

Electronic Supplementary Information

Core-shell Y zeolite with a mono-crystalline core and a loosely aggregating polycrystalline shell: a hierarchically cracking catalyst for large reactants

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Table S1. Product distributions of catalytic cracking of triisopropylbenzene (TIPB) over Y and core-shell Y@NY-3-24

Catalysts Selectivity (wt.%)	Y	Y@NY-3-24
CH ₄	0.07	0.06
C ₂ H ₆	0.04	0.05
C ₂ H ₄	0.18	0.12
C ₃ H ₈	0.75	1.55
C ₃ H ₆	7.50	36.48
<i>i</i> -C ₄ H ₁₀	0.29	0.54
<i>n</i> -C ₄ H ₁₀	0.03	0.02
<i>i</i> -C ₄ H ₈	0.20	0.47
<i>n</i> -C ₄ H ₈	0.04	0.08
<i>i</i> -C ₅ H ₁₂	0.11	0.14
<i>n</i> -C ₅ H ₁₂	1.06	0.06
benzene	20.23	15.86
isopropylbenzene (IPB)	6.28	22.51
diisopropylbenzene (DIPB)	28.78	16.08
Coking	34.44	6.05
^① Conversion (wt.%)	39.89	63.72
^② Theoretical selectivity of C ₃ H ₆	44.64	45.55

^①Reaction condition: Catalytic cracking of TIPB was executed at 450 °C, catalyst: reactant=51.09, g/mol, the contact time between reactants and catalyst was controlled within 5-8s.

^②Theoretical selectivity of C₃H₆: The value is calculated under the condition that the propylene, which was yielded from the cracking of TIPB as well as DIPB and IPB, is not further cracked or polymerized, namely, $n_{TP}=n_D+2*n_I+3*n_B$, “ n_{TP} ” is the theoretical amount of propylene (mol), n_D , n_I and n_B is the amount (mol) of DIPB, IPB and Benzene detected by GC, respectively.

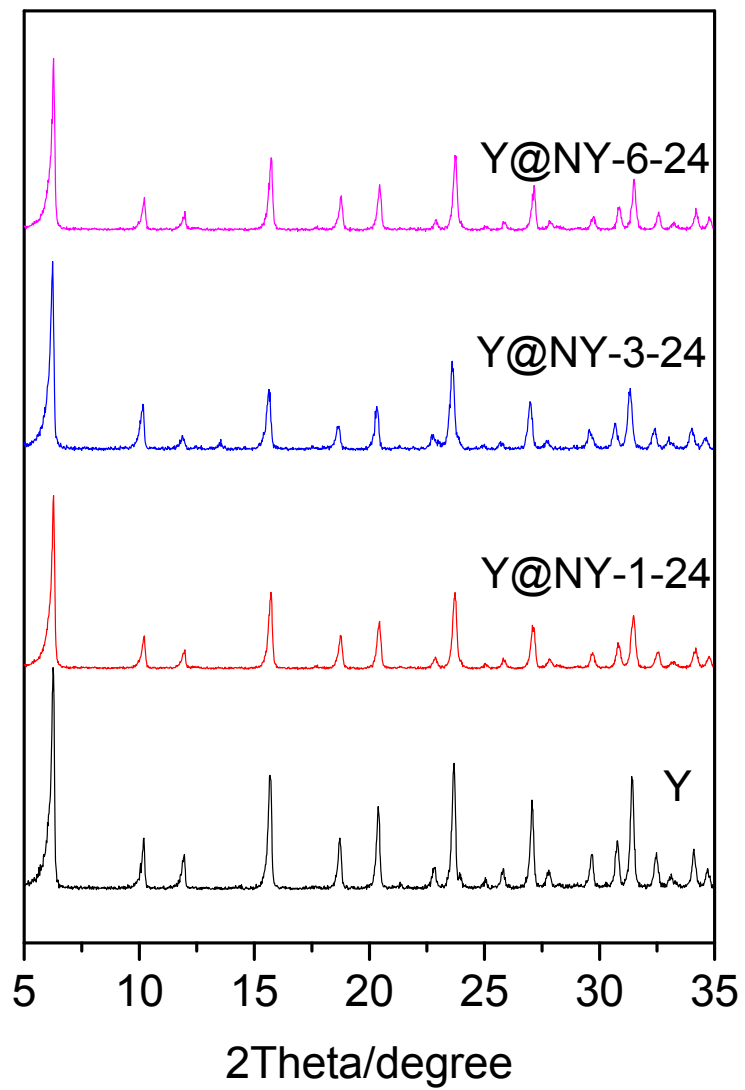


Figure S1. XRD patterns of the starting Y zeolite, Y@NY-1-24, Y@NY-3-24, and Y@NY-6-24

