

Electronic Supplementary Material

Control of aluminum distribution in ZSM-5 zeolite for enhancement of its catalytic performance for propane aromatization

Zhao Ma^{1,2}, Dezhi Shi^{1,2}, Sen Wang (✉)¹, Mei Dong (✉)¹, Weibin Fan (✉)¹

1 State Key Laboratory of Coal Conversion, Institute of Coal Chemistry, Chinese Academy of Sciences, Taiyuan 030001, China

2 University of Chinese Academy of Sciences, Beijing 100049, China

E-mails: wangsen@sxicc.ac.cn (Wang S); mdong@sxicc.ac.cn (Dong M); fanwb@sxicc.ac.cn (Fan W)

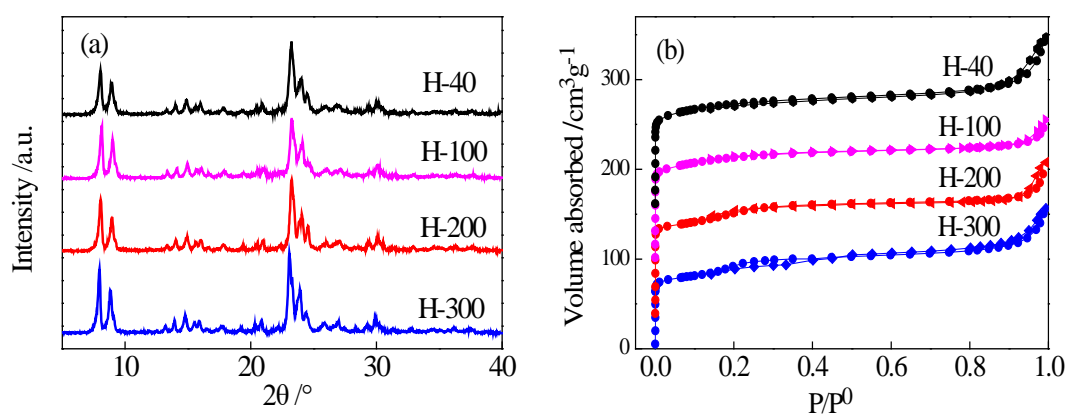


Fig. S1 (a) XRD patterns and (b) N_2 sorption isotherms of various H-ZSM-5 with different Si/Al ratios.

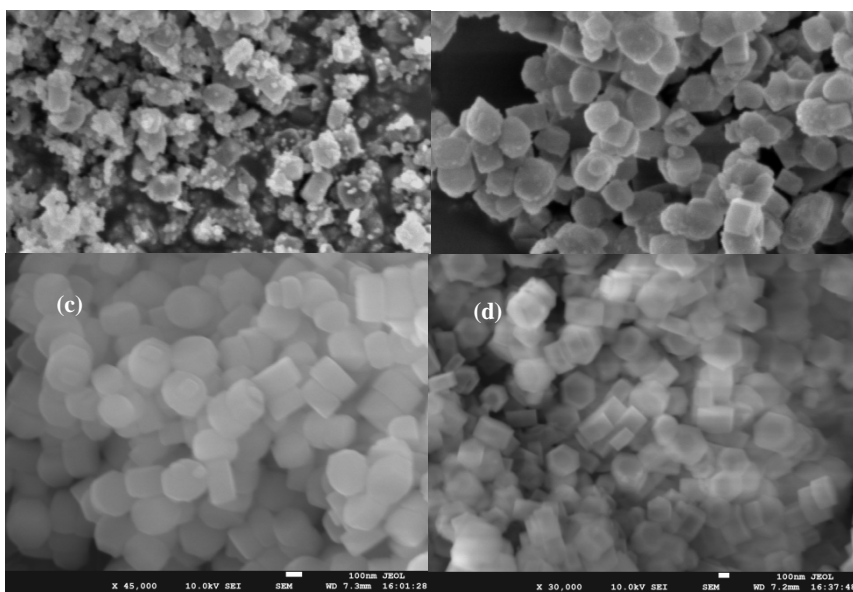


Fig. S2 SEM images of (a) H-40, (b) H-100, (c) H-200 and (d) H-300.

