Supplementary Material (ESI) for *Chemical Communications*

Supporting Information for

Activation of hydrocarbons on acidic zeolites: superior selectivity of methylation of ethene with methanol to propene on weakly acidic catalysts

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Catalyst preparation

The MFI zeolites were prepared by hydrothermal synthesis in autoclaves. Cab-O-Sil M5, $Al(NO)_3 \cdot 9H_2O$ and H_3BO_3 were employed as silicon, aluminum and boron sources, respectively. Tetrapropylammonium bromide (TPABr) was used as the template. After the sol-gel was formed, the autoclave was kept at 443 K for 7 days under tumbling conditions. The obtained crystals were filtered, washed and dried at 373 K overnight. The template was removed by calcination at 823 K for 10 h. The sodium type of MFI zeolites was ion-exchanged with NH_4NO_3, followed by calcinations to produce proton type catalysts. The Si to Al ratio in the resultant H-ZSM-5 was approximately the same as that in the starting gel. However, the Si to B ratio was 41 in the H-[B]-MFI product whereas the Si to B ratio was 5 in the sol-gel mixture. H-ZSM-5 and H-[B]-MFI are heteroatom (Al and B, respectively) substituted zeolite materials with the same crystal structure of MFI topology, and thus they showed similar XRD patterns.

Catalyst characterization

Powder X-ray diffraction was measured using a Rigaku diffractometer. Typically, an XRD diffractogram was recorded in the range of $2^o < 2\theta < 50^o$ using Cu Kα radiation at a scanning speed of 0.04^o min^{-1}.

The microscopic features of synthesized zeolites were observed by scanning electron microscopy (SEM). Images were recorded by a Hitachi S-4700 microscope for samples without any metal coating.

The catalyst sample of approximately 10 mg was pressed into a self-supporting wafer. All the IR spectra were recorded on an FT/IR 7300 spectrometer with an MCT detector.

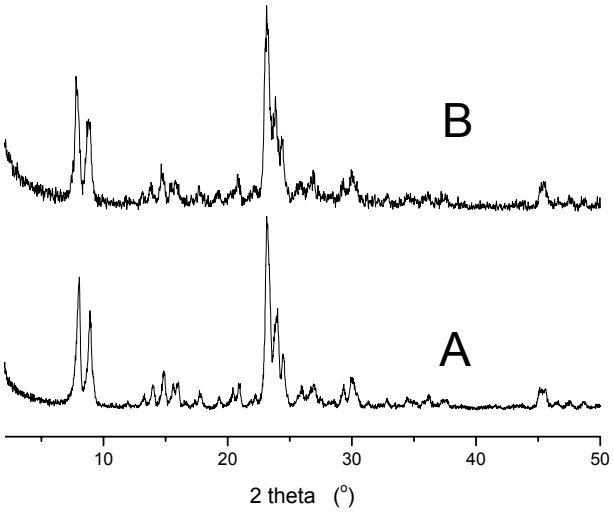
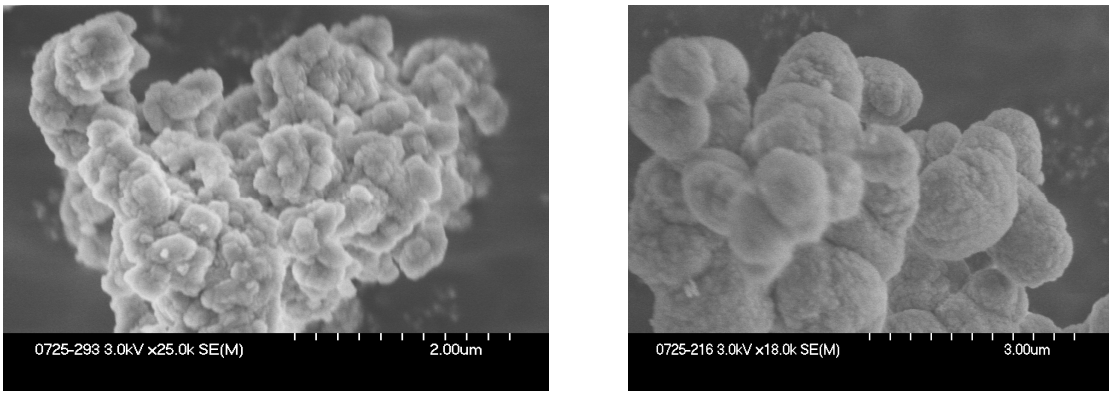


Fig.S1 Powder x-ray diffraction patterns for (A) H-ZSM-5, (B) H-[B]-MFI.



