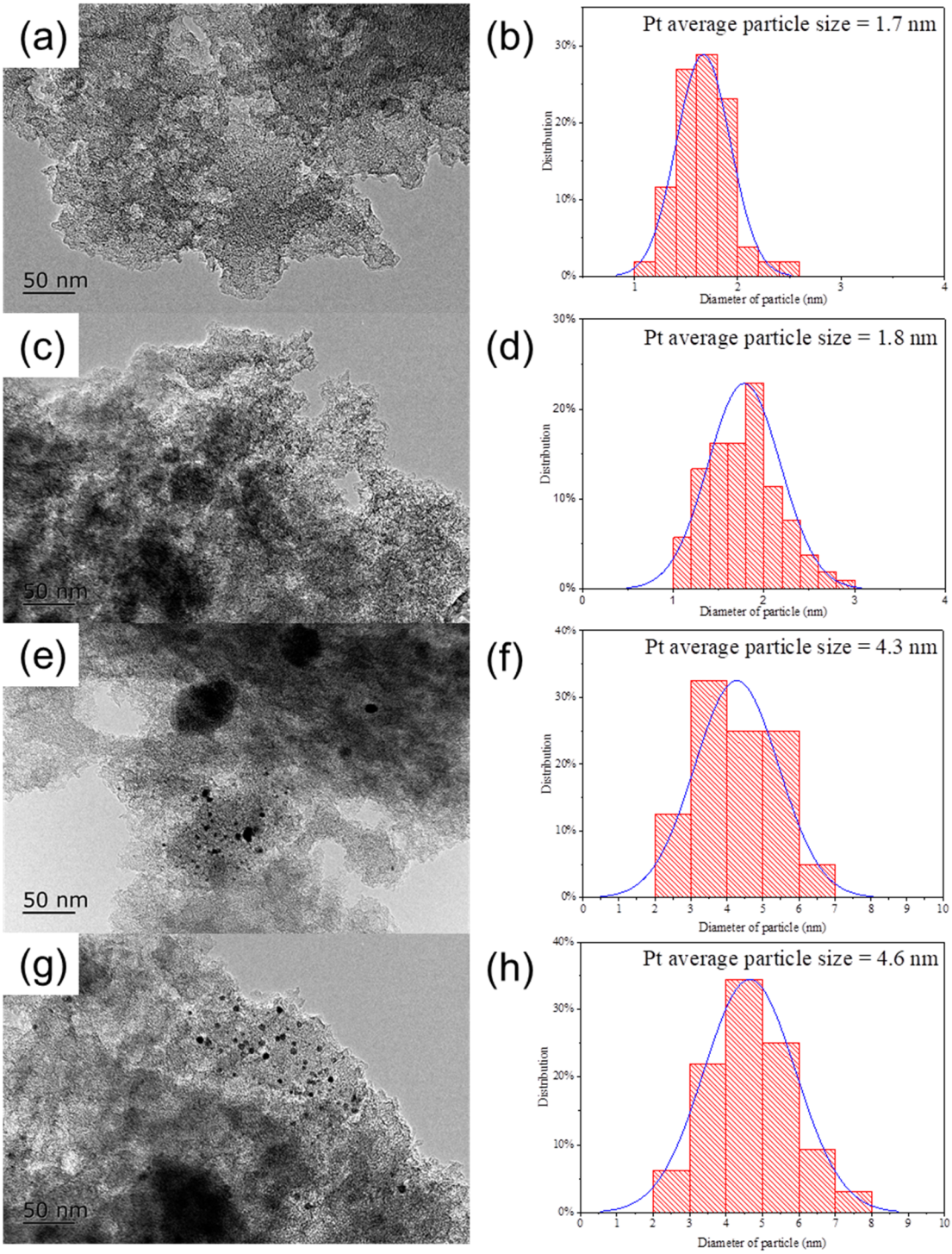

Figure S1. TEM images and particle size distribution histogram of 0.1% Pt-2% FeO_x/AC (a, b), 0.3% Pt-2% FeO_x/AC (c, d), 0.5% Pt-1% FeO_x/AC (e, f), 0.5% Pt-5.83% FeO_x/AC (g, h).