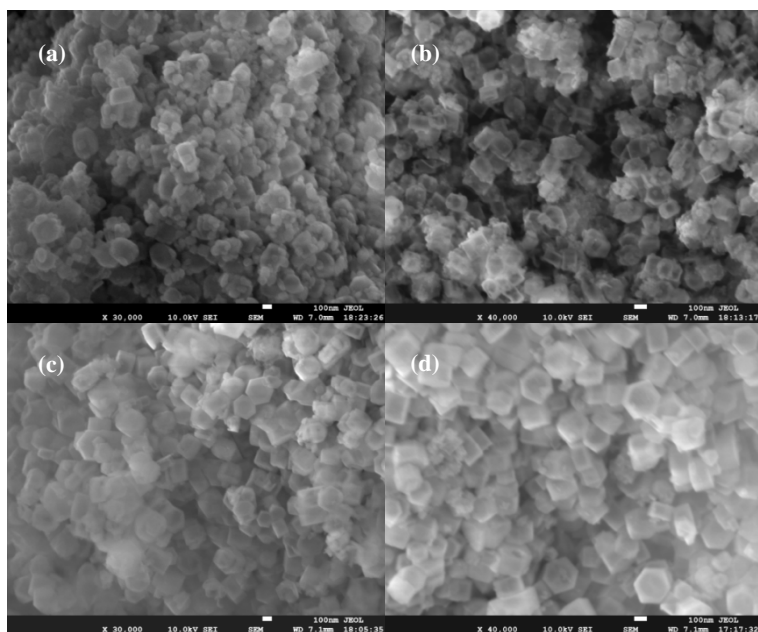


Fig. S3 SEM images of (a) H-40-hol, (b) H-100-hol, (c) H-200-hol and (d) H-300-hol.

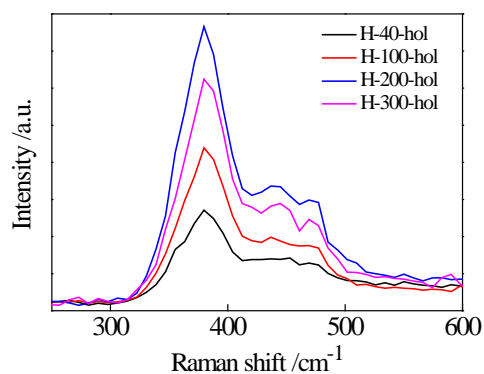


Fig. S4 UV-Raman spectra of H-40-hol, H-100-hol, H-200-hol and H-300-hol.

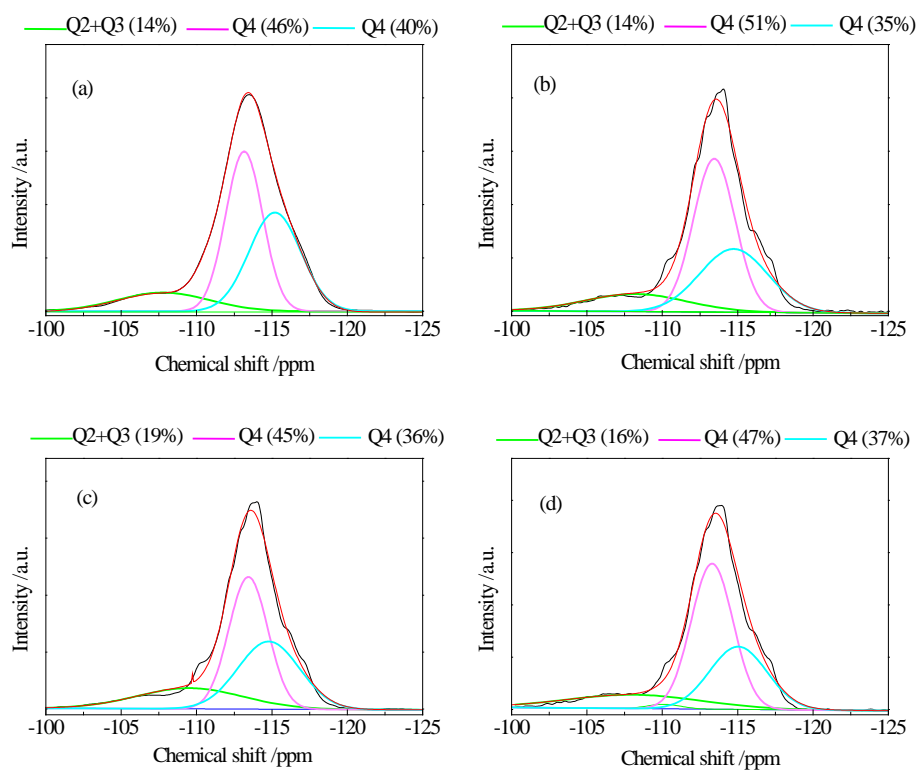


Fig. S5 ^{29}Si MAS NMR spectra of (a) H-40-hol, (b) H-100-hol, (c) H-200-hol and (d) H-300-hol.

