Supporting Information

for

Hydrogenation of CO to Olefins over Supported Iron Catalyst on $MgAl_2O_4$ Spinel：Effect of the spinel Synthesis Method

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Table S1. The amount of reagents used for support preperation (unit: g)

Sample	*$Al(NO_3)_3 \cdot 9H_2O$*	*$Mg(NO_3)_2 \cdot 6H_2O$*	*$C_6H_6O_7 \cdot H_2O$ (CA)*	*$C_{10}H_{16}N_2O_8$ (EDTA)*	*$NH_3 \cdot H_2O$ (25%)*
MAC	*30.0104*	*10.2564*	*25.2168*	*--*	*--*
MAG	*30.0104*	*10.2564*	*--*	*35.0688*	*30 mL*
MAP	*30.0104*	*10.2564*	*--*	*--*	*300 mL*

Table S2. The amount of reagents used for catalyst preperation (unit:g)

Sample	*Support*	*$Fe(NO_3)_3 \cdot 9H_2O$*	*$Mn(NO_3)_2$ (50% aq)*	*KNO_3*	*$C_6H_6O_7 \cdot H_2O$ (CA)*
CMAC	*5.0000*	*4.1461*	*0.7480*	*0.1488*	*3.1928*
CMAG	*5.0000*	*4.1461*	*0.7480*	*0.1488*	*3.1928*
CMAP	*5.0000*	*4.1461*	*0.7480*	*0.1488*	*3.1928*

Table S3 Compositions of the catalysts determined by ICP

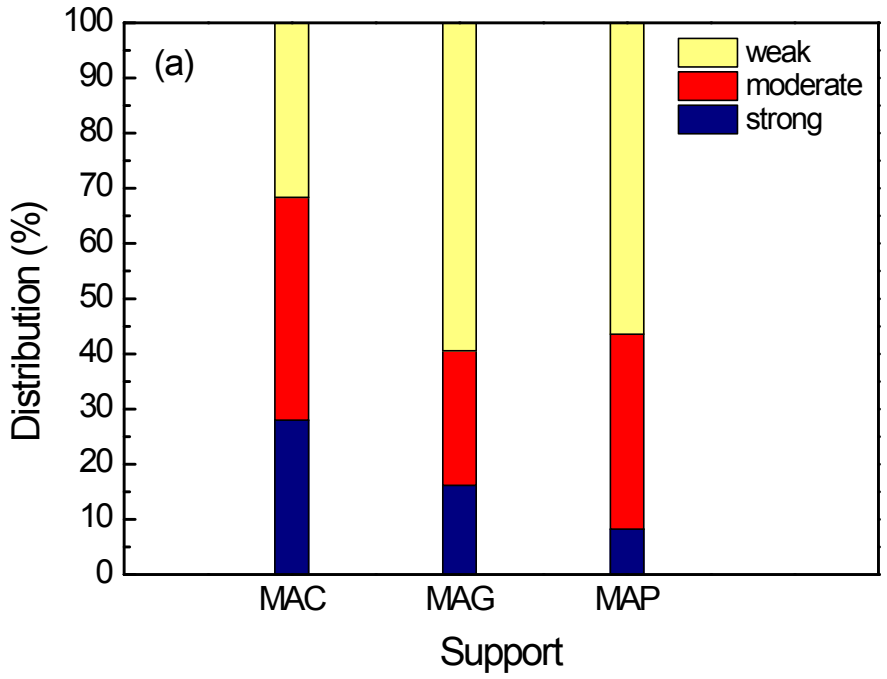
K-Mn-Fe/ $MgO \cdot Al_2O_3$-X	CMAC	CMAG	CMAP
K (wt%)	*0.73*	*0.68*	*0.71*
Mn (wt%)	*1.82*	*1.75*	*1.78*
Fe (wt%)	*7.06*	*6.89*	*6.97*

Table S4 Data of peak deconvolution for CO_2-TPD of supports

MAC			MAG			MAP		
Center Temp. (^oC)	Peak Area (a.u.)	Percentage (%)	Center Temp. (^oC)	Peak Area (a.u.)	Percentage (%)	Center Temp. (^oC)	Peak Area (a.u.)	Percentage (%)
142.2	*453.1*	*7.4*	*115.0*	*54.6*	*3.8*	*141.0*	*442.0*	*19.8*
193.7	*1473.3*	*24.2*	*142.2*	*481.9*	*33.9*	*188.0*	*818.4*	*36.6*
278.4	*1922.4*	*31.6*	*214.2*	*309.4*	*21.7*	*246.9*	*589.6*	*26.4*
370.3	*535.1*	*8.8*	*285.4*	*346.8*	*24.4*	*341.1*	*199.4*	*8.9*
478.9	*940.0*	*15.4*	*420.9*	*153.8*	*10.8*	*529.7*	*184.2*	*8.3*
557.1	*763.6*	*12.5*	*585.3*	*76.6*	*5.4*			

