Electronic Supplementary Material (ESI) for Catalysis Science & Technology.

Supporting Information

Enhanced Activity for the Selective Catalytic Reduction of NO_x by Desilicated Cu-SSZ-13, and its Comparison to Steaming

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1. Surface Area and Pore Volume Measurements

Table S1. Surface areas and pore volumes of parent and hydrothermally treated H-SSZ-13 and Cu-SSZ-13 samples, as measured by N_2 physisorption.

Cu-SSZ-13	BET (m^2g^1)	Micropore Area (m^2g^{-1})	Micropore Volume (cm^3g^{-1})	H-SSZ-13	BET (m^2g^{-1})	Micropore Area (m^2g^{-1})	Micropore Volume (cm^3g^{-1})
parent	755	755	0.28	parent	712	712	0.27
m500	750	749	0.282	m500	694	694	0.28
m650	760			m650	766		
s500	739	739	0.28	s500	736		
s650	731			s750	793		
s750	257						

Note that some data is missing since these measurements were performed by an external laboratory.

Table S2. Surface areas and pore volumes of the parent and hydrothermally treated Cu-SSZ-13 samples, using different amounts of water content in the feed, as measured by Ar physisorption at 77 K.

Sample	BET surface area (m^2/g)	Micropore surface (m^2/g)	Micropore volume (m^3/g)	External surface (m^2/g)
Fresh	599	576	0.27	22
15%	525	506	0.23	19
40%	451	446	0.21	5.2
90%	477	459	0.21	18