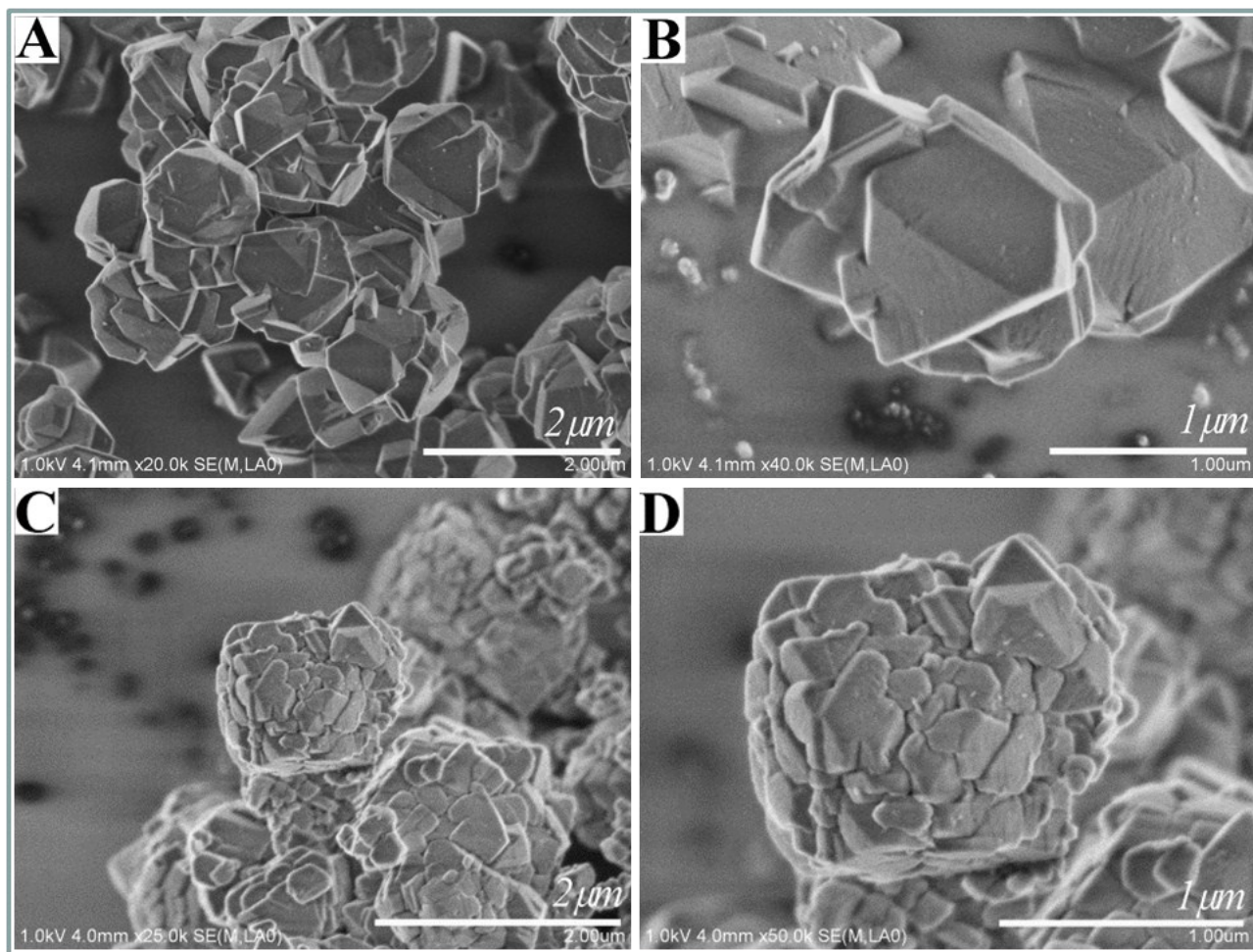


Figure S2. SEM images of the samples. (A), (B): the commercial Y zeolite; (C), (D): the as-synthesized Y@NYr-3-24.