Table S5 Data of peak deconvolution for CO_2-TPD of catalysts

CMAC			CMAG			CMAP		
Center Temp. (°C)	Peak Area (a.u.)	Percentage (%)	Center Temp. (°C)	Peak Area (a.u.)	Percentage (%)	Center Temp. (°C)	Peak Area (a.u.)	Percentage (%)
136.2	*879.1*	*19.4*	*133.3*	*319.1*	*23.1*	*160.3*	*630.5*	*21.6*
185.7	*983.7*	*21.7*	*195.5*	*411.8*	*29.8*	*218.1*	*826.4*	*28.3*
253.0	*577.5*	*12.7*	*279.1*	*158.9*	*11.5*	*323.6*	*874.6*	*29.9*
318.2	*428.6*	*9.4*	*350.8*	*51.1*	*3.7*	*507.8*	*280.3*	*9.6*
426.3	*615.9*	*13.6*	*506.3*	*194.8*	*14.1*	*699.5*	*310.0*	*10.6*
496.3	*577.8*	*12.7*	*438.4*	*28.2*	*2.0*			
655.3	*219.5*	*4.8*	*604.1*	*167.5*	*12.1*			
589.8	*260.0*	*5.7*	*737.4*	*49.5*	*3.6*			



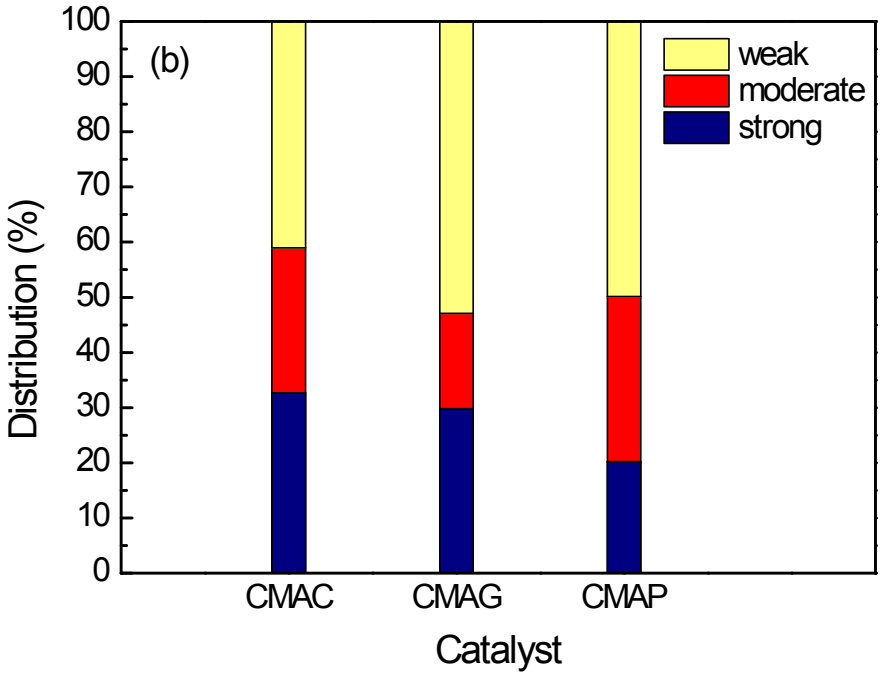
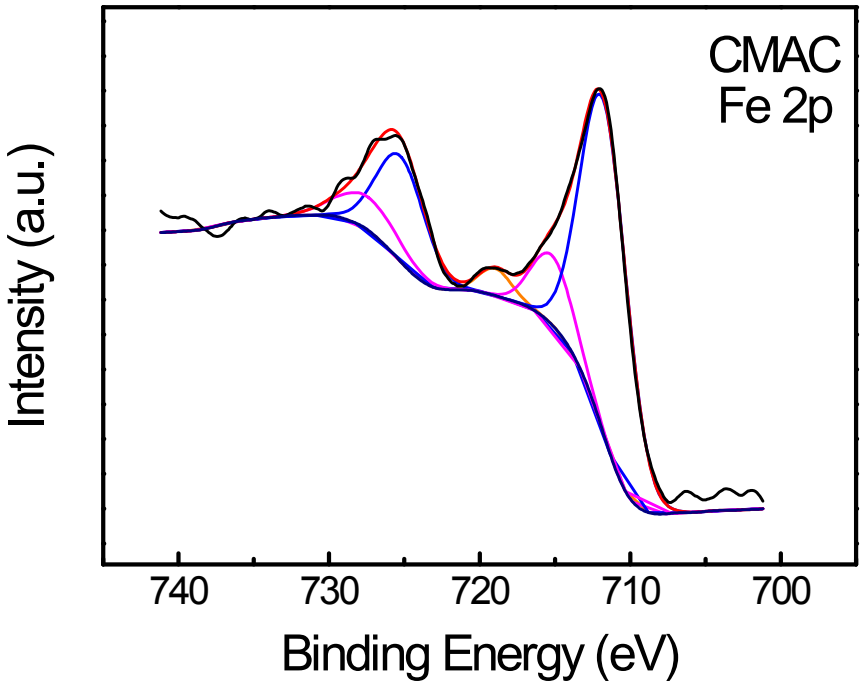


Fig. S1. CO_2-TPD of the supports: (a) and corresponding catalysts: (b).