2. X-ray Diffraction Measurements

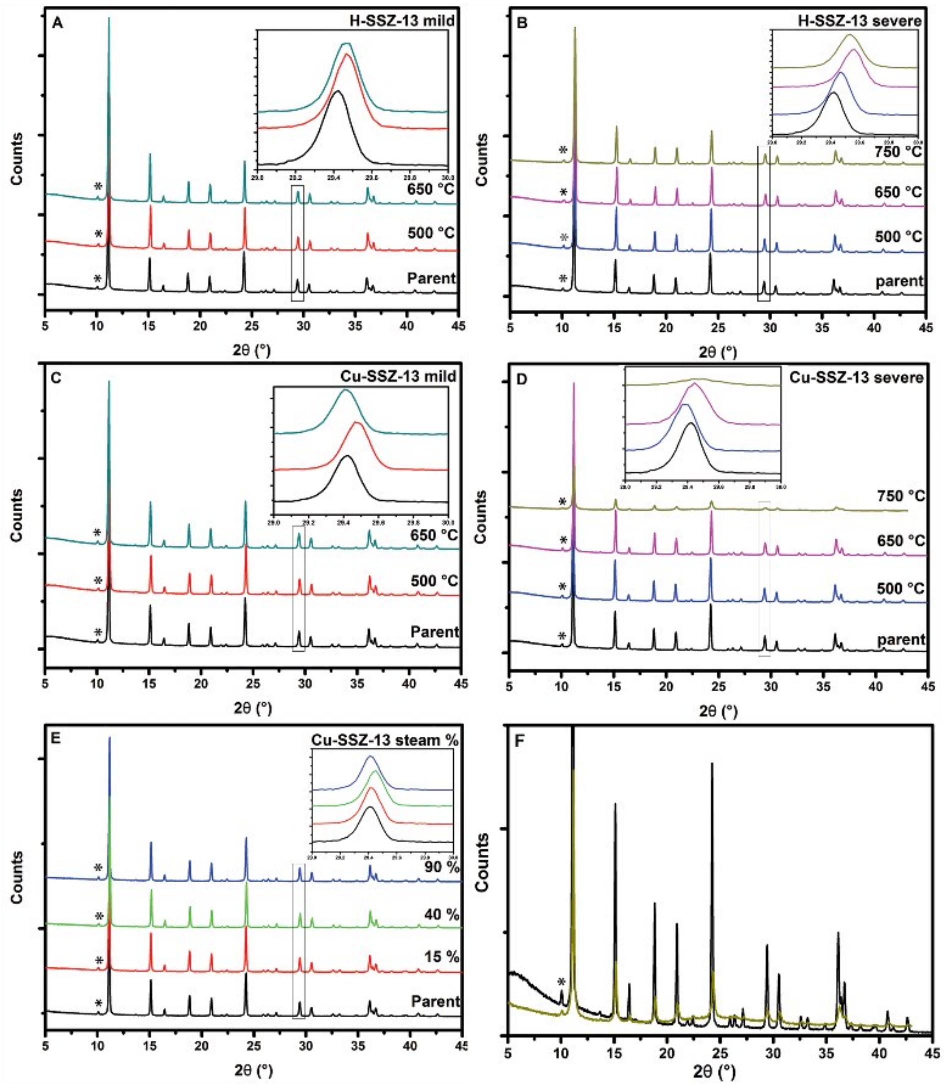

Fig. S1. X-ray powder diffraction data collected on steamed H-SSZ-13 (A+B), steamed Cu-SSZ-13 (C+D) and E) Cu-SSZ-13, showing the influence of water content in the feed. Only Cu-SSZ-13-S750 seems to lose crystallinity, based on the decrease in peak reflection intensities and a rise of amorphous phase at 2θ = 25 °. F shows the Cu-parent and Cu-s750 stacked, so the amorphous phase is clearer. * denotes peaks originating from K_β radiation.

3. Confocal Fluorescence Microscopy Measurements

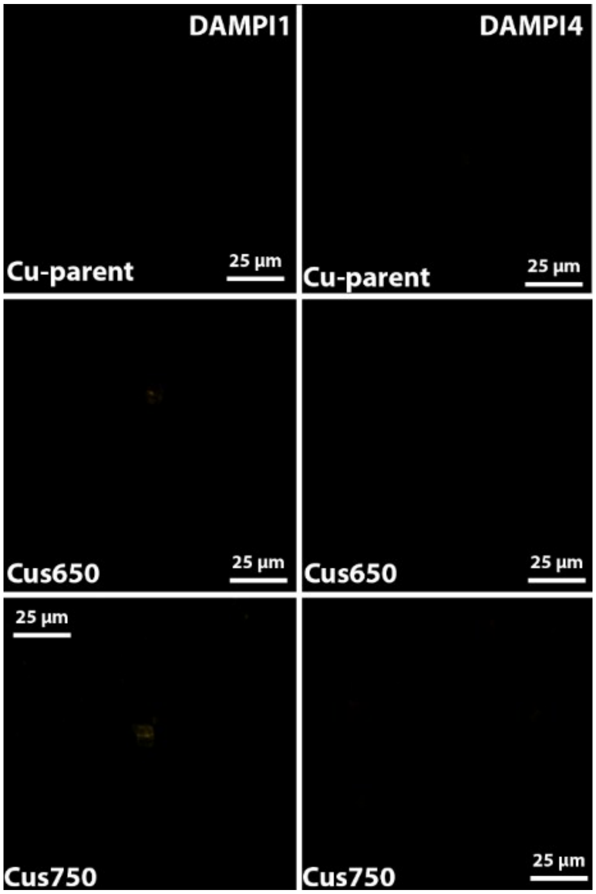

Fig. S2. Confocal fluorescence microscopy images of the parent and two steamed zeolite Cu-SSZ-13 crystals under study. The measurements were made in the middle plane of the crystals. The settings are the same as for the base-leached zeolite Cu-SSZ-13 samples, which are shown in Fig. 3 in the main text.

