Electronic Supplementary Material (ESI) for RSC Advances.

Supplementary Information

Catalytic properties and deactivation behavior of H-MCM-22 in the conversion of methanol to hydrocarbons

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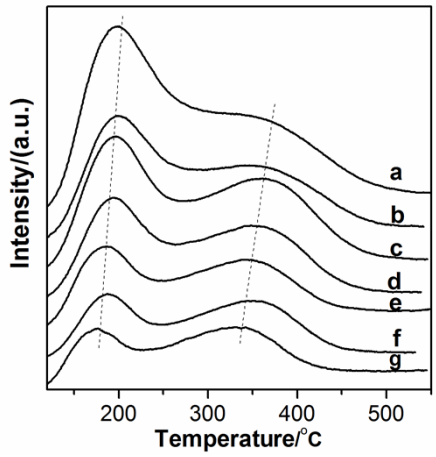


Fig. S1 NH_3-TPD profiles of the parent and oxalic acid-treated H-MCM-22 samples; (a) H-MCM-22-15, (b) H-MCM-22-15-o, (c) H-MCM-22-25, (d) H-MCM-22-25-o, (e) H-MCM-22-37, (f) H-MCM-22-37-o and (g) H-MCM-22-50.

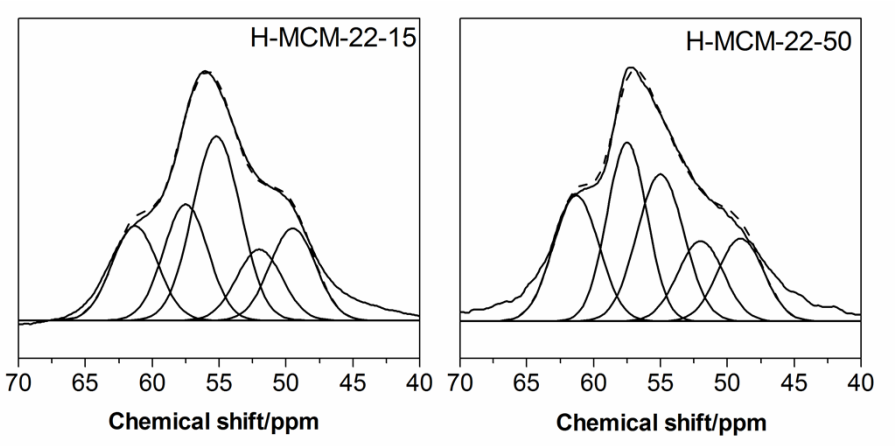


Fig. S2 Deconvolved ^{27}Al MAS NMR spectra of H-MCM-22-15 and H-MCM-22-50 (the dash line is the simulated spectra).