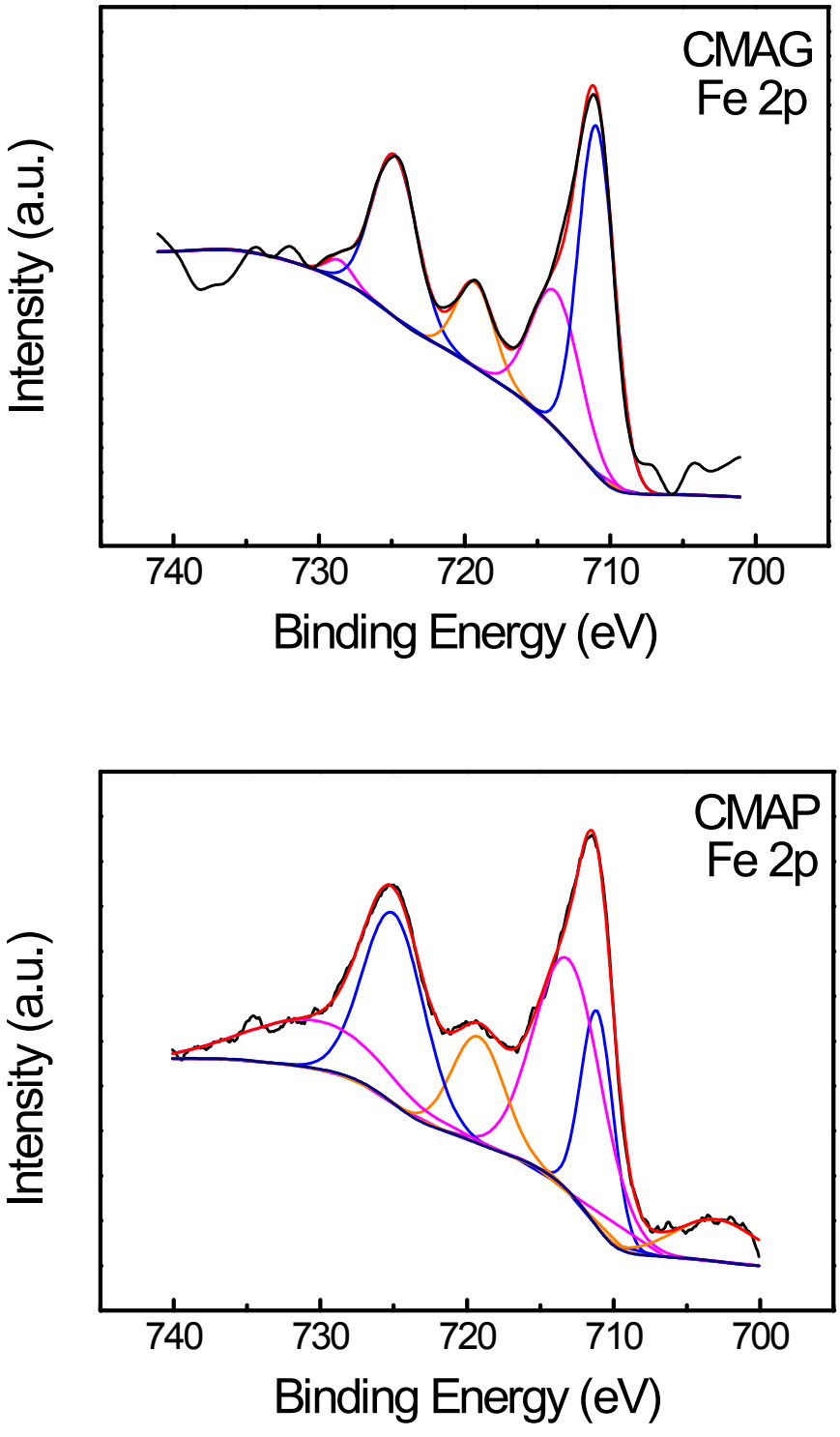
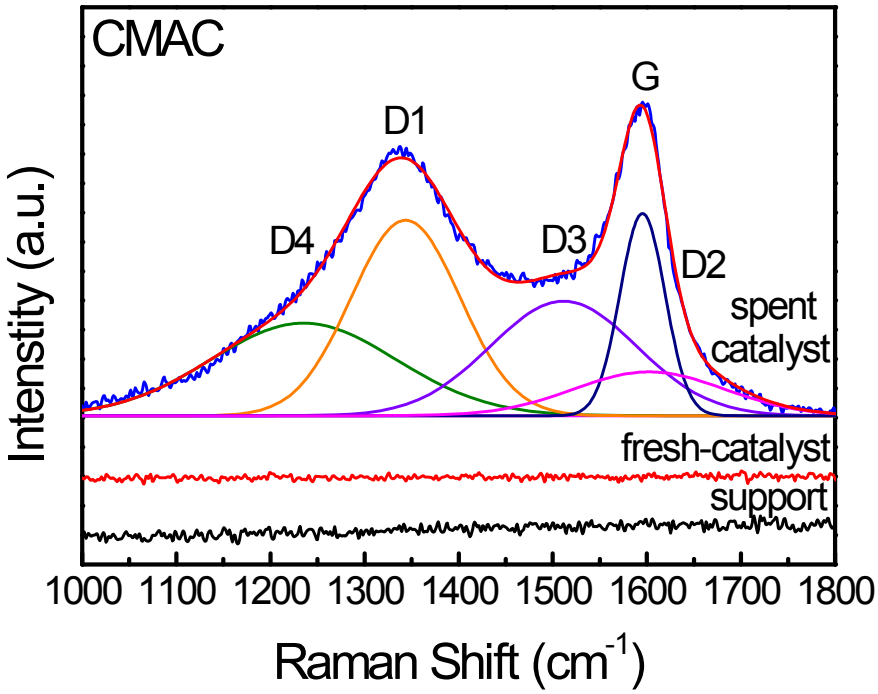
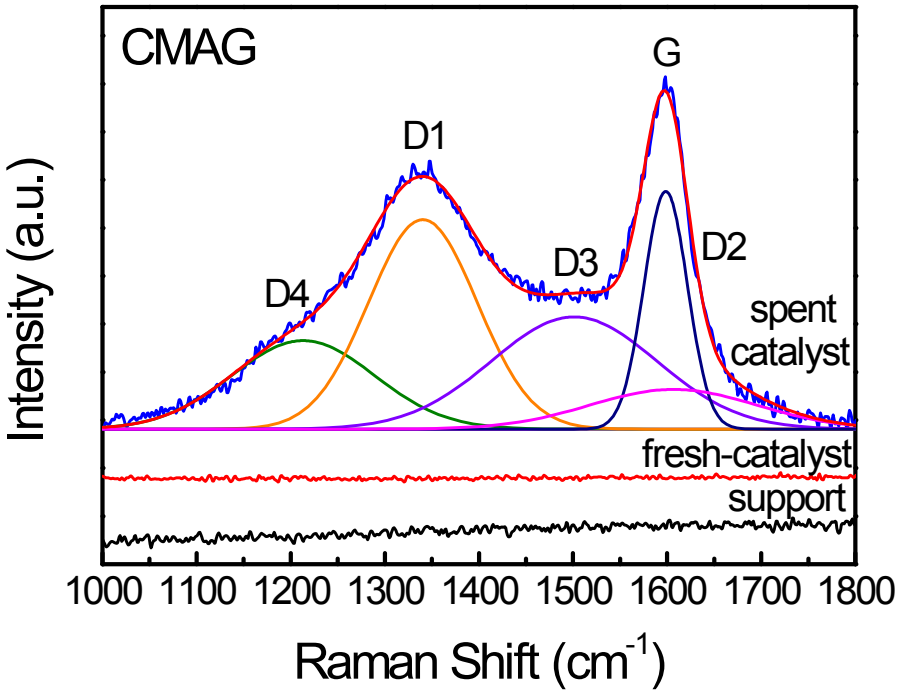


