

Supporting Information for

Effects of aging and hydrothermal treatment on the crystallization of ZSM-5 zeolite synthesis from bentonite

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Table S1. XRF results of the raw and refined Lam Dong bentonite clay.

Raw bentonite		Refined bentonite	
Constituent	Constituent content (wt%)	Constituent	Constituent content (wt%)
SiO ₂	51.00	SiO ₂	63.38
Al ₂ O ₃	21.16	Al ₂ O ₃	22.53
K ₂ O	1.93	K ₂ O	4.35
Fe ₂ O ₃	7.93	Fe ₂ O ₃	4.07
CaO	0.80	CaO	2.32
P ₂ O ₅	0.11	P ₂ O ₅	2.06
MgO	0.79	MgO	0.65
ZrO ₂	0.05	ZrO ₂	0.27
NbO ₂	0.005	NbO ₂	0.21
Na ₂ O	0.10	Na ₂ O	0.17
LOI	12.44		
Other oxides	3.79		

“LOI = lost on ignition”

Table S2. Effect of aging and hydrothermal conditions on the crystallization of ZSM-5 samples

Sample	Aging condition	
	Temp. (°C)	Time (h)
RT-12h	RT	12
RT-36h	RT	36
RT-60h	RT	60
60°C-12h	60	12
60°C-36h	60	36
60°C-60h	60	60
80°C-12h	80	12
80°C-36h	80	36
80°C-60h	80	60
Sample	Aging	Hydrothermal time (h), 170 °C
A _{RT-60} H ₃	RT, 60 h	3
A _{RT-60} H ₆		6
A _{RT-60} H ₉		9
A _{RT-60} H ₁₂		12
A _{RT-60} H ₁₅		15
A ₆₀₋₁₂ H ₃	60 °C, 12 h	3
A ₆₀₋₁₂ H ₆		6
A ₆₀₋₁₂ H ₉		9
A ₆₀₋₁₂ H ₁₂		12
A ₆₀₋₁₂ H ₁₅		15
A ₈₀₋₁₂ H ₃	80 °C, 12 h	3

$A_{80-12}H_6$		6
$A_{80-12}H_9$		9
$A_{80-12}H_{12}$		12
$A_{80-12}H_{15}$		15

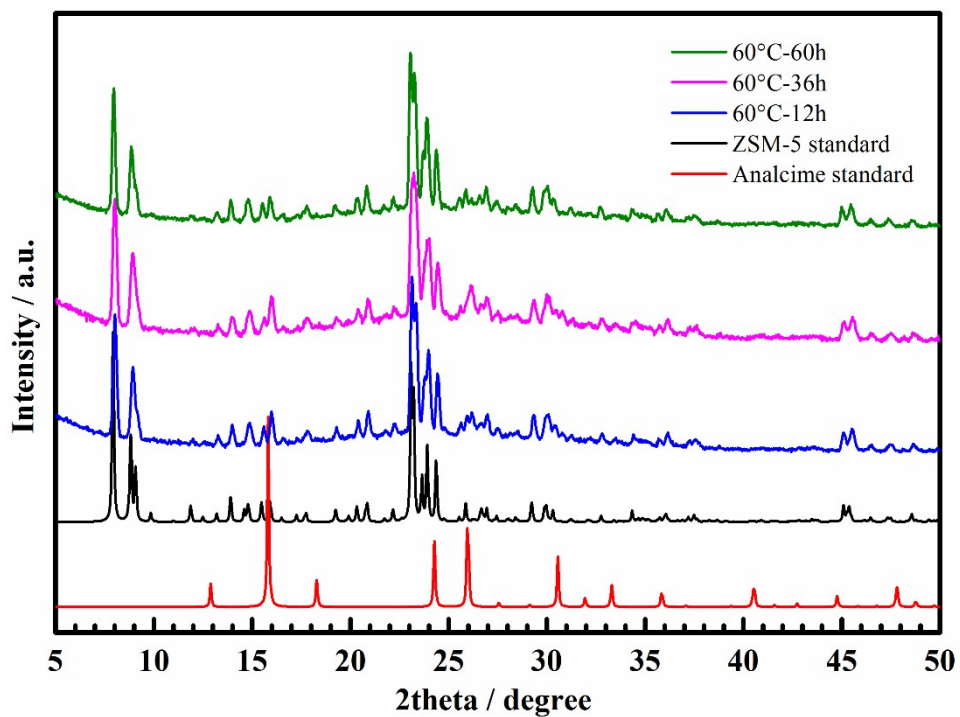


Figure S1. XRD pattern of ZSM-5 sample aged at 60 °C for 12, 36, 60 hours.