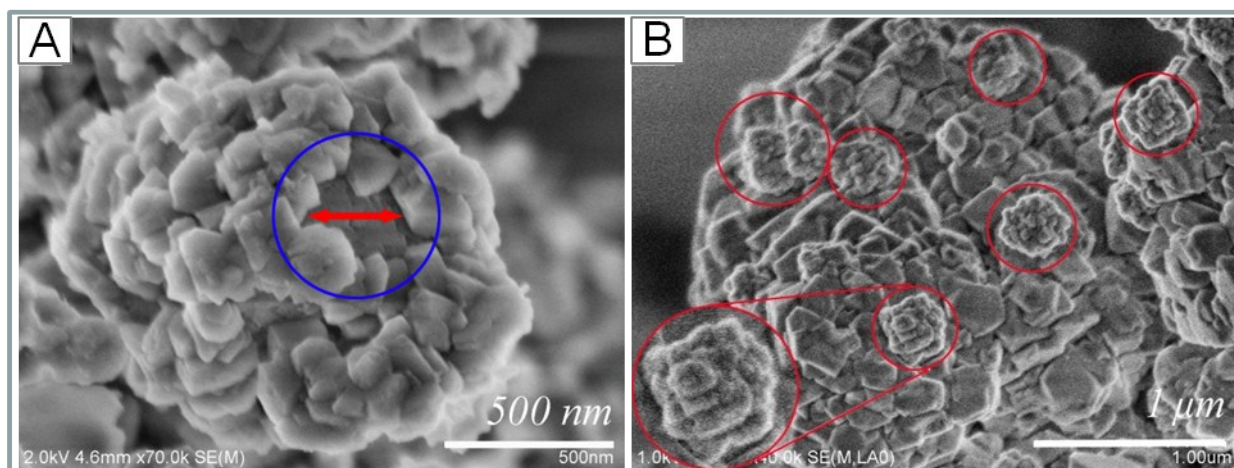


Figure S3. SEM images of (A): Y@NY-6-24; (B): Y@NY-1-24.