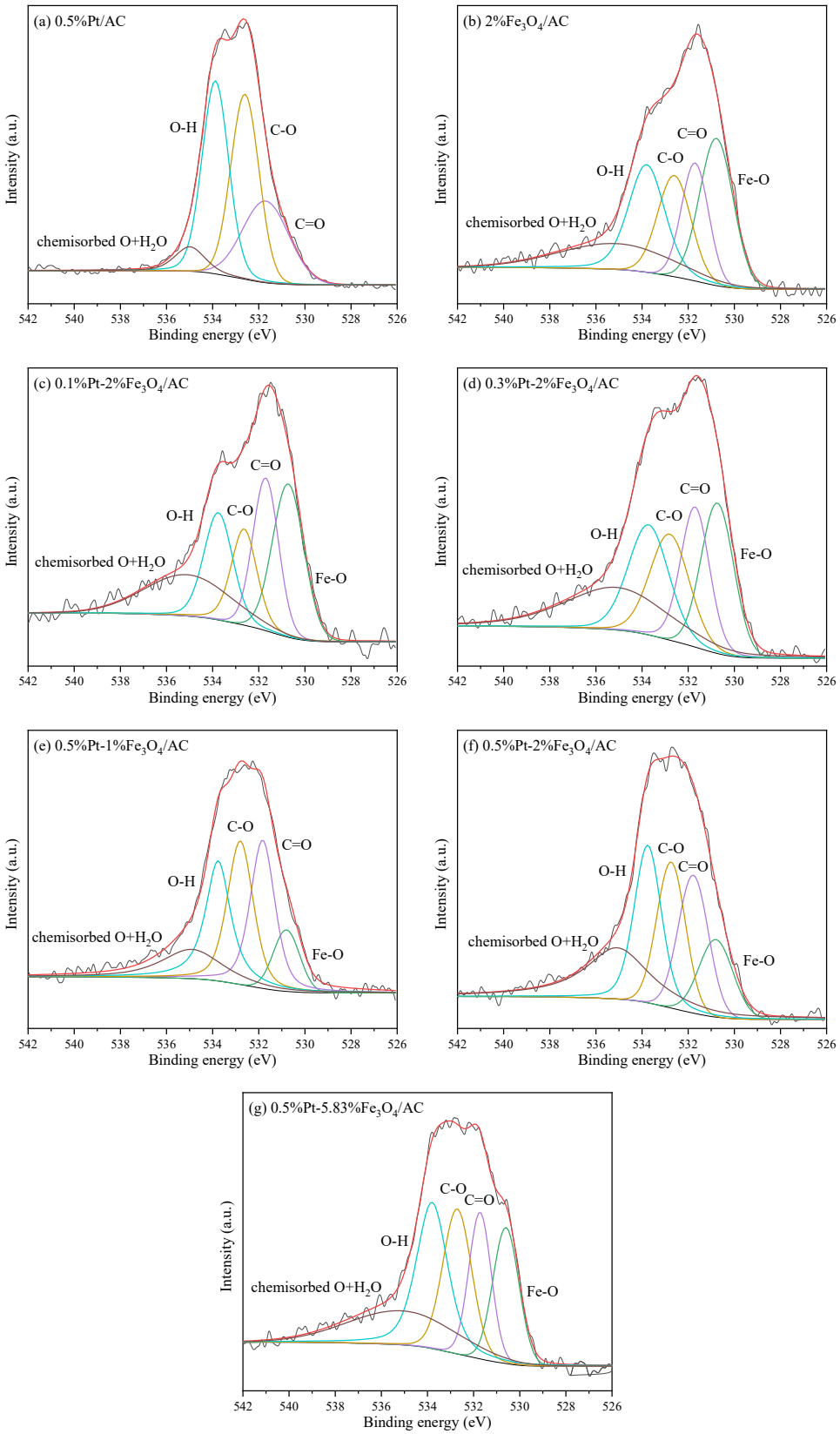

Figure S2. The O 1s XPS spectra of different catalysts.

