

Supplementary Material: H-ZSM-5 Materials Embedded in an Amorphous Silica Matrix: Highly Selective Catalysts for Propylene in Methanol-to-Olefin Process

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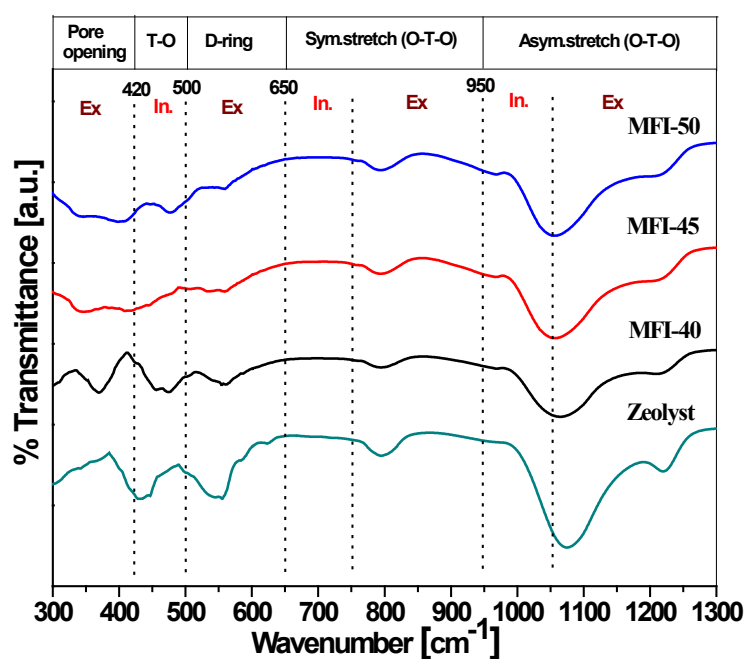


Figure S1. FT-IR spectra for investigated samples

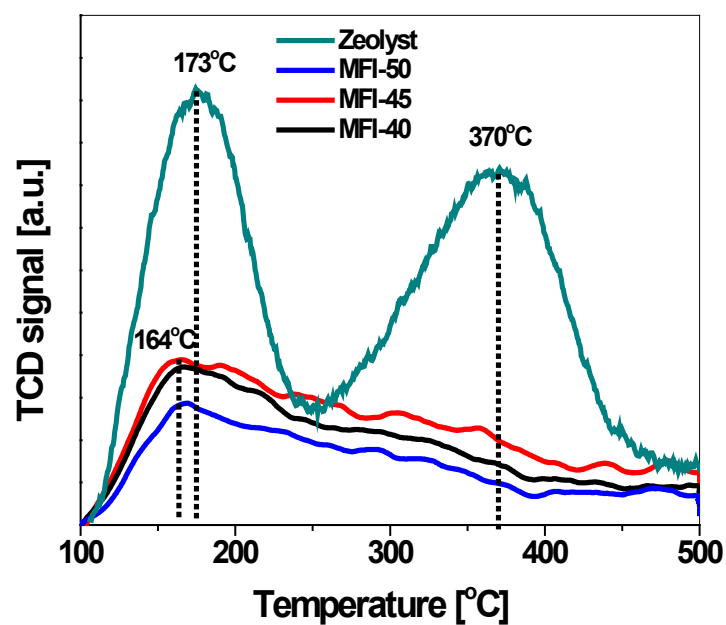
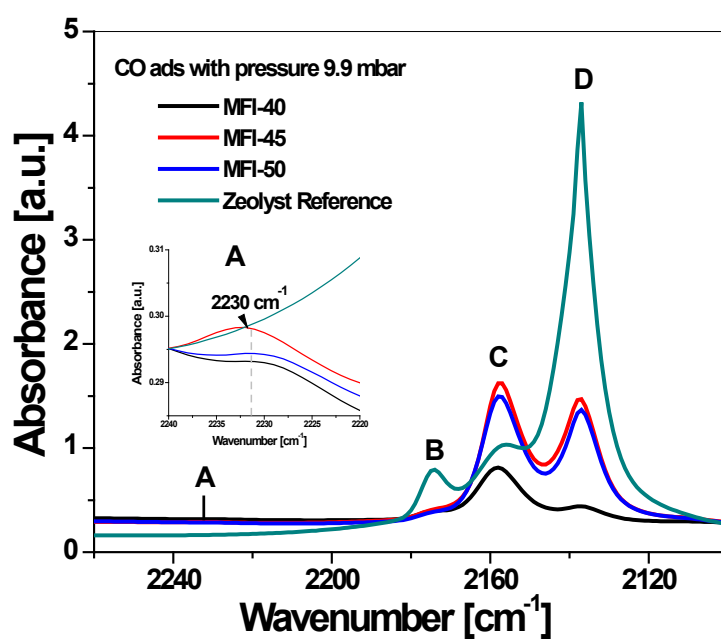
Figure S2. NH₃-TPD patterns of the samples

Figure S3. FT-IR spectra of the samples after CO adsorption in the region of 2260–2100 cm^{−1}, the band at 2230 cm^{−1} corresponding to the strong Lewis acid sites.

