

Fig. S1. Time course of conversion of HDP over H-Beta (Reaction conditions: catalyst, 0.1 g; HDPE, 0.5 g; temperature, 240 °C; N₂ atmosphere).

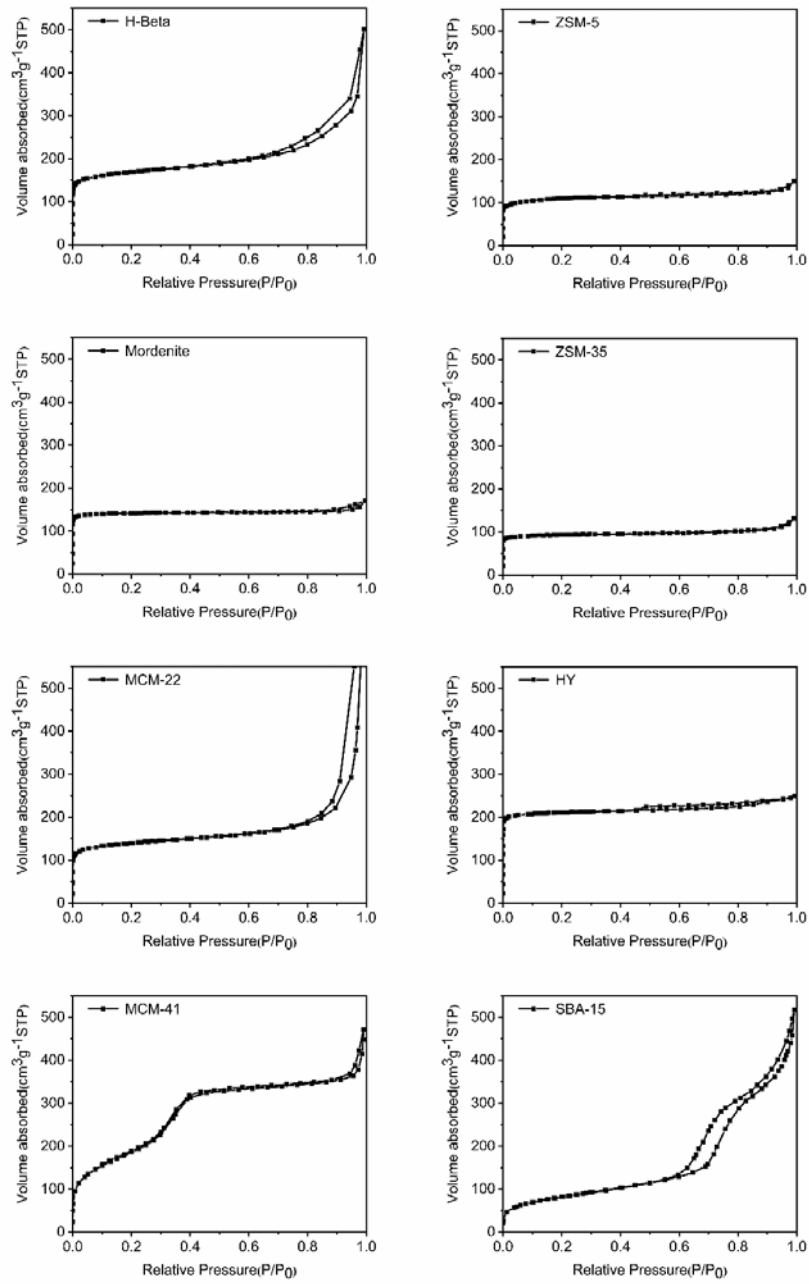


Fig. S2. N₂-adsorption-desorption isotherms of zeolites.

