Supplementary Information

Table S1. Data of Nickel species site and acid sites in the series of MWW catalysts

Catalysts	Total acid amount (mmol/g)	Weak acid amount (mmol/g)	Strong acid amount (mmol/g)	Ni/Total acid amount (mmol/mmol)	Ni/Weak acid amount (mmol/mmol)	Ni/Strong acid amount (mmol/mmol)
H-MCM-22	0.840	0.241	0.599	-	-	-
Ni-MCM-22(1)	0.708	0.254	0.454	0.224	0.570	0.319
Ni-MCM-22(2)	0.631	0.210	0.421	0.648	1.947	0.971
H-ERB-1	0.292	0.079	0.213	-	-	-
Ni-ERB-1	0.302	0.176	0.126	0.169	0.308	0.347
H-D-ERB-1	0.345	0.125	0.220	-	-	-
Ni-D-ERB-1	0.567	0.221	0.346	0.120	0.290	0.197
H-D-MCM-22	0.618	0.274	0.344	-	-	-
Ni-D-MCM-22	0.699	0.371	0.328	0.166	0.312	0.350

Table S2. Average ethylene conversion of each catalyst (3 h reaction) under different reaction conditions

Sample	Reaction conditions	Average ethylene conversion（%）
H-MCM-22	573 K; 2 MPa	57.27
	723 K; 0.1 MPa	86.53
H-D-MCM-22	573 K; 2 MPa	33.88
	723 K; 0.1 MPa	12.97
H-ERB-1	573 K; 2 MPa	0
	723 K; 0.1 MPa	0
H-D-ERB-1	573 K;2 MPa	0
	723 K; 0.1 MPa	0
0.85Ni-MCM-22	573 K; 0.1 MPa	8.45
	573 K; 2 MPa	48.58
	723 K; 0.1 MPa	82.00
	723K; 0.4MPa	90.25
2.4Ni-MCM-22	573 K; 2 MPa	56.59
	723 K; 0.1 MPa	91.26
0.68Ni-D-MCM-22	573 K; 2 MPa	25.15
	723 K; 0.1 MPa	38.80
0.3Ni-ERB-1	523 K; 2 MPa	13.72
	573 K; 2 MPa	32.00
	723 K; 0.1 MPa	0.85
	723 K; 1MPa	2.37
	723 K; 2 MPa	7.57
0.4Ni-D-ERB-1	573 K; 2 MPa	12.49
	573K; 2MPa	20.85

This data was derived from NH_3-TPD thermo gram and titration of the NH_3 desorption in the outlet gas. The thermo gram of the NH_3-TPD was subjected to deconvolute to obtain the corresponding desorption peak area at five desorption temperatures, that is, the acid amount of the corresponding different acid intensity sites. The first two desorption peaks at lower temperature below about 600 K are corresponding to the weak acid, and the latter two peaks at higher temperature are corresponding to strong acid sites. As an example, the NH_3-TPD spectrum deconvolution result of the different acid strength sites of Ni-MCM-22 is list as follows.