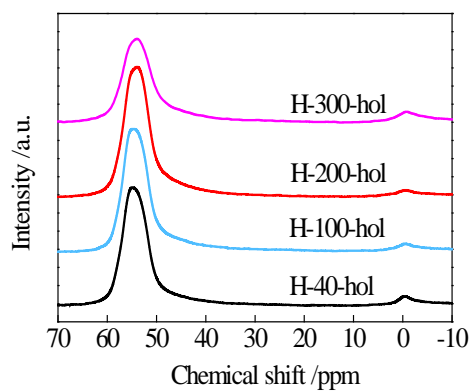


Fig. S6 ^{27}Al MAS NMR spectra of H-40-hol, H-100-hol, H-200-hol and H-300-hol.

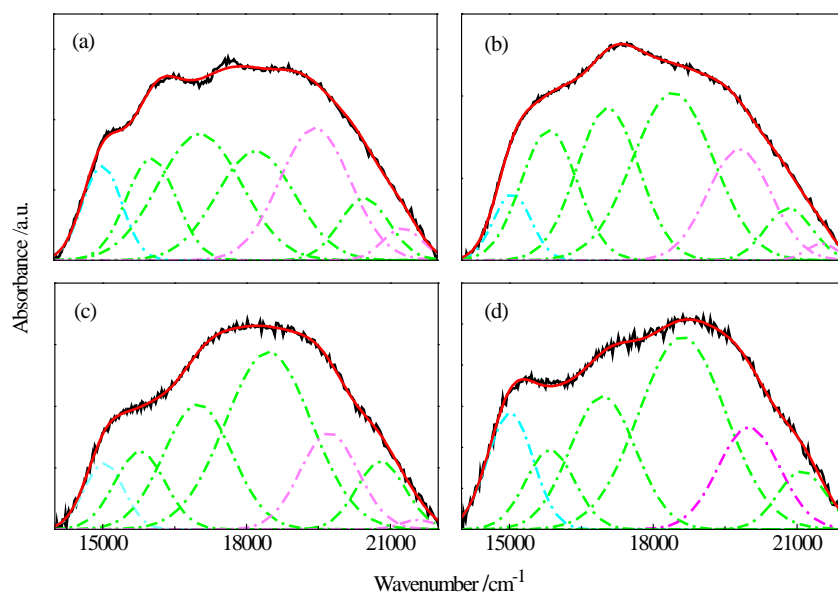


Fig. S7 Deconvolution of DR UV-vis spectra of Co^{2+} -exchanged (a) H-40-hol, (b) H-100-hol, (c) H-200-hol and (d) H-300-hol.

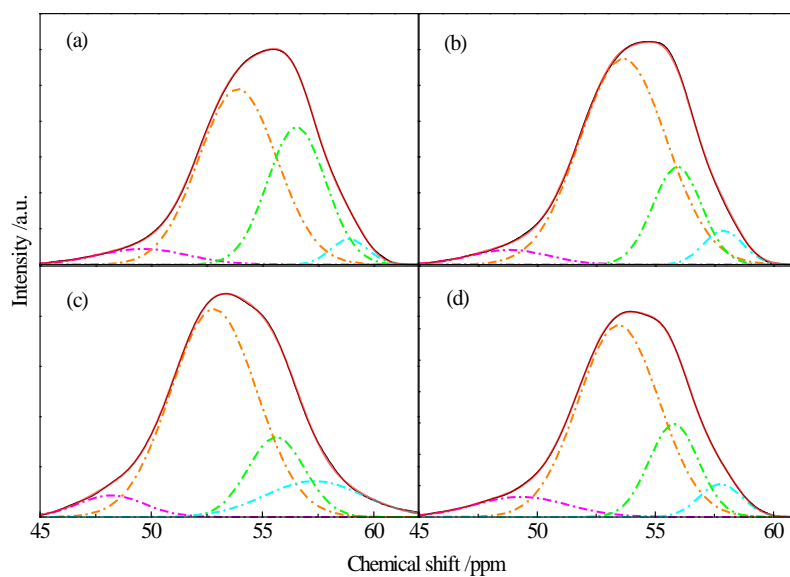


Fig. S8 Deconvolution of ^{27}Al MAS NMR spectra of (a) H-40-hol, (b) H-100-hol, (c) H-200-hol and (d) H-300-hol.