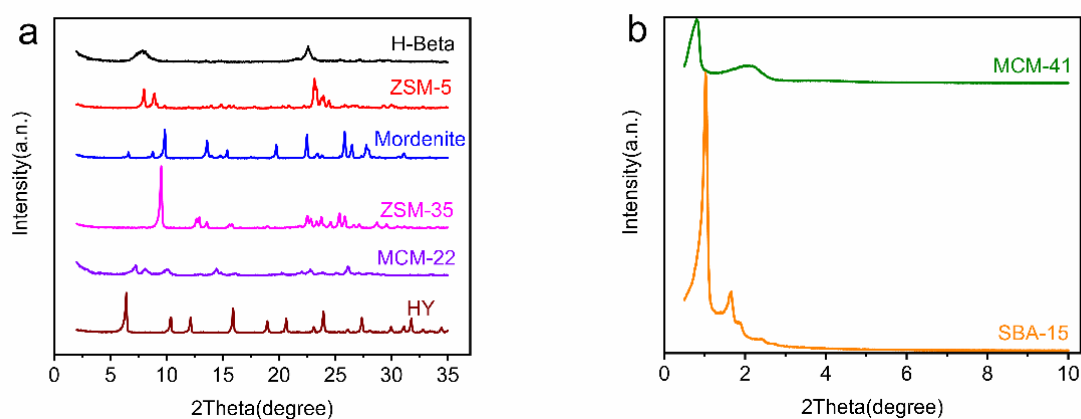


Fig. S3. XRD patterns of catalysts.

(a) H-Beta, ZSM-5, Mordenite, ZSM-35, MCM-22, and HY; (b) MCM-41 and SBA-15.

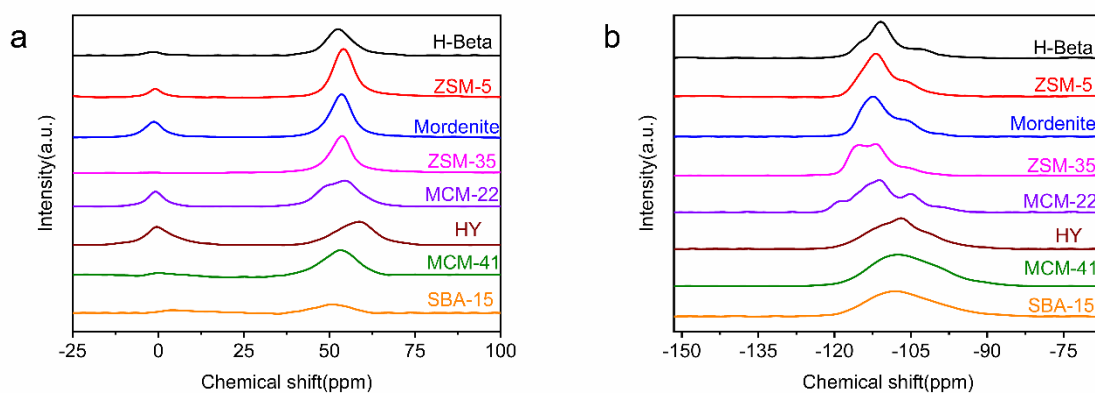


Fig. S4. Solid-state NMR spectra of catalysts. (a) ^{27}Al MAS NMR spectra of H-Beta, ZSM-5, Mordenite, ZSM-35, MCM-22, HY, MCM-41, and SBA-15; (b) ^{29}Si MAS NMR spectra of H-Beta, ZSM-5, Mordenite, ZSM-35, MCM-22, HY, MCM-41, and SBA-15.

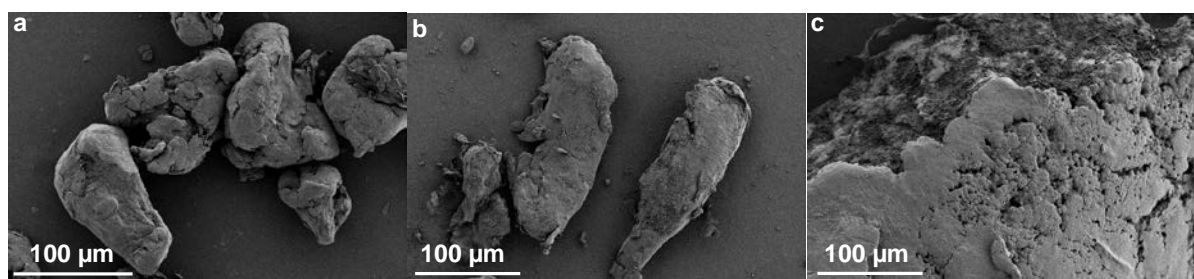


Fig. S5. SEM images.

(a) HDPE; (b) before mixing HDPE and HY; (c) after mixing HDPE and HY.

