Electronic Supplementary Material (ESI) for Inorganic Chemistry Frontiers.

Supporting Information

High-silica zeolite Y: seeds-assisted synthesis, characterization and catalytic properties

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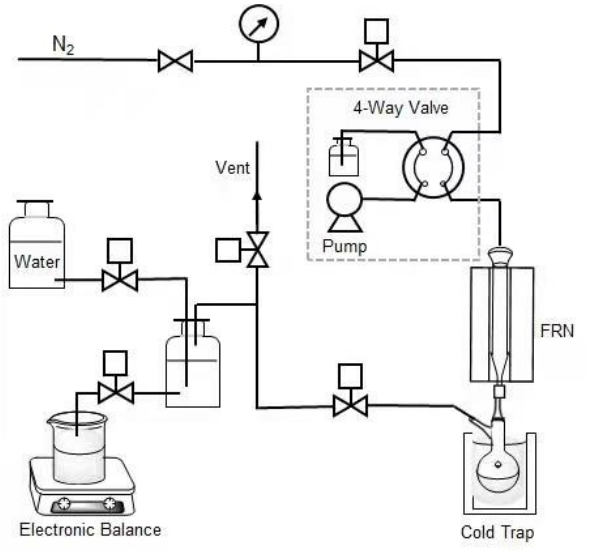


Figure S1. Process flow diagram of heavy oil test system.

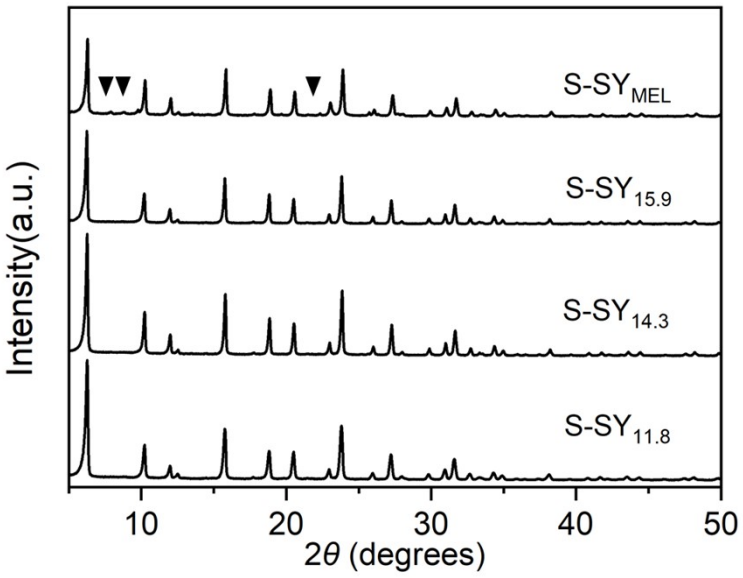
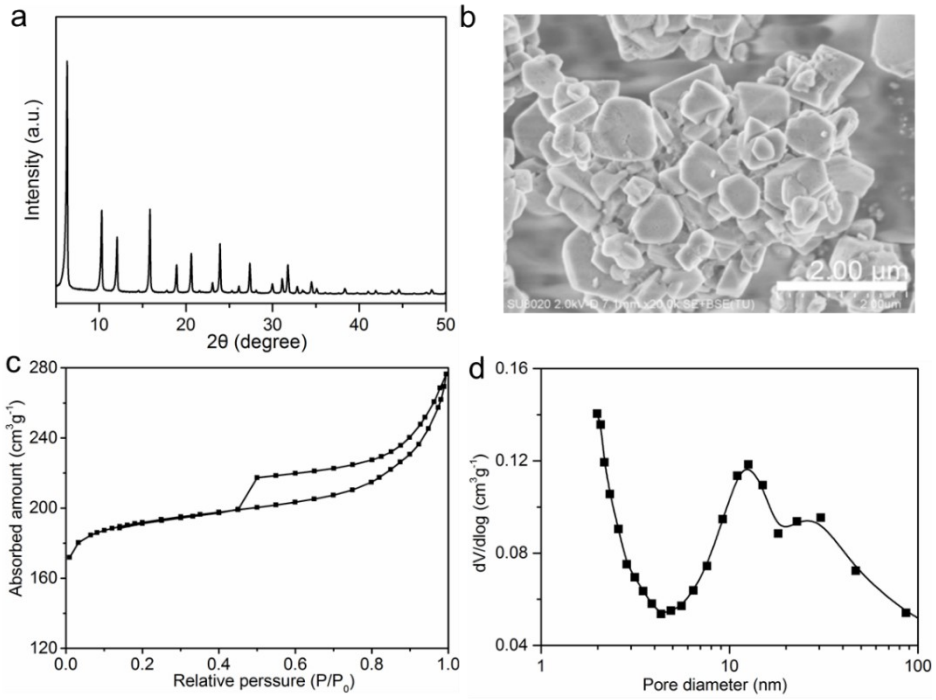


