Supporting Information

From powder to extrudate zeolite-based bifunctional hydroisomerization catalysts: on preserving zeolite integrity and optimizing Pt location

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Contents

X-ray powder diffraction

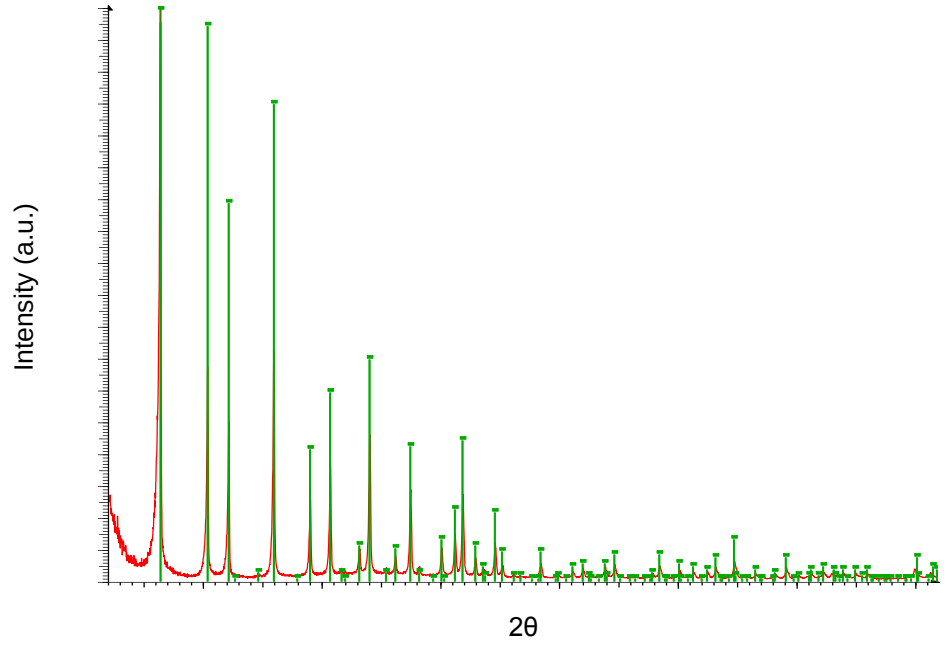

Figure S1: XRD powder diffractogram of HUSY zeolite and ICDD pattern of FAU structure (04-007-2502).

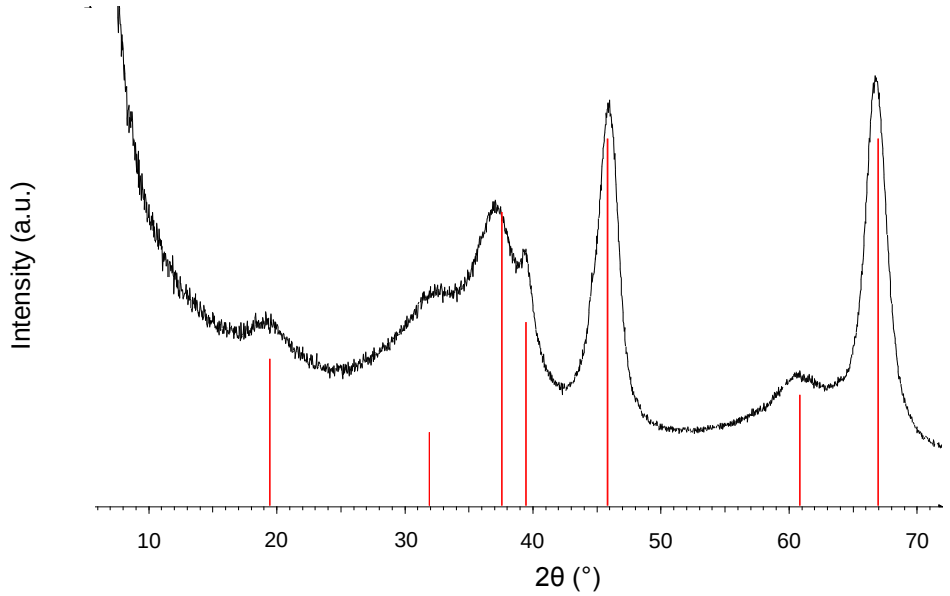

Figure S2: Diffractogram of Al_2O_3 support (black) and ICDD pattern of γ-Al_2O_3 (00-010-0425).