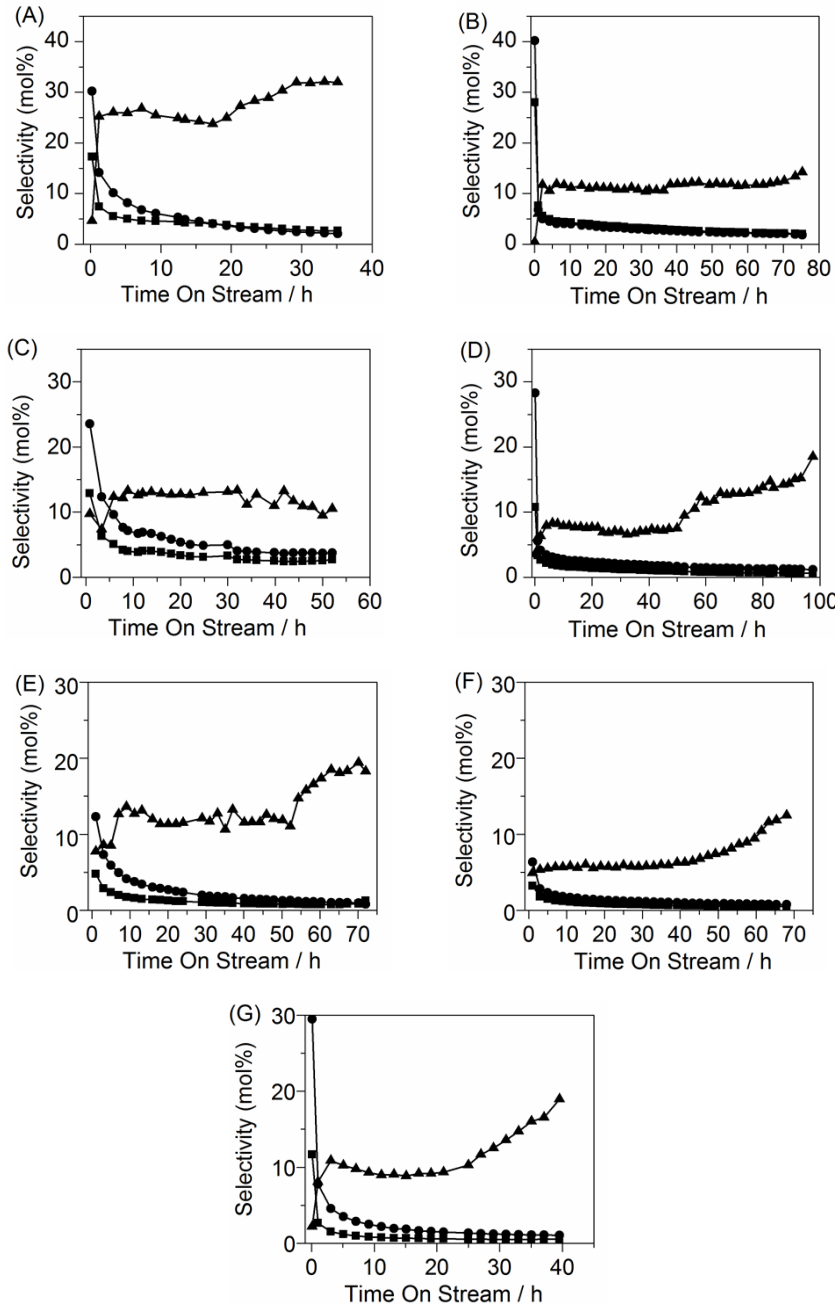


Fig. S3 Product selectivity obtained over the parent and the oxalic acid-treated H-MCM-22 samples (Reaction conditions: 450 ºC, WHSV of 2 h^{-1}); (A) H-MCM-22-15; (B) H-MCM-22-15-o; (C) H-MCM-22-25; (D) H-MCM-22-25-o; (E) H-MCM-22-37; (F) H-MCM-22-37-o; (G) H-MCM-22-50; (■) ethane and propane, (●) butane, (▲) C6+ (aliphatic and aromatics hydrocarbons).

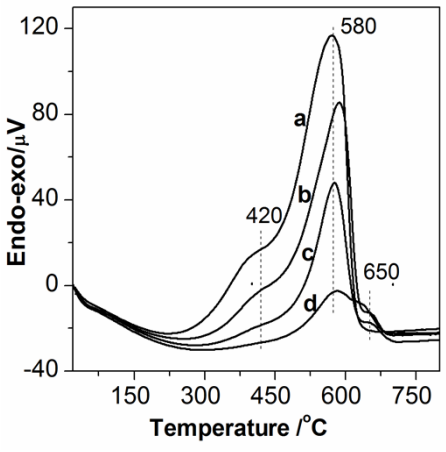


Fig. S4 DTA profiles of the coked (a) H-MCM-22-15, (b) H-MCM-25-22, (c) H-MCM-22-37 and (d) H-MCM-22-50.

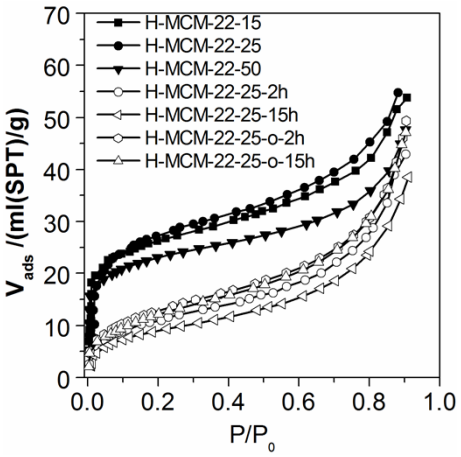


Fig. S5 *p*-Xylene adsorption isotherms at 25 °C on the fresh and coked H-MCM-22-x and H-MCM-22-x-o.