(A) **(B)**

Fig.S2 SEM images of (A) H-ZSM-5, (B) H-[B]-MFI.

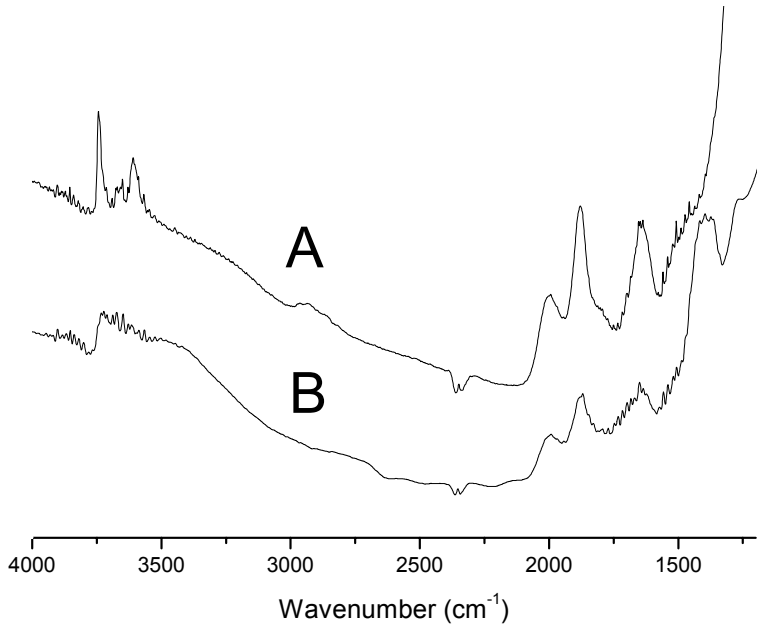


Fig.S3 IR spectra of (A) H-ZSM-5, (B) H-[B]-MFI.

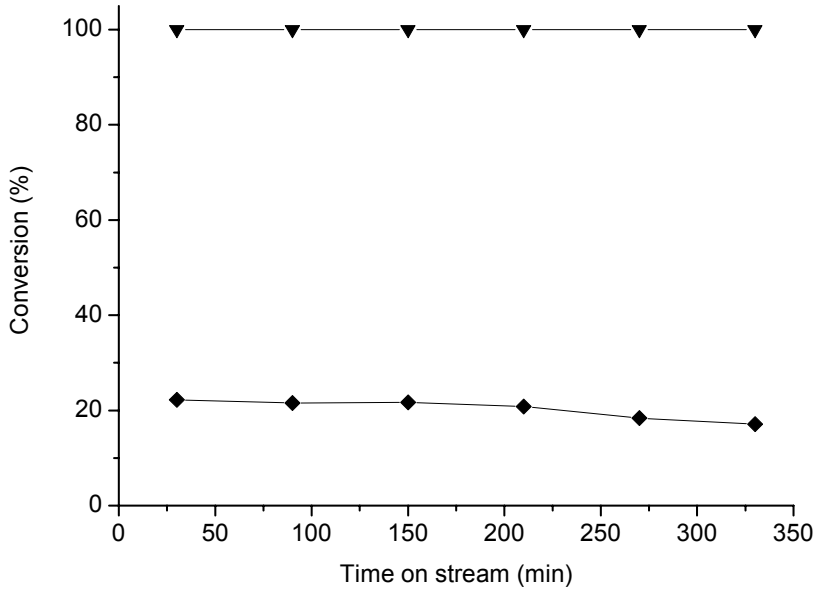


Fig.S4 Reaction stability of co-reaction of methanol and ethene over H-[B]-MFI catalyst at 773 K, (▼) conversion of methanol, (♦)conversion of ethylene.