Electronic supplementary information (ESI)

Controlling the Morphologies and Crystal Growth Orientations of H-ZSM-5: Their Impact on the Structure-Diffusion-Performance Relationship in the Methanol-to-Propylene Reaction

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As the Electronic supplementary information (ESI) of the manuscript "*Controlling the Morphologies and Crystal Growth Orientations of H-ZSM-5: Their Impact on the Structure-Diffusion-Performance Relationship in the Methanol-to-Propylene Reaction*", following materials are provided:

Fig. S1.

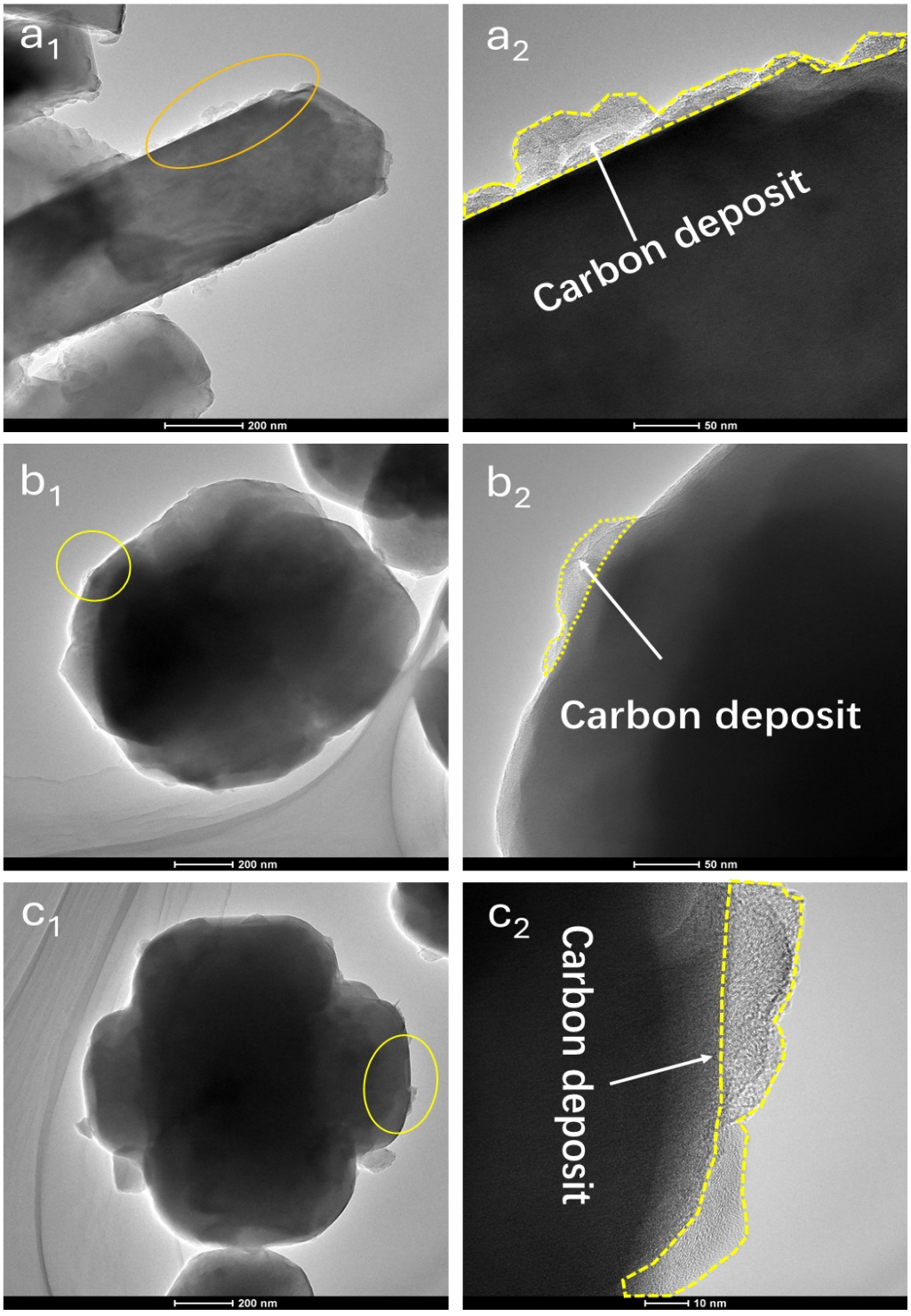

Fig. S1 TEM of the coke deposition over ZSM-5 with different morphologies

(a.1-2) ZSM-5-NS; (b.1-2) ZSM-5-NC; (c.1-2) ZSM-5-NF;

Fig. S2.

