

Impact of the Si/Al ratio on the ethanol/water coadsorption on MFI zeolites revealed by original quantitative IR approaches.

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Supporting information

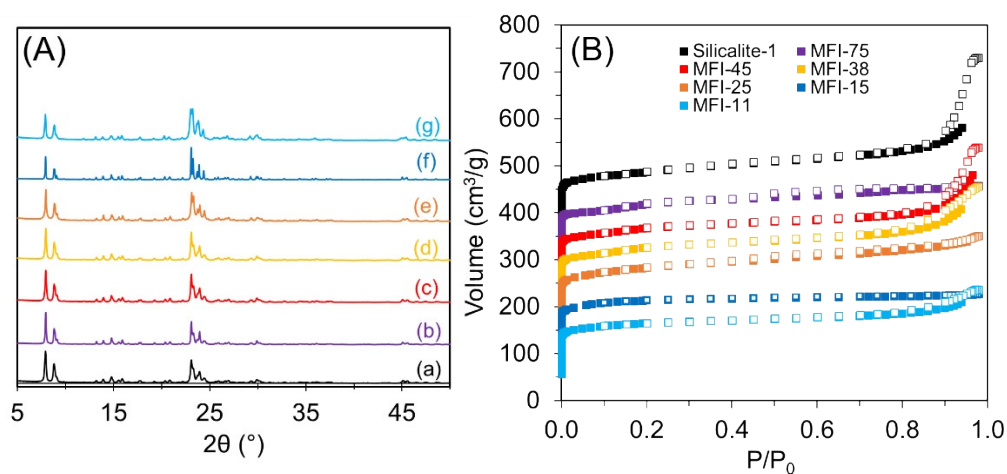


Figure S1: (A) PXRD patterns and (B) N_2 adsorption/desorption isotherms at 77 K of Silicalite-1 (black, (a)), MFI-75 (purple, (b)), MFI-45 (red, (c)), MFI-38 (yellow, (d)), MFI-25 (orange, (e)), MFI-15 (dark blue, (f)) and MFI-11 (light blue (g)). The adsorption/desorption isotherms are offset vertically for comparison.

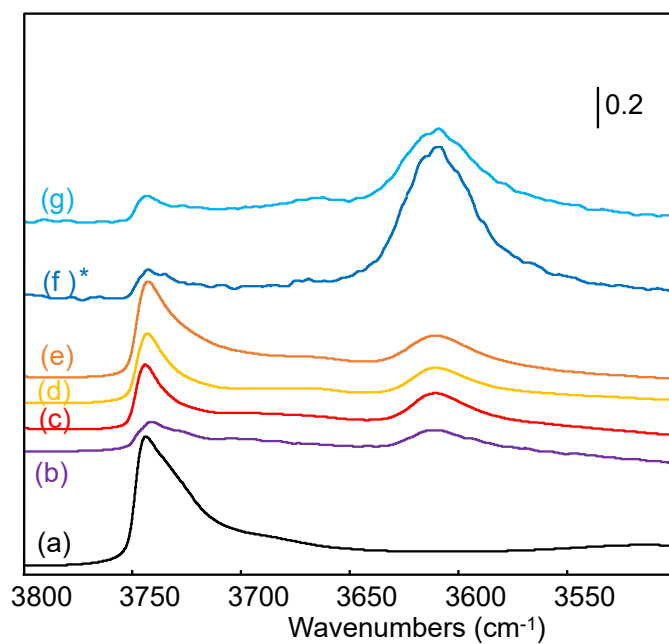


Figure S2: FTIR spectra in the OH region between 3800 and 3500 cm^{-1} for Silicalite-1 (black, (a)), MFI-75 (purple, (b)), MFI-45 (red, (c)), MFI-38 (yellow, (d)), MFI-25 (orange, (e)), MFI-15 (dark blue, (f)) and MFI-11 (light blue (g)). The spectra were recorded at RT and normalized to the mass of the pellet (20 mg). * the higher intensity of the $\nu(\text{OH})$ band results from an IR light scattering effect due to the big crystallites size of the MFI-15 sample (compared to other zeolites).