Fig. S2. Fe 2p XPS spectra of pretreated catalysts


CMAC
G
D1
D4
D3
D2
spent
catalyst
fresh-catalyst
support
Intenstity (a.u.)
1000 1100 1200 1300 1400 1500 1600 1700 1800
Raman Shift (cm-1)


CMAG
G
D1
D4
D3
D2
spent
catalyst
fresh-catalyst
support
Intensity (a.u.)
1000 1100 1200 1300 1400 1500 1600 1700 1800
Raman Shift (cm-1)

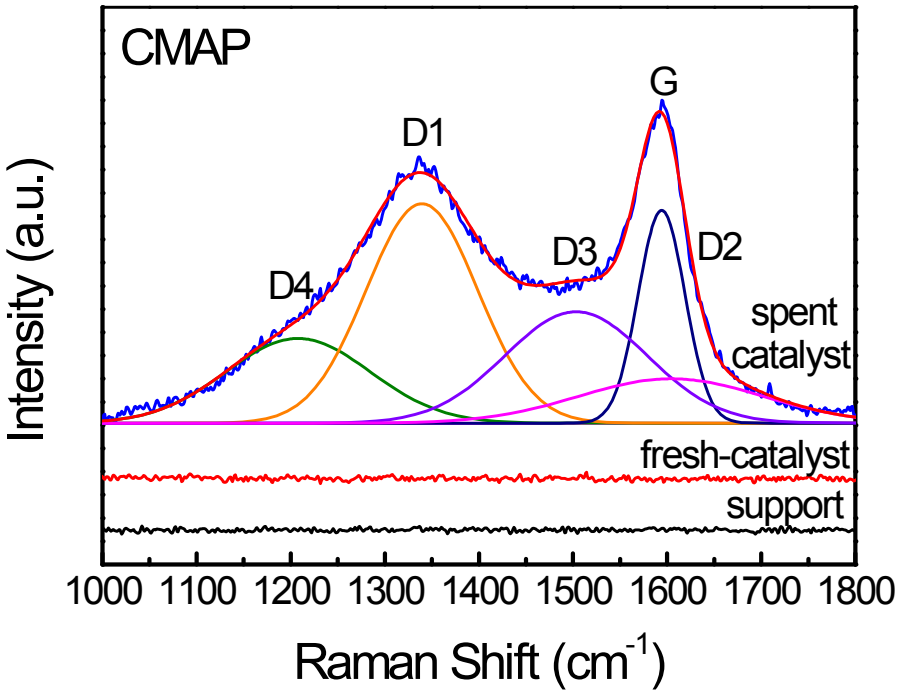