Table S1. Quantification data obtained from FT-IR spectra after CO adsorption (9.9 mbar pressure).

Samples	Area under peak 2175 cm ^{−1} (B)	Area under peak 2156 cm ^{−1} (C)	Area under peak 2137 cm ^{−1} (D)
MFI-40	0.50	4.6	0.45
MFI-45	0.05	9.1	6.53
MFI-50	0.02	8.8	6.48
Zeolyst	30.9	1.2	30.9

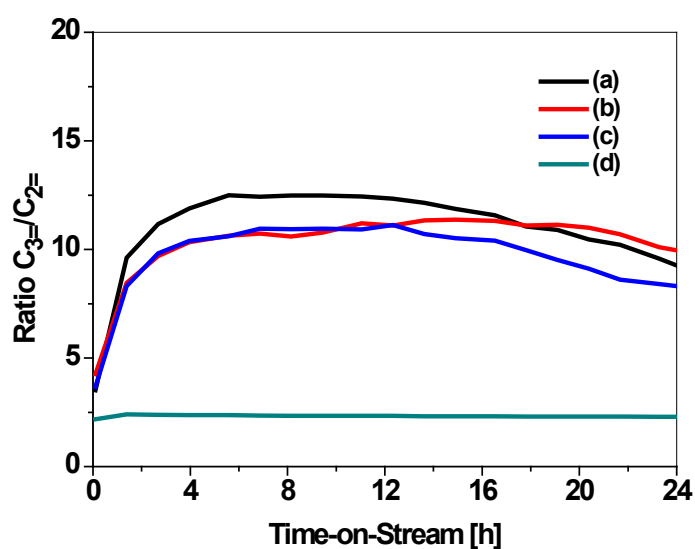


Figure S4. Selectivity patterns for $C_3=$ / $C_2=$ ratio of synthesized H-ZSM-5 and Zeolyst reference sample for the MTO reaction at reaction temperature of 500°C and WHSV of 3 h⁻¹; a) MFI-40, b) MFI-45, c) MFI-50, and d) Zeolyst reference