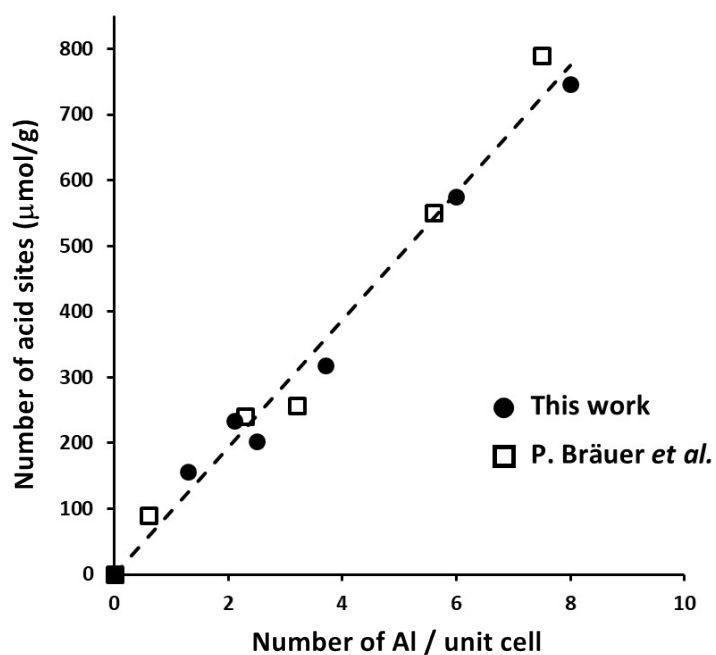


Figure S3: Linear evolution of the total amount of acid sites (Lewis + Bronsted) as a function of the Al content per unit cell. Black circle : this work and empty square : values reported from P. Bräuer, O. Situmorang, P; L. Ng and C. D'Agostino, Phys. Chem. Chem. Phys., 2018, 20, 4250

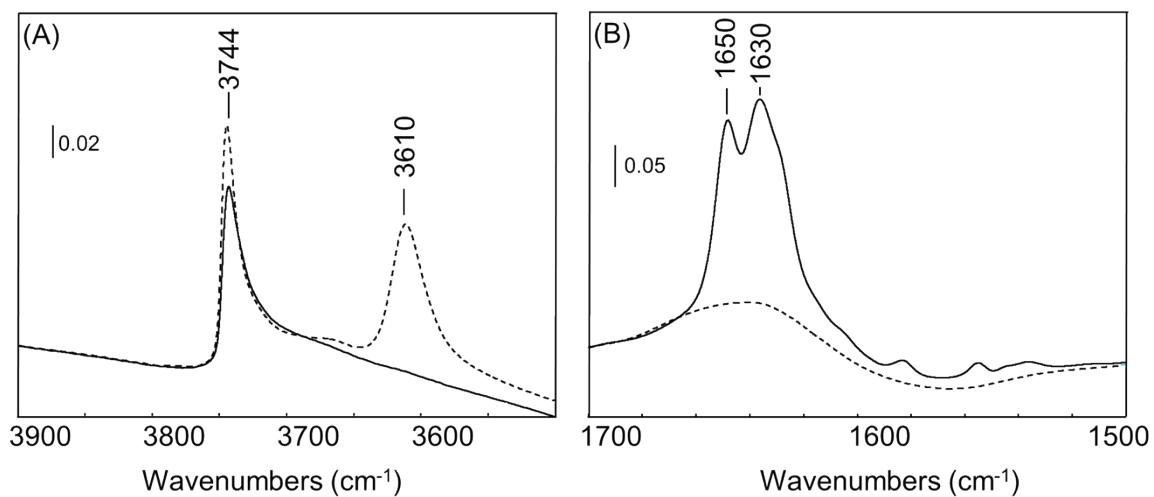


Figure S4: FTIR spectra in the OH region between 3800 and 3500 cm^{-1} (A) and in the region between 1700 and 1500 cm^{-1} (B) for MFI-45 before (dashed line) and after (solid line) adsorption of Lutidine.