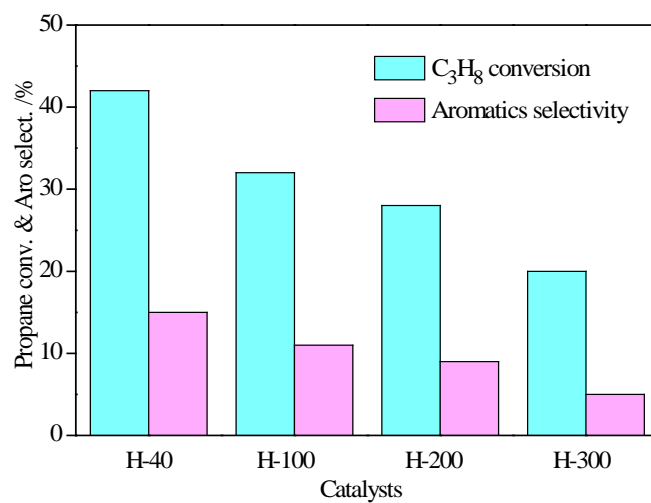


Fig. S9 Propane conversion and aromatics selectivity of various H-ZSM-5 zeolites with different Si/Al ratios in propane aromatization (reaction conditions: 540°C , 1 atm and WHSV of 0.8 h^{-1}).

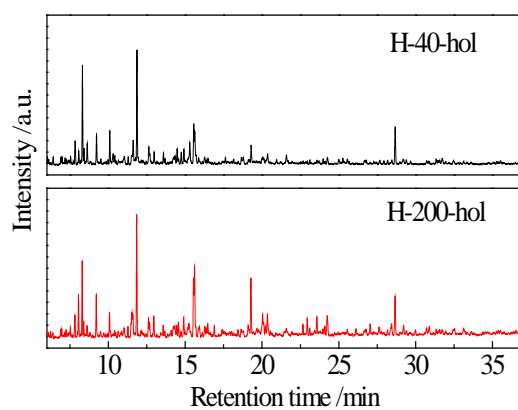


Fig. S10 GC-MS chromatograms of the residual species trapped in the spent H-40-hol and H-200-hol samples after propane aromatization.

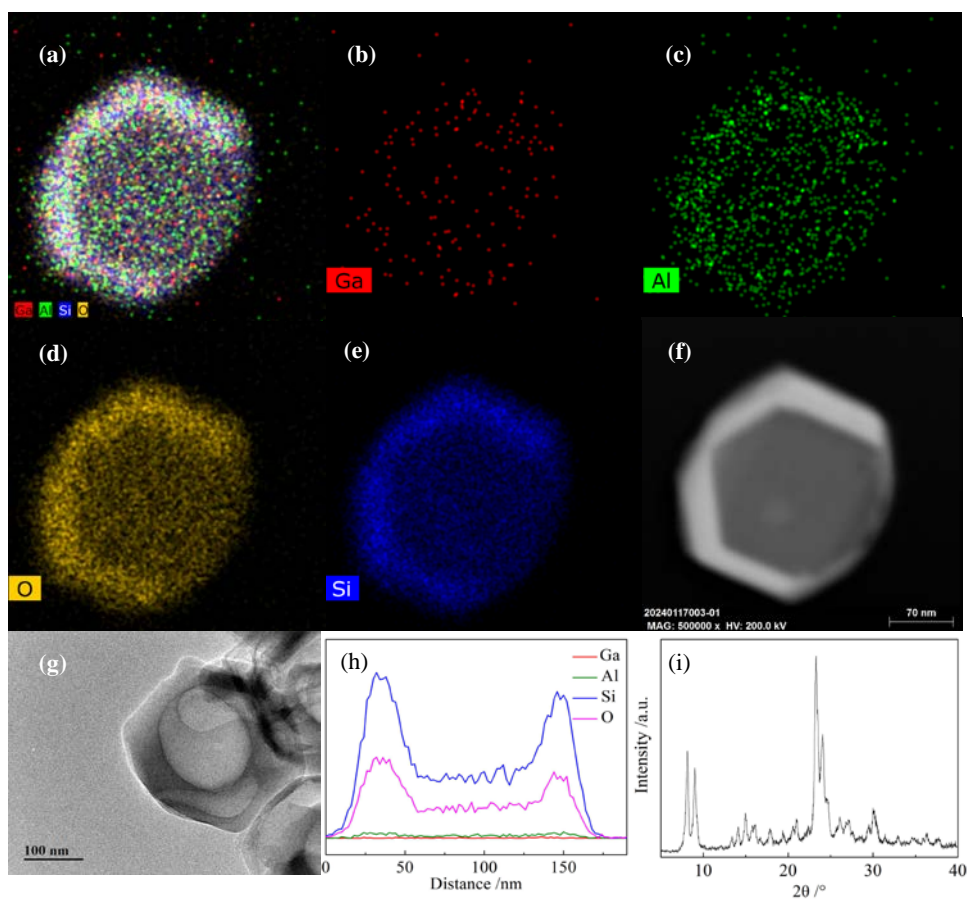


Fig. S11 (a-g) STEM and EDX elemental mappings, (h) TEM image and (i) XRD pattern of spent Ga-200-hol after propane aromatization.