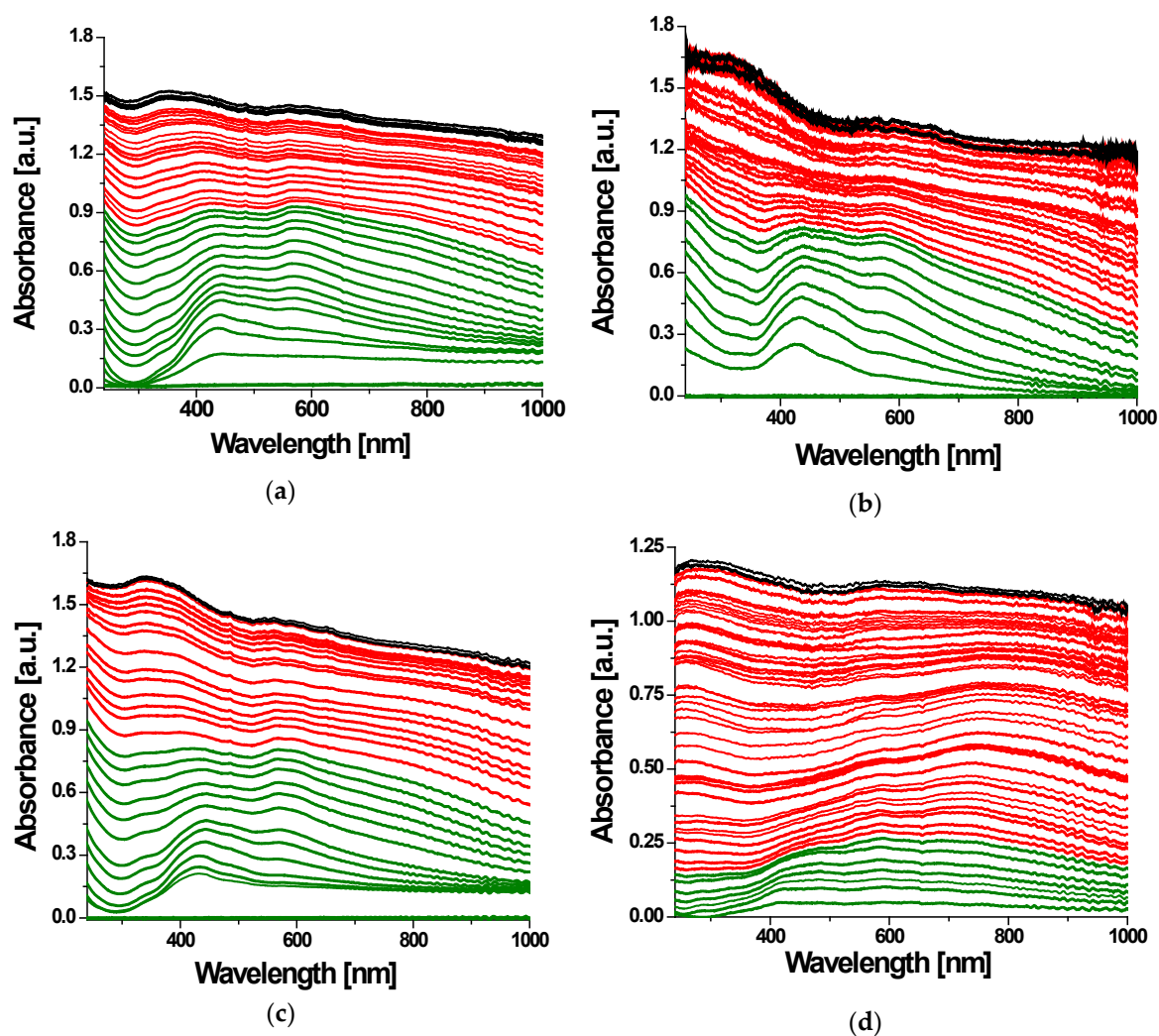


Figure S5. Operando UV-vis spectra collected during the MTO reaction over a) MFI-40; b) MFI-45; c) MFI-50 and d) Zeolyst; WHSV: 3 h⁻¹, reaction temperature: 500°C. The green colored spectra

corresponds to the initial stage of reaction; where the products formation is initiated, the red colored spectra indicate to the stable/slower deactivation; where the products formation reach to the steady state, and the black colored spectra relates to the deactivated stage; where the products formation was decreased drastically.

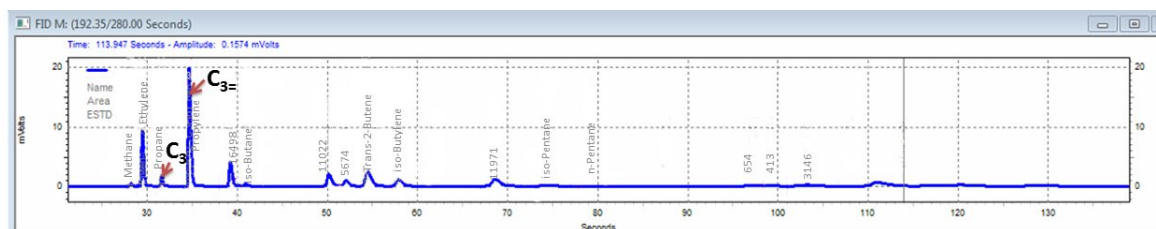
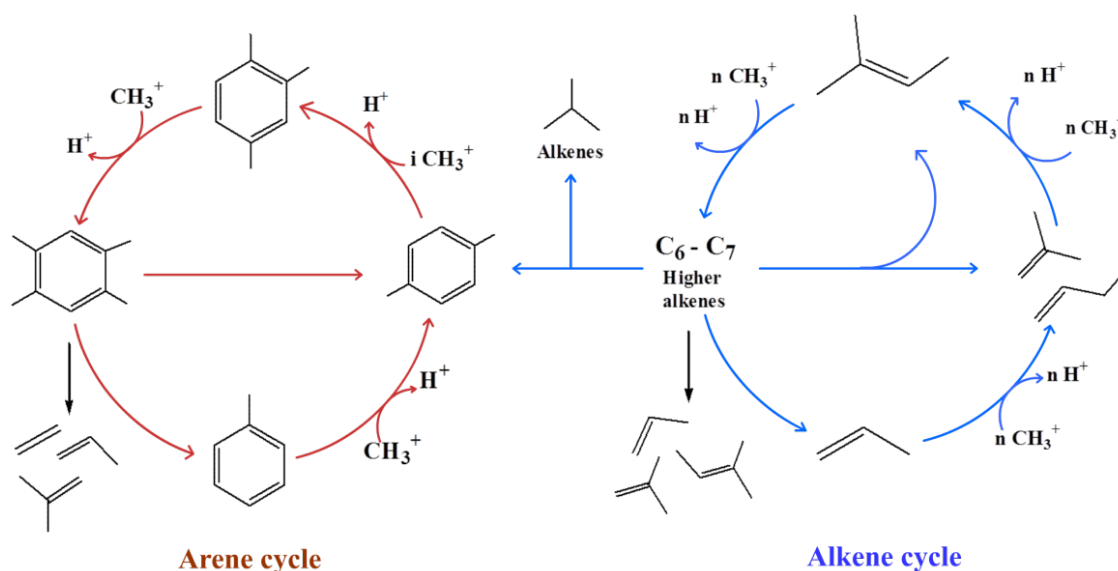


Figure S6. The GC image for running MTO reaction of synthesized HZSM-5 (Si/Al = 50) sample.



Scheme S1. The dual-cycle mechanistic concepts for conversion of methanol-to-olefins reaction over HZSM-5 catalysts¹

References

1. Bjørgen, M.; Joensen, F.; Lillerud, K.-P.; Olsbye, U.; Svelle, S. The mechanisms of ethene and propene formation from methanol over high silica H-ZSM-5 and H-beta, *Catal. Today*. **2009**, *142*, 90–97.



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