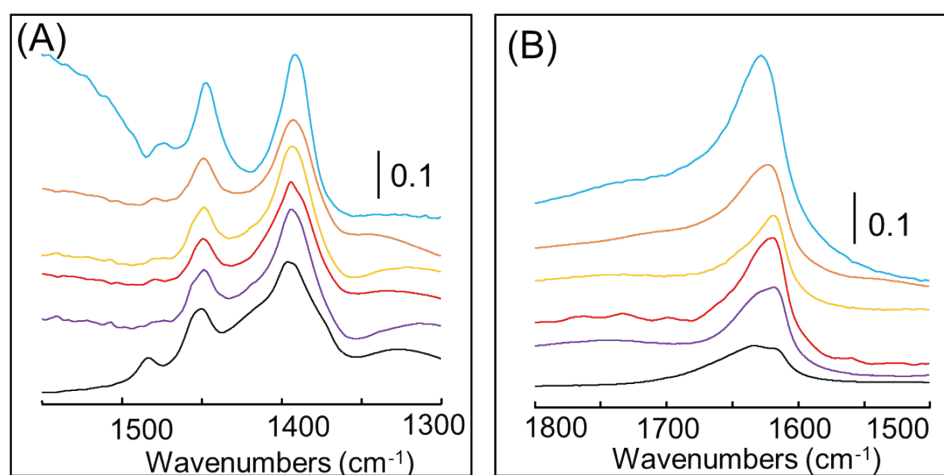


Figure S5: Evolution of the IR spectra (subtracted spectra) of different zeolites after adsorption of (A) ethanol ($P/P_0 = 0.129$) and (B) water ($P/P_0 = 0.16$) on Silicalite-1 (black), MFI-75 (purple), MFI-45 (red), MFI-38 (yellow), MFI-25 green, and MFI-11 (light blue). The spectra are normalized to the mass of the pellet (20 mg).

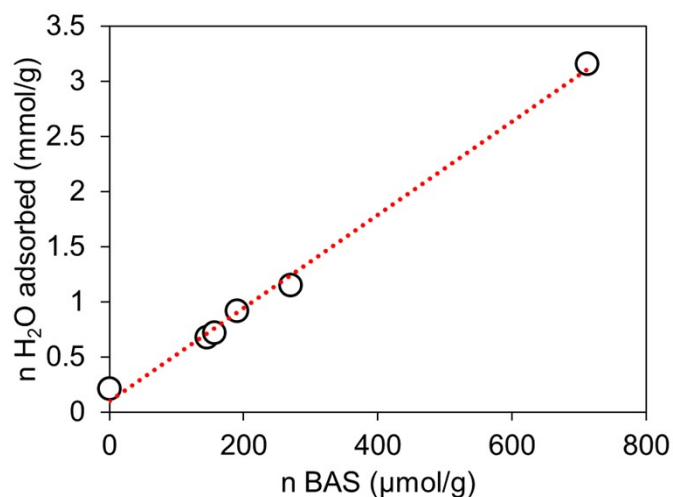


Figure S6: Linear correlation between Bronsted acid sites calculated after Pyridine adsorption and the quantity of adsorbed water at water partial pressure $P/P_0 = 0.0065$, for MFI zeolites with different Si/Al ratios.