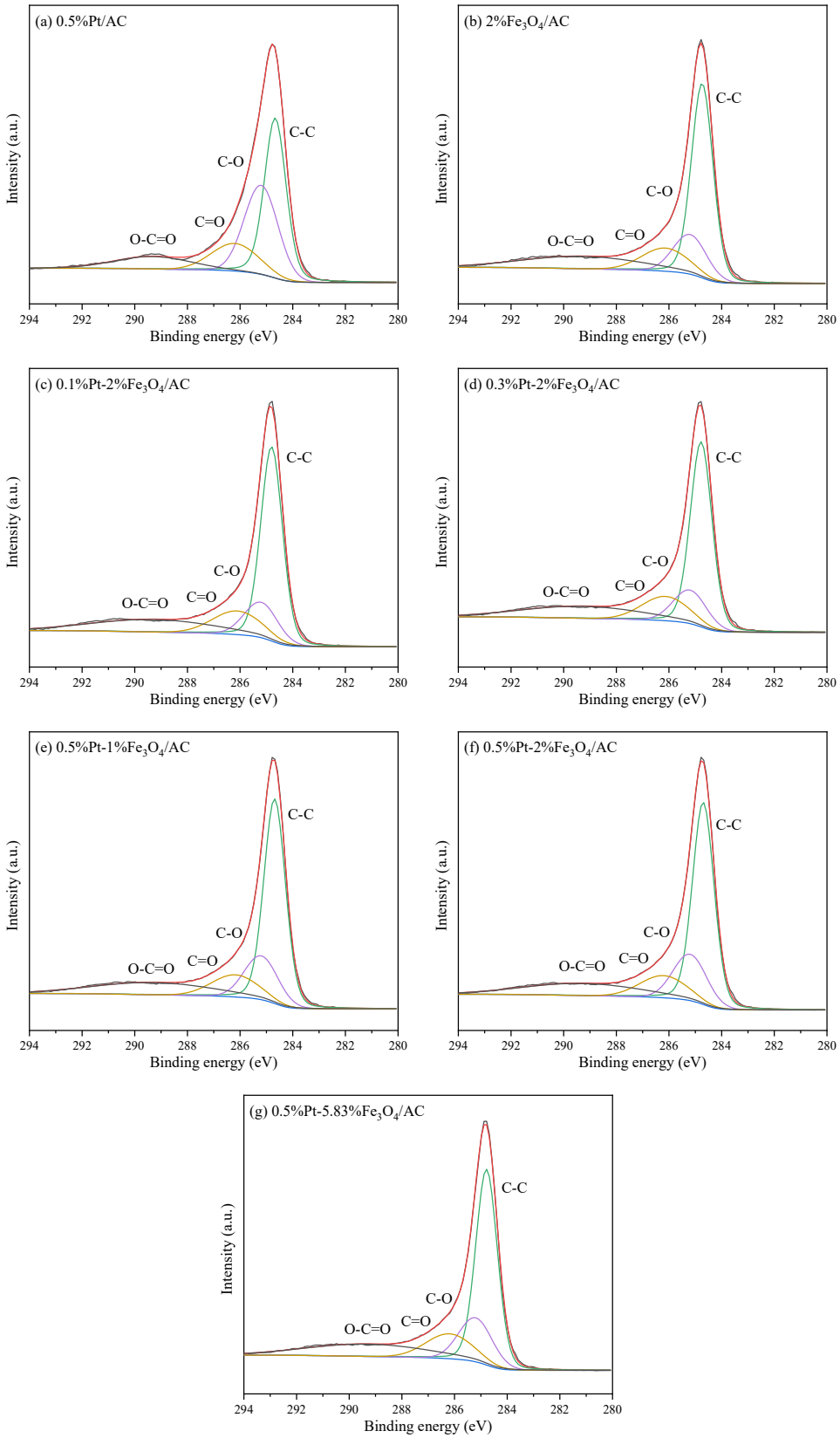

Figure S3. The C 1s XPS spectra of different catalysts.

Table S1. The O 1s and C 1s XPS peak fitting data of different catalysts.

catalysts	O 1s					C 1s			
	Fe-O	C=O	C-O	O-H	chemisorbed $O+H_2O$	C-C	C-O	C=O	O-C=O
0.5%Pt/AC	-	24.5%	34.4%	35.4%	5.7%	42.2%	32.5%	14.7%	10.6%
2%FeO_x/AC	27.3%	17.0%	18.0%	21.9%	15.8%	53.0%	16.3%	12.8%	17.9%
0.1%Pt-2%FeO_x/AC	26.1%	21.7%	14.8%	18.0%	19.4%	52.6%	15.3%	13.7%	18.4%
0.3%Pt-2%FeO_x/AC	20.8%	18.2%	18.5%	20.3%	22.2%	53.1%	14.5%	14.2%	18.2%
0.5%Pt-1%FeO_x/AC	10.8%	27.5%	24.2%	20.3%	17.1%	54.2%	16.6%	12.2%	17.1%
0.5%Pt-2%FeO_x/AC	12.8%	20.2%	20.3%	23.4%	23.3%	53.7%	18.2%	11.6%	16.5%
Used-1st 0.5%Pt-2%FeO_x/AC	6.9%	21.0%	37.9%	28.5%	5.7%	52.3%	17.5%	18.4%	11.8%
Used-4th 0.5%Pt-2%FeO_x/AC	1.7%	13.9%	35.2%	34.9%	14.3%	41.9%	24.7%	23.3%	10.1%
0.5%Pt-5.83%FeO_x/AC	17.2%	16.5%	21.4%	26.8%	18.1%	51.8%	16.4%	14.0%	17.7%

Table S2. Reports on the hydrogenation of HMF to DMF over Pt based catalysts.