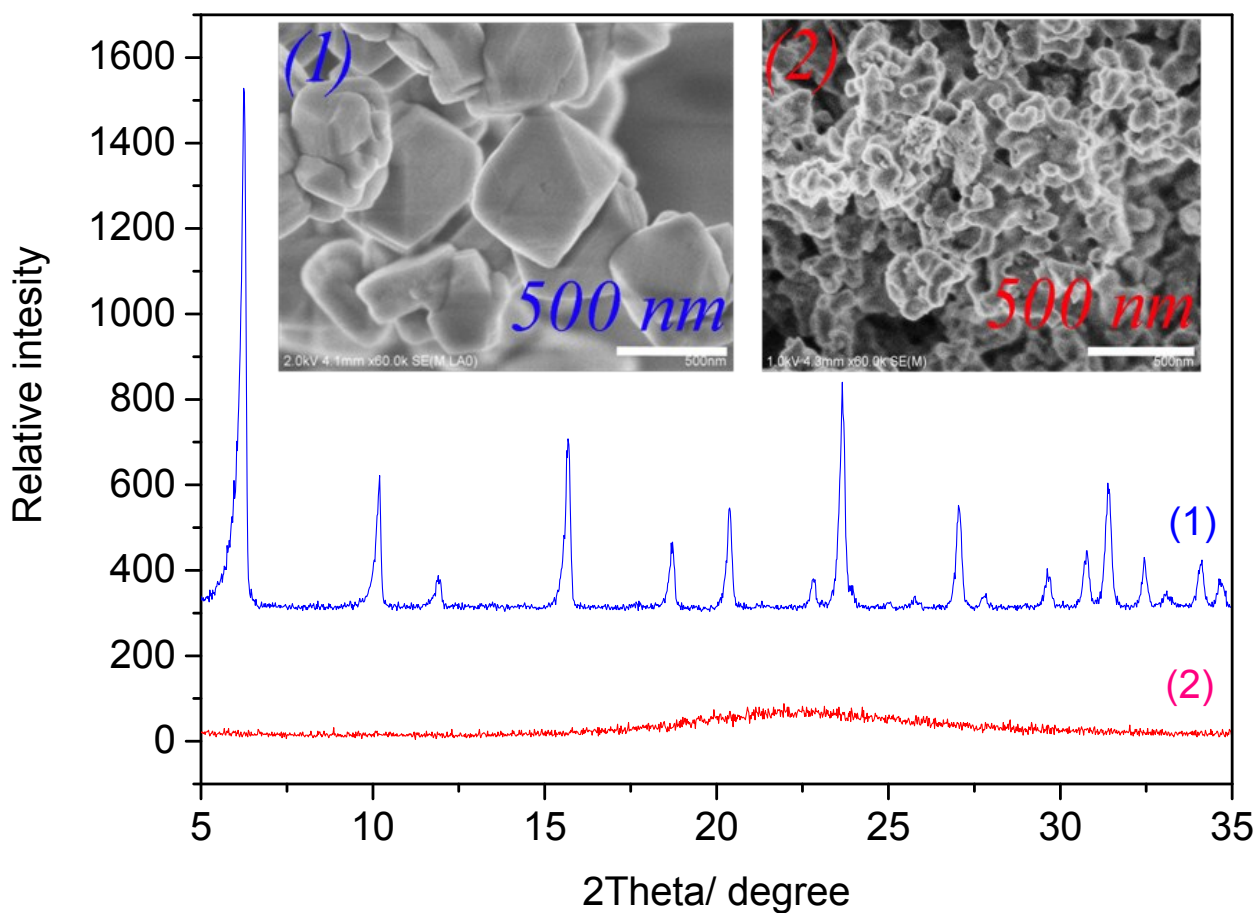


Figure S4. XRD patterns and SEM images (insets) of Y@NY-0-24 and Y@NYr-0-24 samples which were respectively obtained by a similar procedure of Y@NY and Y@NYr, in which the core, namely the starting Y zeolite, was absent. (1) Y@NYr-0-24; (2): Y@NY-0-24.

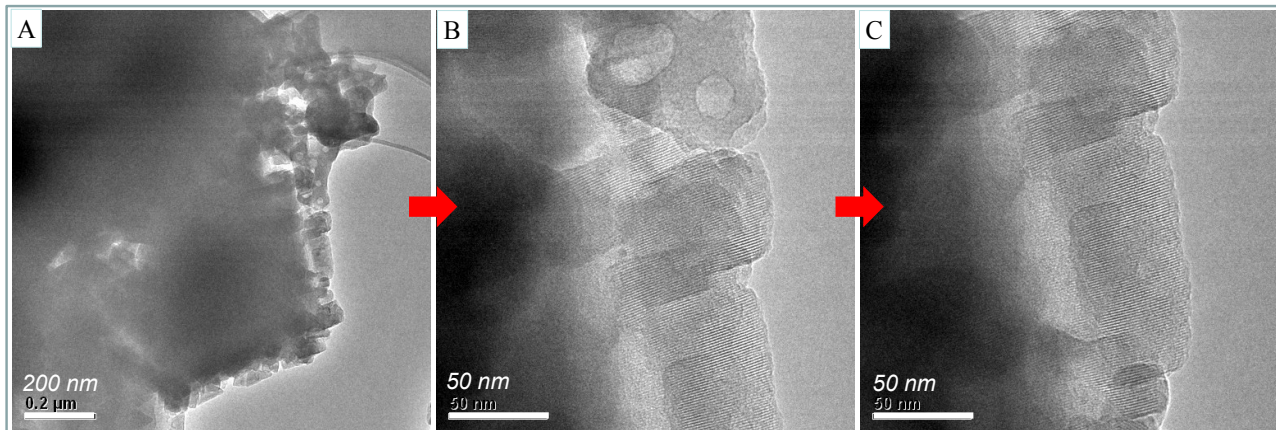


Figure S5. TEM images of sample Y@NY-3-12

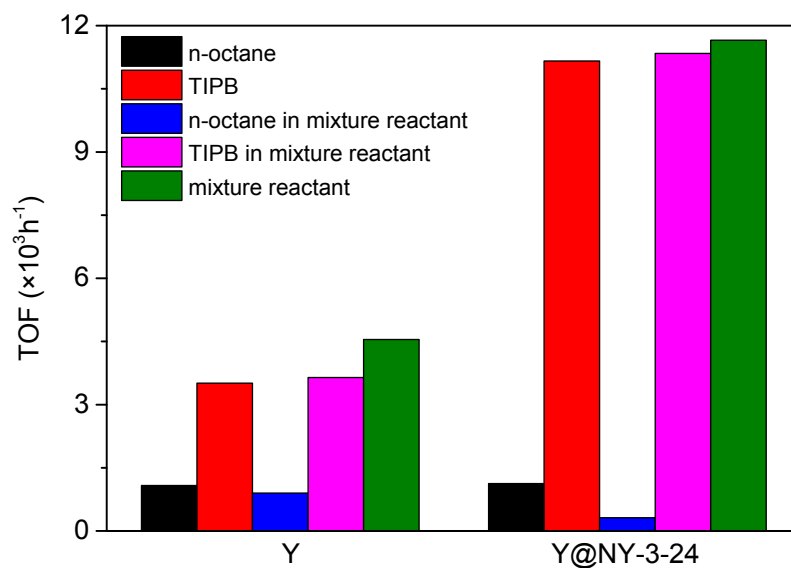


Figure S6. Turnover frequency (TOF) of the reactant over the HY and HY@NY-3-24. Since the active sites in the catalytic cracking of hydrocarbon would be positively related to Brønsted acid. The TOF was obtained by calculating the molecule number (mol) of reacted reactant per Brønsted acid sites (mol) per hour.