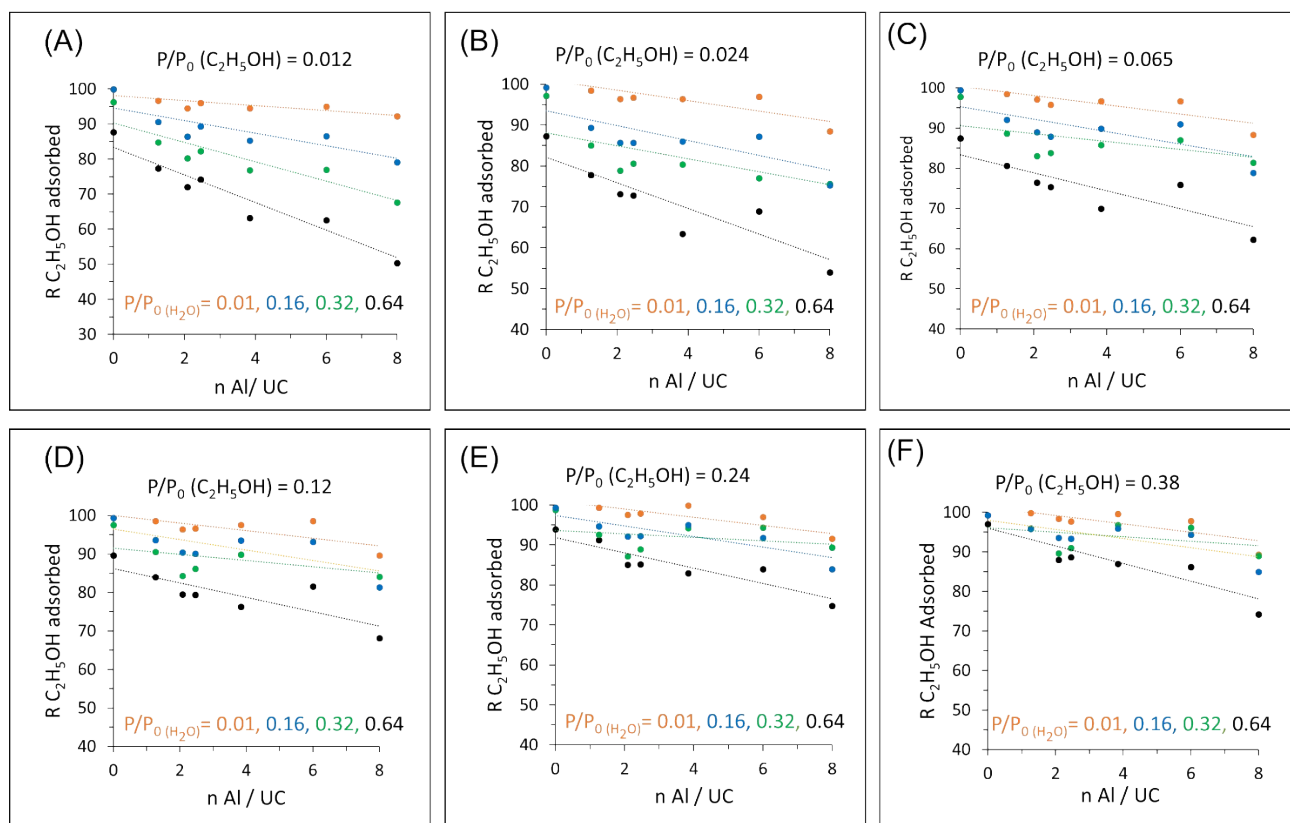


Figure S7: Ratio of adsorbed C_2H_5OH vs the number of Al per unit cell for $P/P_0(C_2H_5OH) = 0.012$ (A), 0.024 (B), 0.065 (C), 0.12 (D), 0.24 (E) and 0.38 (F) after adsorption of different water partial pressures ($P/P_0(H_2O) = 0.01$ (orange), $P/P_0(H_2O) = 0.16$ (blue), $P/P_0(H_2O) = 0.32$ (green) and $P/P_0(H_2O) = 0.64$ (black)) for different MFI zeolites.