Catalyst	Catalyst/metal amount	HMF concentration	Reaction conditions	Solvent	Conv. (%)	DMF yield (%)	Average reaction rate ($mmol \cdot g^{-1} \cdot h^{-1}$)	Ref.
Pt/C	50mg, 10wt%Pt	W/F=50 g*min/g	180℃, 3.3MPa H_2	ethanol	100%	70.0%	-	[1]
Pt/rGO	0.02mmol Pt, 5wt%Pt	2mmol/12ml	120℃, 2h, 3MPa H_2	n-butanol	100%	73.2%	187.6	[2]
Pt@MOF-T3	0.02mmol Pt, 10wt%Pt	2mmol/12ml	140℃, 8h, 3MPa H_2,	n-butanol	99.6%	96.1%	61.6	[3]
Pt_3Co_2/C	50mg, 10wt%	W/F=1.0 g*min/mL	160℃, 3.3MPa H_2，	1-propanol	100%	98.0%	46.4	[4]
PtCo/GC	50mg, 10wt%Pt, 10wt%Co	2mmol/45ml	180℃, 2h, 1MPa H_2.	commercial gasoline	100%	95.0%	95.0	[5]
PtCo/MWCNTs	4.35 mg Pt, 8.2wt%Pt, 6.3wt%Co	0.4mmol/30 mL	160℃, 8h, 1MPa H_2	n-butanol	100%	92.3%	6.0	[6]
PtCo@HCS	50mg, 12.0wt%Pt, 12.2wt%Co	2mmol/6ml	180℃, 2h, 1MPa H_2	n-butanol	100%	98.0%	81.0	[7]
Pt_1/Co SAA	80mg, 0.001mmol Pt	0.5mmol/10ml	180℃, 2h, 1MPa H_2	tetrahydrofuran	100%	92.9%	2.90	[8]
Pt_3Co BNN	1.3 mg	0.25mmol/2ml	160℃, 24h, 1MPa H_2	ethanol	100%	78.0%	6.25	[9]
Pt_3Ni/C	50mg, 10wt%	W/F=1.0 g*min/mL	200℃, 3.3MPa H_2，	1-propanol	100%	98.0%	46.4	[10]
PtIr-CMK-3	150mg, 0.5wt%Pt, 0.5wt%Ir	1.2mmol/50mL	120℃, 4h, 1.5MPa H_2	tetrahydrofuran	98%	86.0%	172	[11]
Pt-FeO_x/AC	100mg, 0.5wt%Pt, 2wt%Fe	2mmol/20ml	180℃, 6h, 1.5MPa H_2	n-butanol	100%	91.1%	121.5	This work

Average reaction rate = DMF yield × mmol of HMF / metal mass / reaction time.

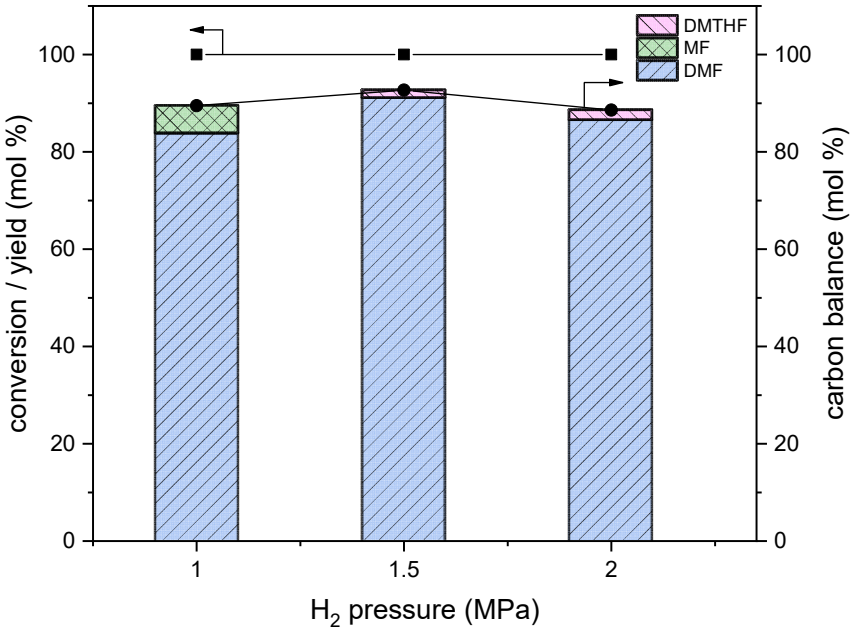

Figure S4. Effect of H_2 pressure on HMF hydrogenolysis over 0.5% Pt-2% FeO_x/AC. [Reaction conditions: T = 180 °C, t = 6 h, stirring speed = 600 rpm, m_{HMF} = 250 mg, $m_{catalyst}$ = 100 mg, $V_{n\text{-butanol}}$ = 20 mL.]