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Scanning electron microscopy

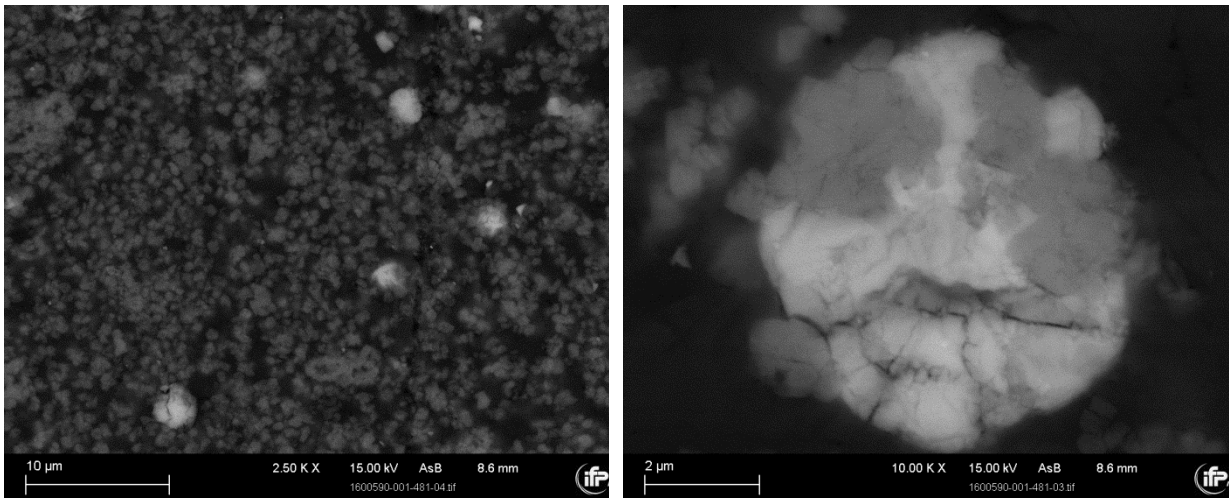

Figure S3: TEM micrographs for HUSY zeolite. Dense agglomerates of zeolite are observed.

Pyridine desorption followed by FT-IR

Pyridine adsorption experiments were performed with a static experimental setup under vacuum. A homemade IR cell equipped with KBr windows was used. The catalyst powder was pressed into self-supporting wafers (20 mg, 10 mg cm^{-2}). The samples were activated in static conditions under secondary vacuum at 723 K. After cooling at room temperature, pressure of 4 mbar of pyridine was introduced in contact to the activated sample. IR spectra of thermo desorbed sample at 423, 523, 623 and 723 K were recorded in order to get information on the acidic surface properties of the material (concentration, strength and accessibility of acid sites). Further discussion on pyridine adsorption in the same HUSY zeolite sample is available in literature [1].

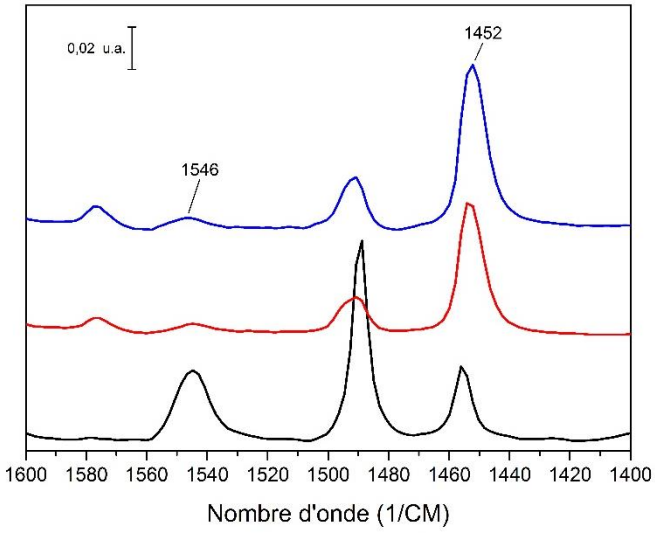

Figure S4: FTIR spectra for desorption of pyridine adsorbed at 150 °C on HUSY-based samples. From bottom to top: powder zeolite, shaped support, and mechanical mixture with alumina. The band around 1540 cm^{-1} is characteristic for pyridinium ions (Brønsted acid sites, BAS), while bands between 1445 and 1460 cm^{-1} are attributed to coordinatively adsorbed pyridine (Lewis acid sites, LAS) [2].