Fig. S3. Raman spectra of spent catalysts

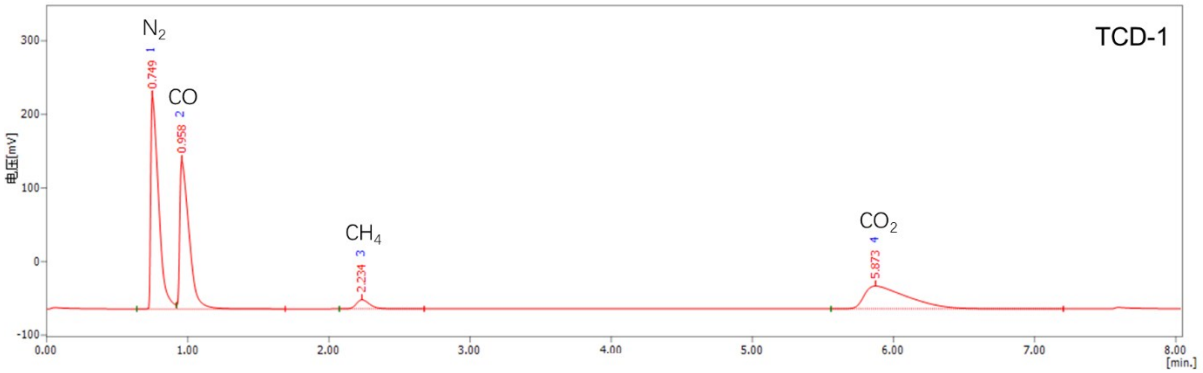
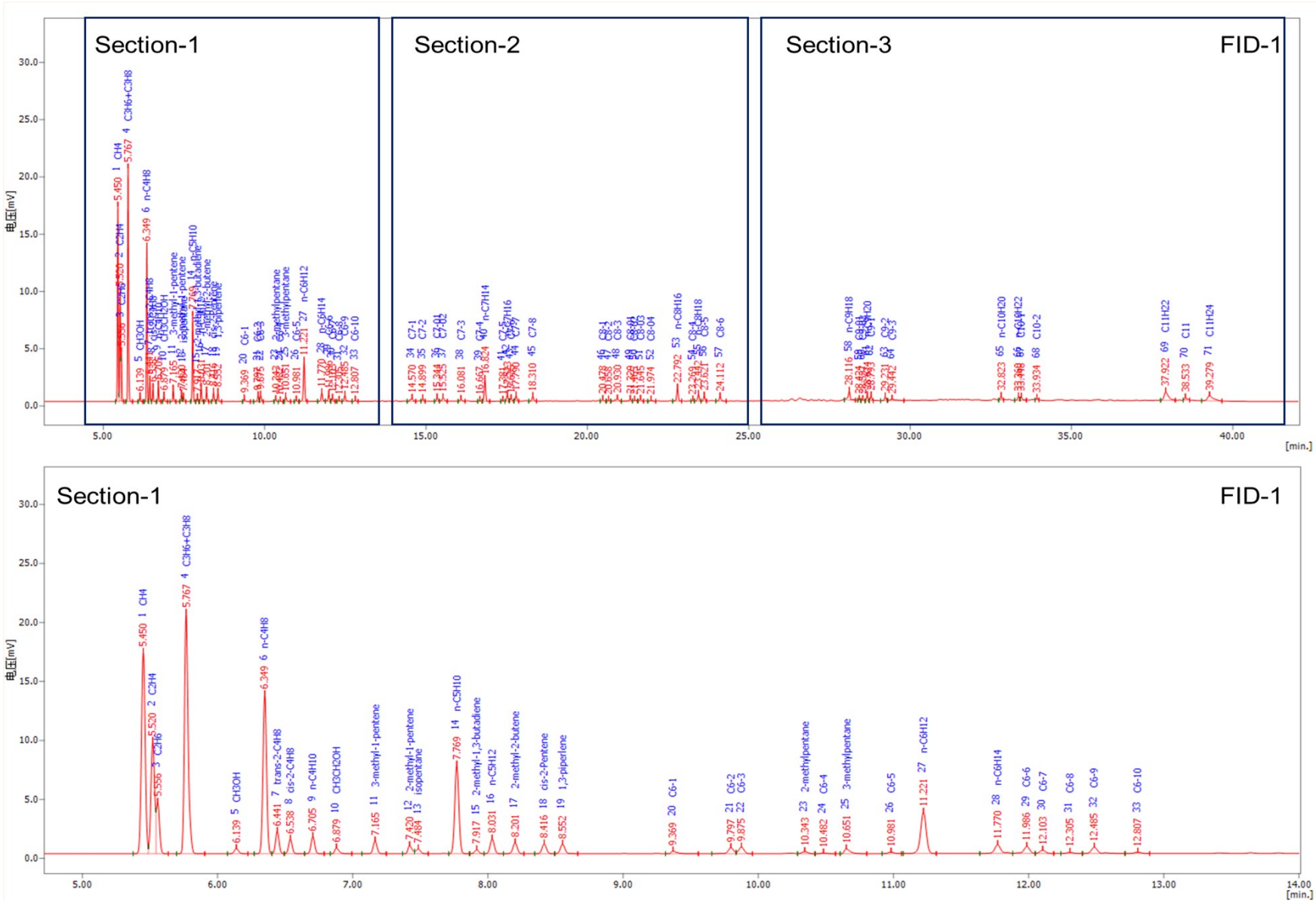
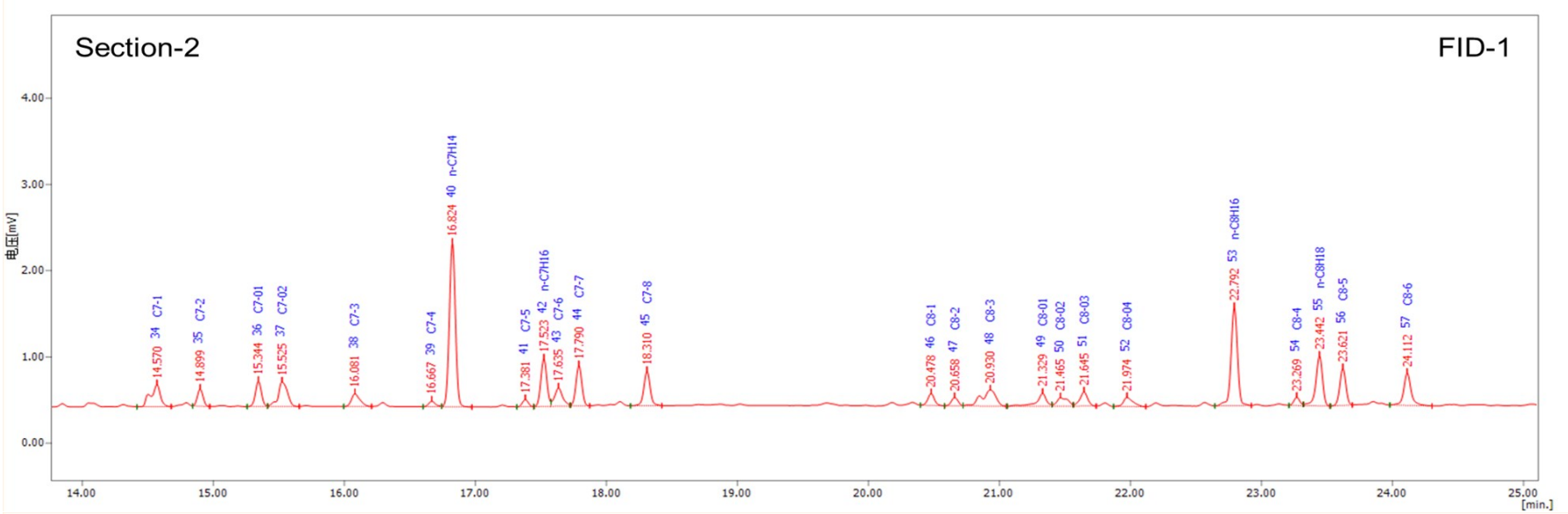
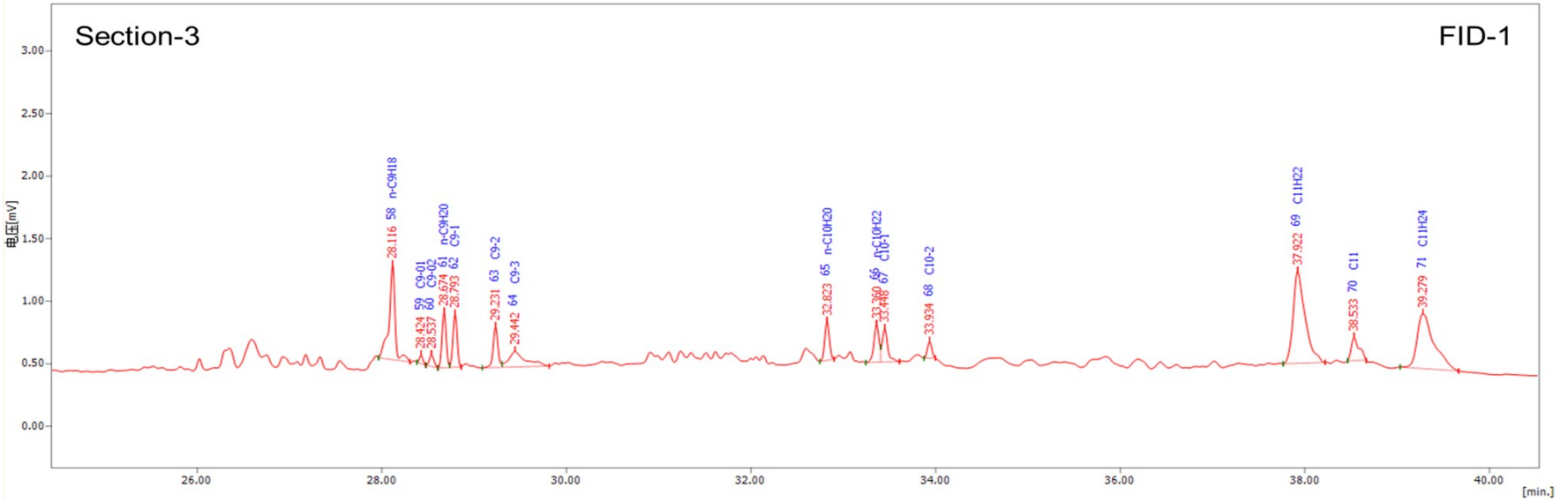