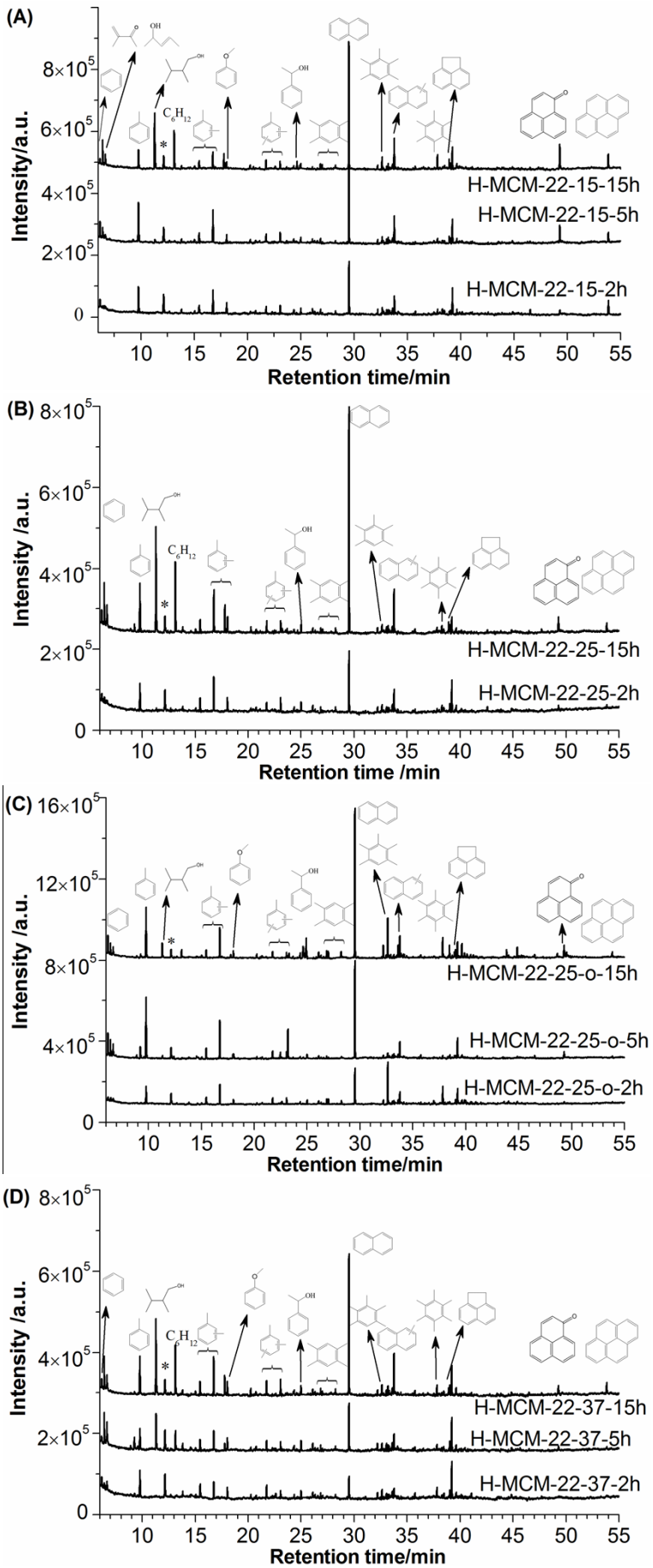

(A)
Intensity/a.u.
8×10^5
6×10^5
4×10^5
2×10^5
0
C6H12
*
H-MCM-22-15-15h
H-MCM-22-15-5h
H-MCM-22-15-2h
10 15 20 25 30 35 40 45 50 55
Retention time/min
(B)
Intensity /a.u.
8×10^5
6×10^5
4×10^5
2×10^5
0
C6H12
*
H-MCM-22-25-15h
H-MCM-22-25-2h
10 15 20 25 30 35 40 45 50 55
Retention time /min
(C)
Intensity /a.u.
16×10^5
12×10^5
8×10^5
4×10^5
0
*
H-MCM-22-25-o-15h
H-MCM-22-25-o-5h
H-MCM-22-25-o-2h
10 15 20 25 30 35 40 45 50 55
Retention time/min
(D)
Intensity /a.u.
8×10^5
6×10^5
4×10^5
2×10^5
0
C6H12
*
H-MCM-22-37-15h
H-MCM-22-37-5h
H-MCM-22-37-2h
10 15 20 25 30 35 40 45 50 55
Retention time/min

Fig. S6 GC-MS chromatogram of the coke species extracted with CH_2Cl_2 from (A) H-MCM-22-15, (B) H-MCM-22-25, (C) H-MCM-22-25-o and (D) H-MCM-22-37 at different reaction time (Reaction conditions: 450 ^oC, WHSV = 2 h^{-1}. The asterisk (*) represents the internal standard (C_2Cl_4)).

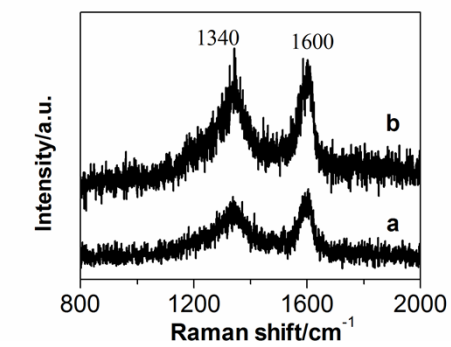
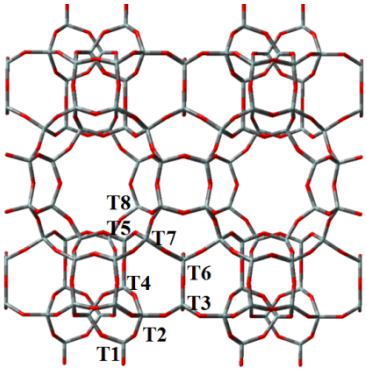


Fig. S7 Raman spectra of the coke species deposited on the (a) H-MCM-22-25 and (b) H-MCM-22-37.



Scheme S1 MCM-22 framework with 8 crystallographically inequivalent T sites.