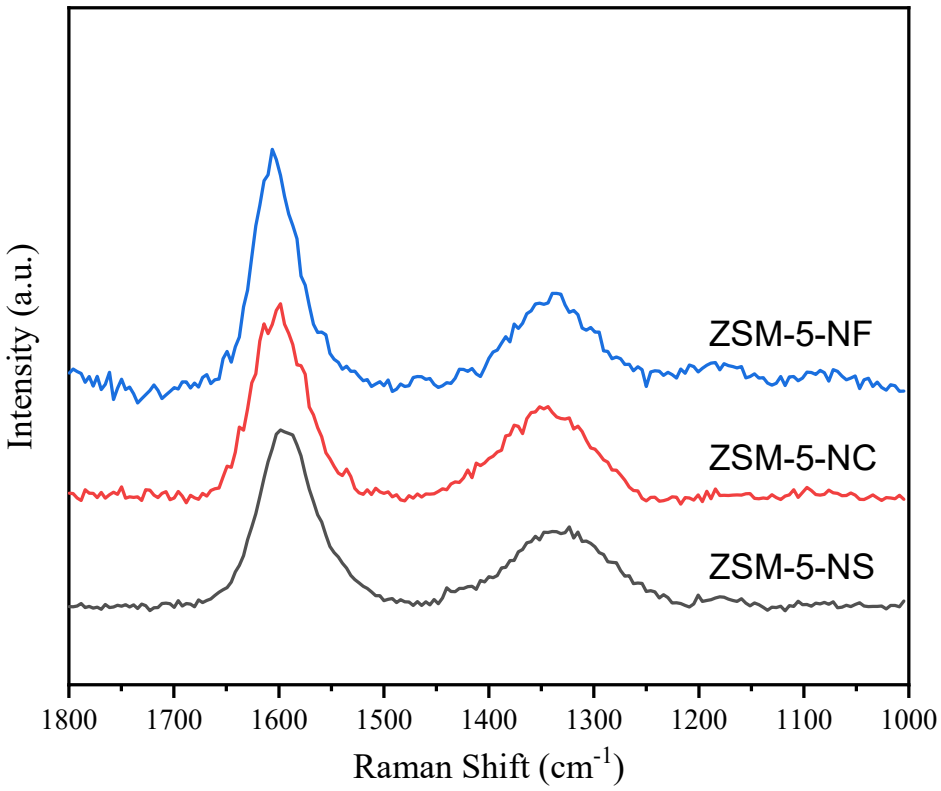

Fig. S2 Raman spectra of the deactivation ZSM-5 with different morphologies.

Table S1 Relative Raman band intensity of deposited coke species on ZSM-5 with different morphologies.

Catalyst	I_D	I_G	I_D/I_G
ZSM-5-NS	42.09	57.91	0.73
ZSM-5-NC	42.80	57.84	0.74
ZSM-5-NF	40.11	60.89	0.66

Fig. S3.

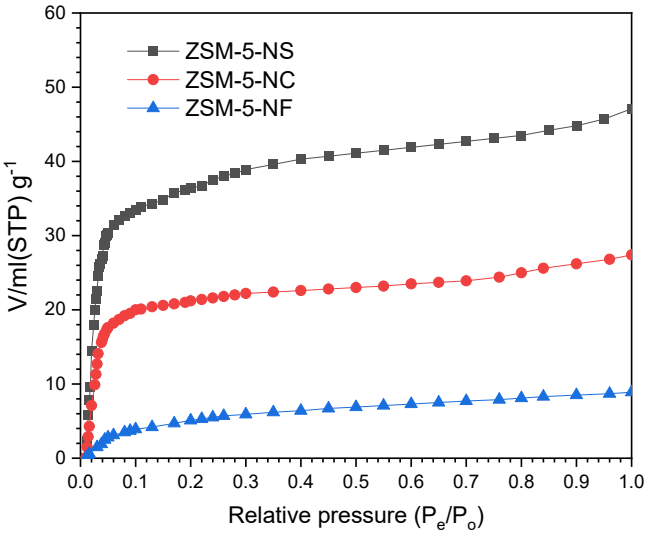

Fig. S3 *o*-xylene vapor adsorption isotherms of ZSM-5 with different morphologies

The *o*-xylene vapor adsorption isotherms were measured on a Micromeritics ASAP 2020 instrument at 298 K. Prior to measurement, the samples were degassed at 573 K under vacuum for 4 h.