Fig. S4 Chromatogram of TCD detector


Section-1
Section-2
Section-3
FID-1
电压[mV]
[min.]
1 CH4
2 C2H4
3 C2H6
4 C3H6+C3H8
5 CH3OH
6 n-C4H8
7 trans-2-C4H8
8 cis-2-C4H8
9 n-C4H10
10 CH3CH2OH
11 3-methyl-1-pentene
12 2-methyl-1-pentene
13 isopentane
14 n-C5H10
15 2-methyl-1,3-butadiene
16 n-C5H12
17 2-methyl-2-butene
18 cis-2-Pentene
19 1,3-piperlene
20 C6-1
21 C6-2
22 C6-3
23 2-methylpentane
24 C6-4
25 3-methylpentane
26 C6-5
27 n-C6H12
28 n-C6H14
29 C6-6
30 C6-7
31 C6-8
32 C6-9
33 C6-10
34 C7-1
35 C7-2
38 C7-3
45 C7-8
46 C8-1
47 C8-2
48 C8-3
52 C8-04
53 n-C8H16
56 C8-4
57 C8-6
58 n-C9H18
63 C9-2
64 C9-3
65 n-C10H20
68 C10-2
69 C11H22
70 C11
71 C11H24


Section-2
FID-1
电压[mV]
4.00
3.00
2.00
1.00
0.00
14.570 34 C7-1
14.899 35 C7-2
15.344 36 C7-01
15.525 37 C7-02
16.081 38 C7-3
16.667 39 C7-4
16.824 40 n-C7H14
17.381 41 C7-5
17.523 42 n-C7H16
17.635 43 C7-6
17.790 44 C7-7
18.310 45 C7-8
20.478 46 C8-1
20.658 47 C8-2
20.930 48 C8-3
21.329 49 C8-01
21.465 50 C8-02
21.645 51 C8-03
21.974 52 C8-04
22.792 53 n-C8H16
23.269 54 C8-4
23.442 55 n-C8H18
23.621 56 C8-5
24.112 57 C8-6
14.00
15.00
16.00
17.00
18.00
19.00
20.00
21.00
22.00
23.00
24.00
25.00
[min.]