4. NH_3-Temperature Programmed Desorption Measurements

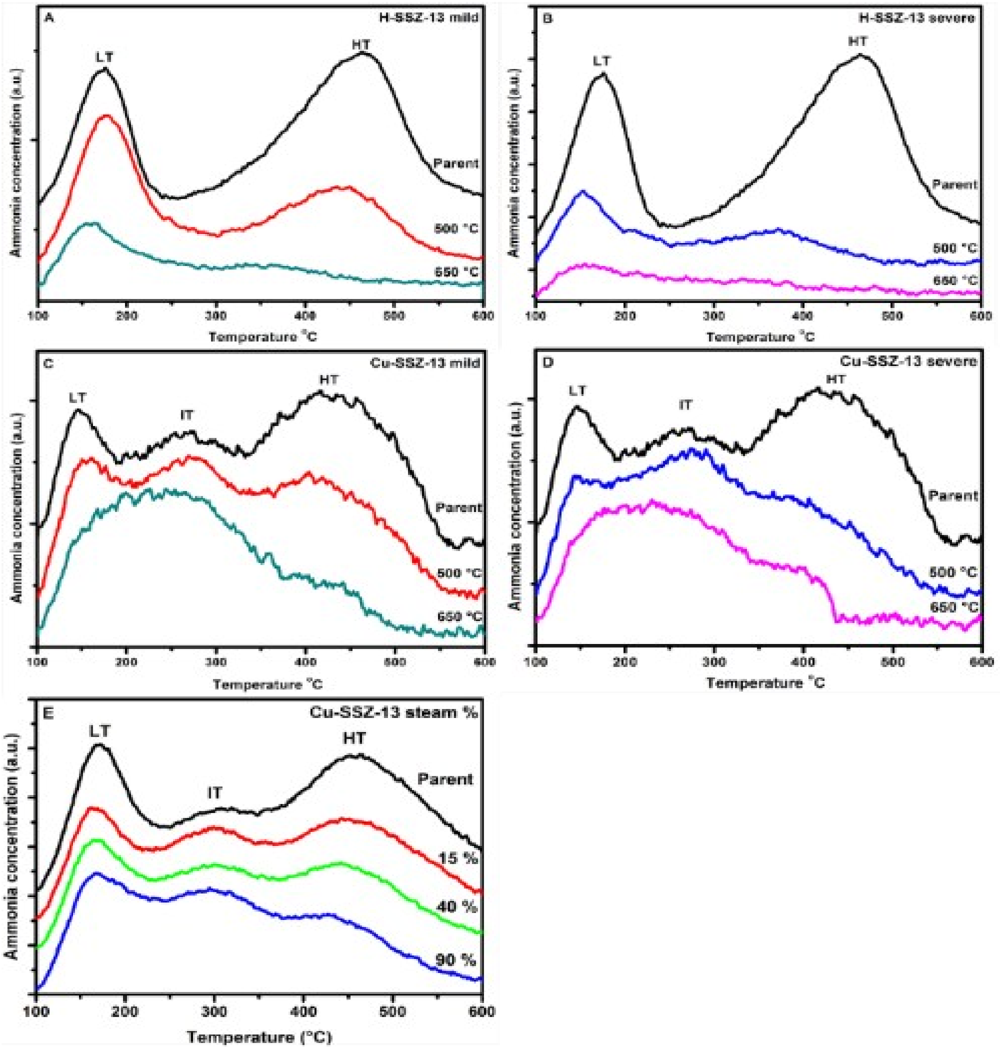

Fig. S3 NH_3-TPD-curves, H-SSZ-13 mild and severe (A+B) and Cu-SSZ-13, mild and severe treated zeolites (C+D), E). Influence of water content in the feed at 550 °C, stacked by Y-offset. LT low temperature, HT high temperature, IT intermediate temperature. The LT peak is normally assigned to Lewis acid sites inside the zeolite framework and the HT peak is assigned to Brønsted acid sites. The IT peak is due to interaction of Cu^{2+} with NH_3.

Table S3. Results of NH_3-TPD for the H-SSZ-13 and Cu-SSZ-13 parent and steamed samples, including the total integrated amount of NH_3 desorbed from the catalysts.