As illustrated in the figure, the order of adsorption amounts at low relative pressure is ZSM-5-NS > ZSM-5-NC > ZSM-5-NF. This observed variation can be attributed to the fact that ZSM-5 exhibits different surface exposure ratios of straight pores due to distinct morphologies and growth orientations. These differences lead to varying adsorption amounts of macromolecules, providing evidence for the micropore diffusion ability of ZSM-5 with different morphologies.

Fig. S4.

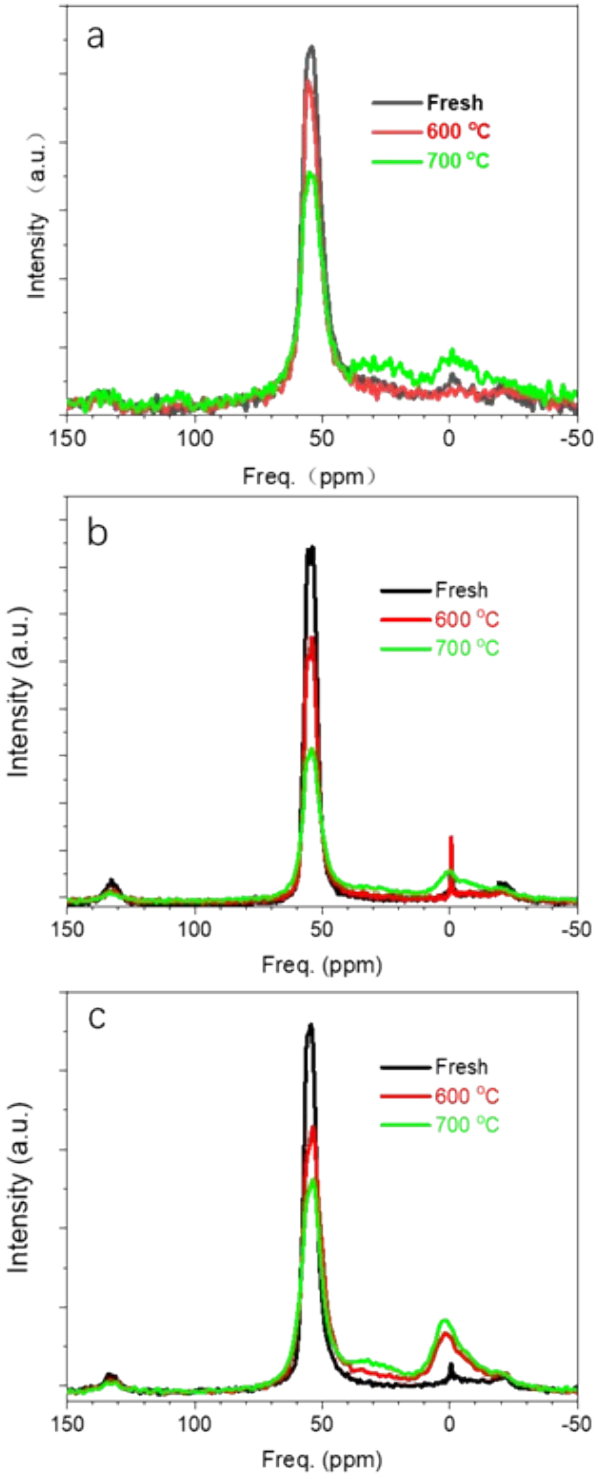

Fig. S4 ^{27}Al MAS NMR spectra of ZSM-5 with various morphologies under high temperature water steam treatment at 600 °C and 700 °C. (a) ZSM-5-NS; (b) ZSM-5-NC; (c) ZSM-5-NF. The Partial pressure of steam is about 20 kPa.