Section-3
FID-1
电压[mV]
3.00
2.50
2.00
1.50
1.00
0.50
0.00
28.116 58 n-C9H18
28.424 59 C9-01
28.537 60 C9-02
28.674 61 n-C9H20
28.793 62 C9-1
29.231 63 C9-2
29.442 64 C9-3
32.823 65 n-C10H20
33.380 66 n-C10H22
33.448 67 C10-1
33.934 68 C10-2
37.922 69 C11H22
38.533 70 C11
39.279 71 C11H24
26.00
28.00
30.00
32.00
34.00
36.00
38.00
40.00
[min.]

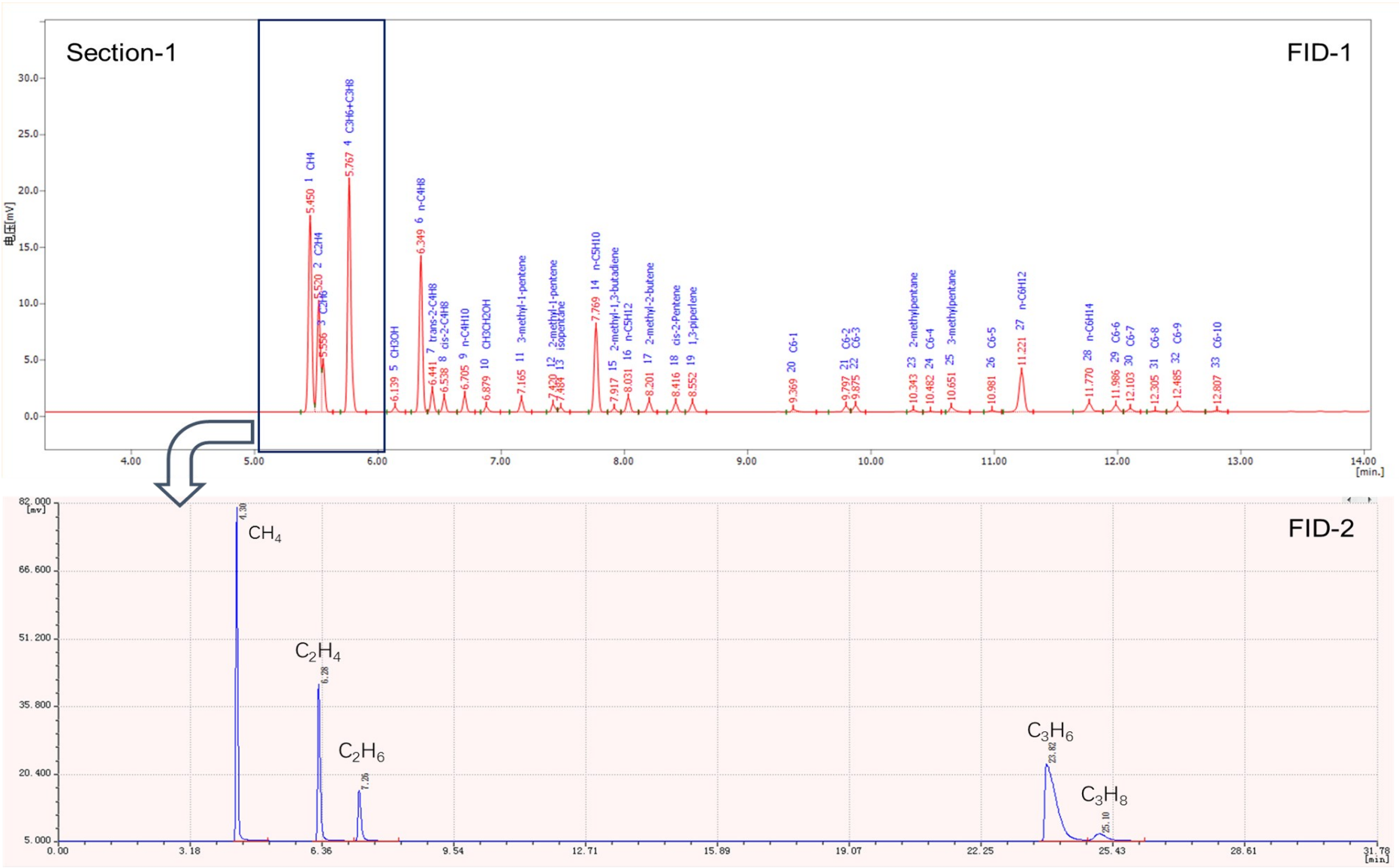


Fig. S5 Chromatogram of FID detector