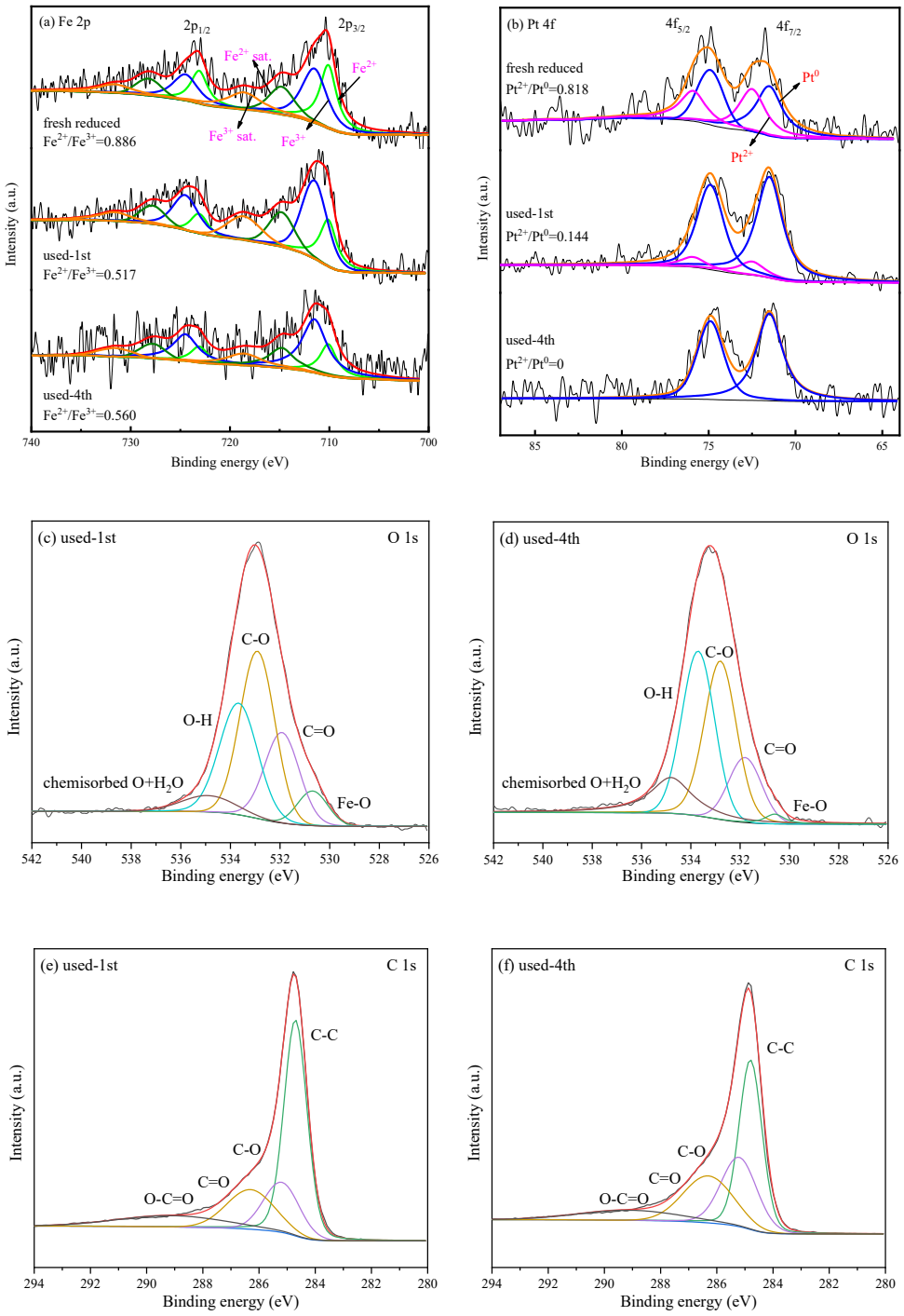

Figure S5. The Fe 2p (a), Pt 4f (b), O 1s (c) and C 1s (d-f) XPS spectra of fresh reduced, used-1st and used-4th 0.5% Pt-2% FeO_x/AC catalyst.

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