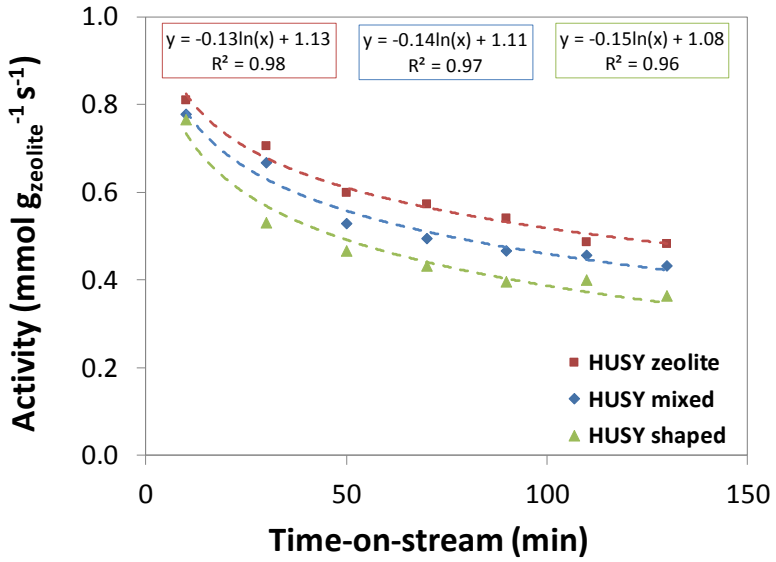

Figure S5: Activity as function of time-on-stream for the parent HUSY zeolite itself, and both mechanically mixed and shaped with alumina in m-xylene isomerization. The reaction was carried out at 623 K, 2.8 kPa of m-xylene, and a weight hourly space velocity of 5.6 gm-xylene $g_{zeolite}^{-1}$ s^{-1}.

n-Hexadecane hydroisomerization

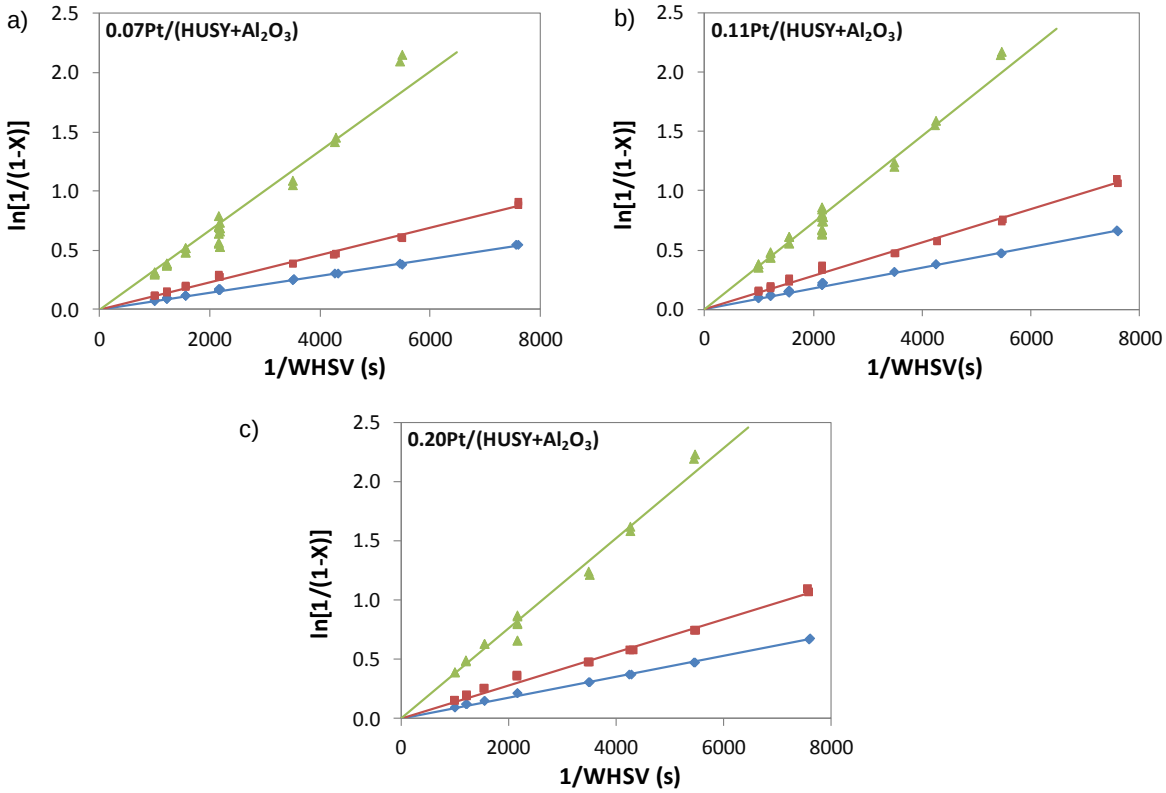

Figure S6: First-order plot for the consumption of *n*-C_{16} at 483 K (◆), 488 K (■), and 498 K (▲). Symbols stand for experimental data and lines for fitting results. The reaction was carried out at 1.1 MPa total pressure and a molar H_2 to *n*-C_{16} ratio of 10.

References

1 P. S. F. Mendes, G. Lapisardi, C. Bouchy, M. Rivallan, J. M. Silva and M. F. Ribeiro, Hydrogenating activity of Pt/zeolite catalysts focusing acid support and metal dispersion influence, *Appl. Catal. A*, 2015, **504**, 17–28. DOI: 10.1016/j.apcata.2015.03.027.

2 J. A. Lercher, C. Gründling and G. Eder-Mirth, Infrared studies of the surface acidity of oxides and zeolites using adsorbed probe molecules, *Catal. Today*, 1996, **27**, 353–376. DOI: 10.1016/0920-5861(95)00248-0.