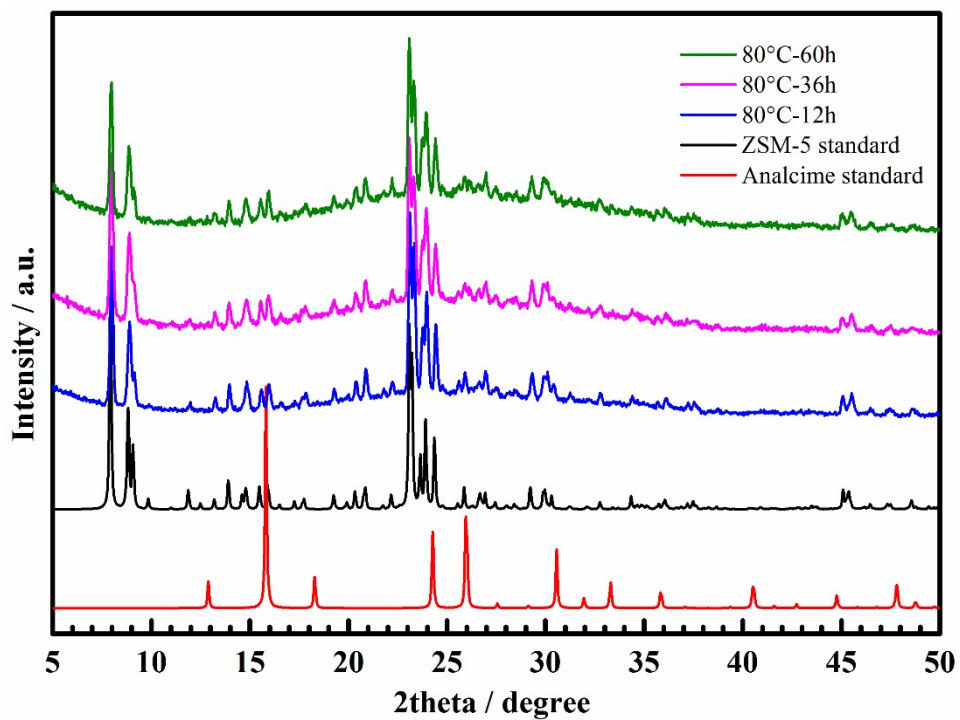


Figure S2. XRD pattern of ZSM-5 sample aged at 80 °C for 12, 36, 60 hours.

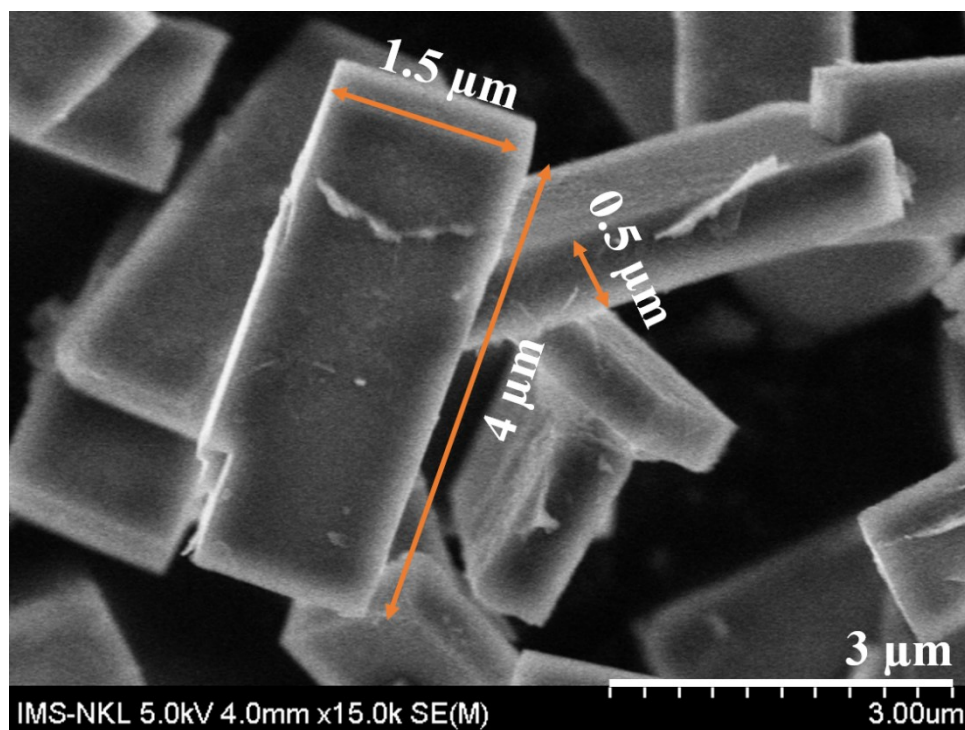


Figure S3. SEM image of RT-60h sample obtained at 15.000 magnification with a scale of 3 μm

Table S3. Calculation of crystallinity of ZSM-5 sample as different aging condition

Sample	Crystallinity = [area of crystalline peak ^a /area of all peaks ^b] x 100		
	<i>a</i>	<i>b</i>	Crystallinity (%)
RT-12h	4681.5	5744.6	81.5
RT-36h	4102.1	4853.1	84.5
RT-60h	5379.0	6125.5	87.8
60°C-12h	4964.2	6439.5	77.1
60°C-36h	4460.5	5772.8	77.3
60°C-60h	4773.6	6090.1	78.4
80°C-12h	4636.6	5909.7	78.5
80°C-36h	3952.7	5328.4	74.2
80°C-60h	3223.1	4613.2	70.0