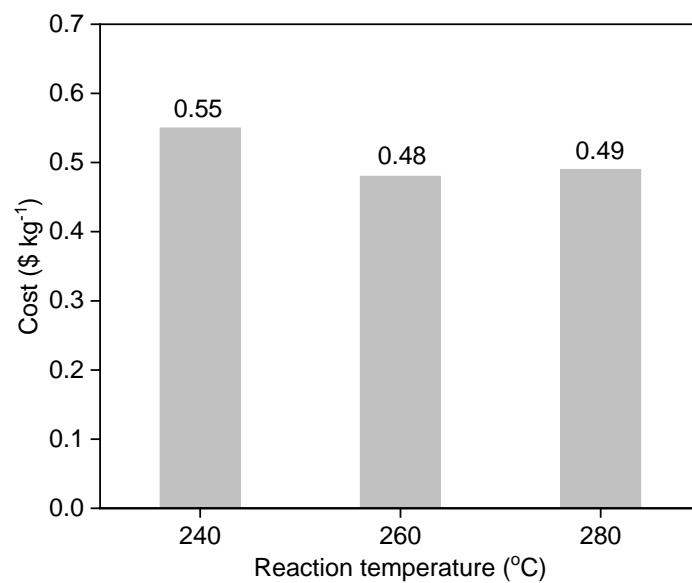


Fig. S6. Costs associated with energy (temperature) for polyethylene conversion at different temperatures.

Table S1 SiO₂/Al₂O₃ ratios of zeolites used in this work

Zeolites	SiO ₂ /Al ₂ O ₃ ratio ^a
H-Beta	26
ZSM-5	25
Mordenite	33
ZSM-35	34
MCM-22	21
HY	24
MCM-41	21
SBA-15	29

Note: ^a—SiO₂/Al₂O₃ ratio determined by ICP-OES.

Table S2 Summary of different types of Al and Si atoms from ^{27}Al and ^{29}Si NMR data

	Value/ $(\times 10^{-6})$	Assignment
^{27}Al	0	Octahedral coordination aluminum
chemical shift	~56	Tetrahedral coordination aluminum
	-111 to -119	$\text{Si}(\text{OSi})_4$
^{29}Si	-105 to -108	$\text{Si}(\text{OSi})_3\text{OAl}$
Chemical	-104 to -101	$\text{Si}(\text{OSi})_3\text{OH}$
Shift	-95 to -100	$\text{Si}(\text{OSi})_2(\text{OAl})_2$
	-93 to -92	$\text{Si}(\text{OSi})_2(\text{OH})_2$

Table S3 Accessible acid amount of zeolites

Zeolites	Accessible acid amount/ $(\text{mmol}\cdot\text{g}^{-1})$
H-Beta	0.58
ZSM-5	0.22
Mordenite	0.24
ZSM-35	0.06
MCM-22	0.39
HY	0.43
MCM-41	0.15
SBA-15	0.09

Table S4 Difference between size of diffusion channel and cage of zeolites

Zeolites	Volume of sphere that can be included (\AA^3) ^I	Volume of sphere that can diffuse along (\AA^3) ^{II}	Size difference (\AA^3)
H-Beta	156	110	46
ZSM-5	135	49	86
Mordenite	157	16	142
ZSM-35	131	13	118
MCM-22	476	33	443
HY	743	208	535
MCM-41	>4000		0
SBA-15	>4000		0

Note: ^I—Volume= $4/3*\pi*(d/2)^3$, d is the maximum diameter of a sphere that can be included in zeolites, as display in Table 3; ^{II}—Volume= $4/3*\pi*(a/2)*(b/2)*(c/2)$, a , b , c are listed in Table 3.

Table S5 Summary of different polymers conversion and product yields over various catalysts^a.

Entry	Catalysts	Polymers	Temperature/°C	Conversion/%	Yield/%			Components of gasoline range products/%				
					C ₁ -C ₃	C ₄ -C ₁₂ (gasoline range)	>C ₁₂ ^b	n-alkanes	i-alkanes	alkene	cycloalkanes	aromatics
1	H-Beta	PP	240	38.0	0.1	37.9	0	1.6	70.8	19.8	1.9	5.9
2	H-Beta	LDPE	240	56.4	0.2	56.2	0	9.5	75.3	7.6	3.2	4.4

Note: PP: polypropylene; LDPE: low-density polyethylene; ^a —Reaction conditions, catalyst, 0.1 g; polymers, 0.5 g; reaction time, 5 h; N₂ atmosphere; ^b —C₁₂₊ compounds not detected by GC.