Sample name	mmol NH_3/g	Sample name	mmol NH_3/g	Sample name	mmol NH_3/g
H-SSZ-13		Cu-SSZ-13		Cu-SSZ-13	
Parent	0.90	parent	0.79	fresh	1.06
m500	0.67	m500	0.75	15%	0.89
s500	0.47	s500	0.71	40%	0.78
m650	0.32	m650	0.60	90%	0.76
s650	0.31	s650	0.44		

5. UV-Vis-NIR Diffuse Reflectance Spectroscopy Measurements

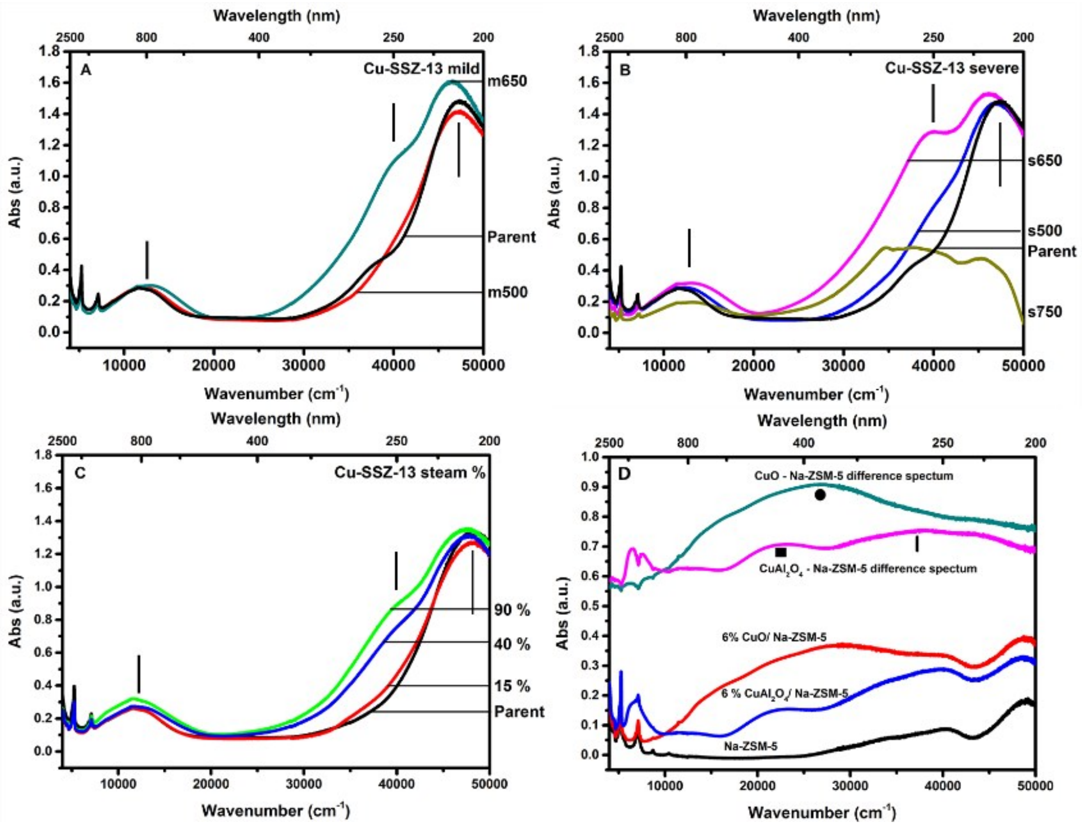

Fig. S4 UV–Vis-NIR DRS spectra of Cu-SSZ-13 after being submitted to the steaming procedures, both mild (A) and severe steaming treatments (B) and the influence of water content in the feed for Cu-SSZ-13 (C). Three important positions are marked; the d-d transition at 12000 cm^{-1}, the CT at ~ 47000 cm^{-1} and the CT of the Cu_xO_y species at ~ 40000 cm^{-1}. (D) bulk CuO and bulk $CuAl_2O_4$ reference spectra, mixed with sodium zeolite, and difference spectra between the mixed spectra and the sodium exchanged zeolite. Abs. bands $CuAl_2O_4$: 22000 and 37500 cm^{-1}, main Abs. band bulk CuO: 26500 cm^{-1}.