Figure S2. XRD patterns of the as-made S-SY zeolites. Triangle (▼) refers to MEL impurity.



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Surface area(m^2/g)			Pore volume(cm^3/g)	
S_{total}	S_{micro}	S_{ext}	V_{total}	V_{micro}
633	543	90	0.27	0.40

Figure S3. Physicochemical properties of commercial ultra-stable zeolite Y (USY, SAR=13.8). (a) XRD pattern, (b) SEM images, (c) N_2 sorption isotherms, (d) BJH pore size distribution, (e) textural properties.

Table S1. The properties of heavy oil

Items	Heavy oil
Density (20 °C), g/cm^3	0.9144
Viscosity (100 °C), mPa·s	26.95
Carbon residue, wt.%	5.2
S, wt.%	0.189
N, wt.%	0.072
Saturates, wt.%	53.24
Aromatics, wt.%	29.36
Resins, wt.%	16.96
Asphaltenes, wt.%	0.44
Ni, μg/g	5.87
V, μg/g	4.04
Fe, μg/g	3.57
Cu, μg/g	0.02
Na, μg/g	0.47
Ca, μg/g	0.63

Table S2. Textural properties of the high-silica products and the seeds employed for the syntheses

Sample	Surface area (m^2g^{-1})[b]			Pore volume (cm^3g^{-1})[b]		
	S_{BET}	S_{micro}	S_{exter}	V_{micro}	V_{meso}	V_{total}
NaY	595	567	28	0.28	0.01	0.29
Milled NaY	180	138	42	0.07	0.16	0.23
$Y_{6.4}$	746	667	81	0.33	0.08	0.41
$Y_{10.2}$	652	581	71	0.28	0.07	0.35
$Y_{14.1}$	672	602	70	0.29	0.01	0.38
S-$SY_{14.3}$	690	626	64	0.31	0.05	0.36
S-$SY_{15.9}$	634	592	42	0.29	0.02	0.31

[a] S_{BET}: BET surface area, S_{micro}: t-plot micropore surface area, $S_{exter} = S_{BET} - S_{micro}$,
[b] V_{micro}: t-plot micropore volume, V_{total}: single point adsorption volume at $P/P_0 = 0.97$, V_{meso}: mesopore volume, $V_{meso} = V_{total} - V_{micro}$.

Table S3. Heavy oil cracking results on S-SY-based catalyst and USY-based catalyst

Items (wt%)	S-SY-based catalyst-17h [a)]	USY-based catalyst-17h [a)]
Dry gas	0.93	0.75
Liquid petroleum gas (LPG)	9.53	6.43
Gasoline	52.78	52.73
Diesel	18.24	19.08
Heavy oil	12.37	14.50
Coke	6.15	6.52
Conversion (excluding coke)	81.48	78.98
Conversion	87.63	85.50
LPG+Gasoline+Diesel	80.55	78.24
Diesel/Gasoline ratio	0.34	0.36

[a)] The catalysts were aged under 100% steam at 800 ^{o}C for 17 h before the catalyst test.