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Tunning catalytic acidity in Al$_2$O$_3$ nanofibers with mordenite nanocrystals for dehydration reactions

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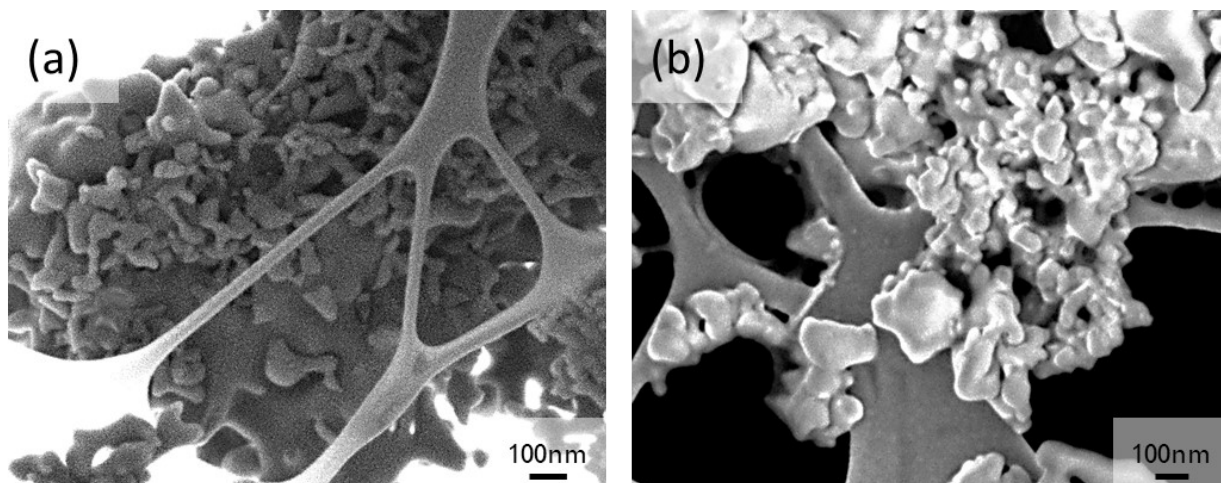# Electronic supporting information (ESI)

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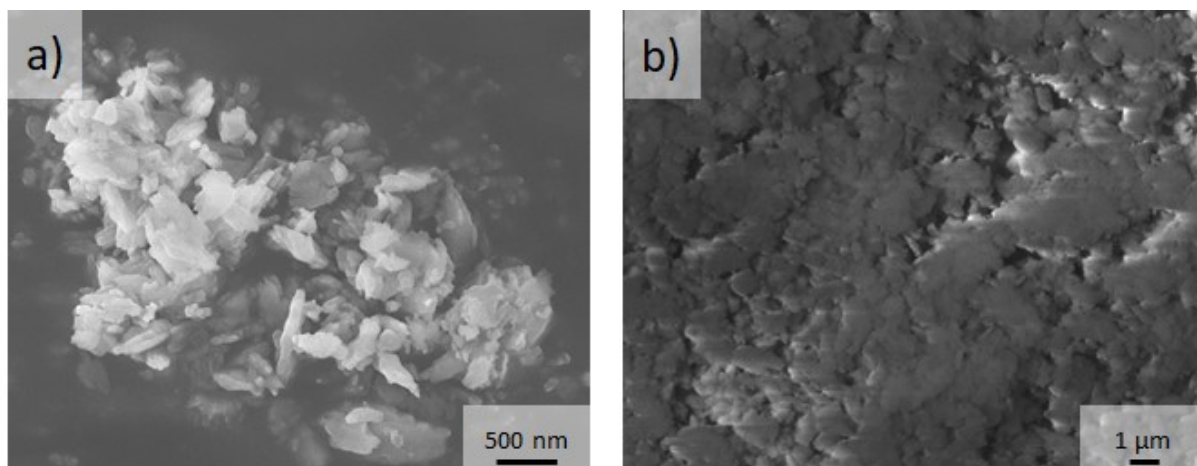
Figure S1. a) SEM images of commercial NaMOR with crystallite size of 220 nm estimated with XRD and b) Electrospun hybrid ANFs containing HMOR after annealing.

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Figure S2. STEM image of a) HMOR and b) NaMOR zeolite seeds. The particle sizes of NaMOR and HMOR correspond to 118 nm and 110 nm as estimated with XRD.
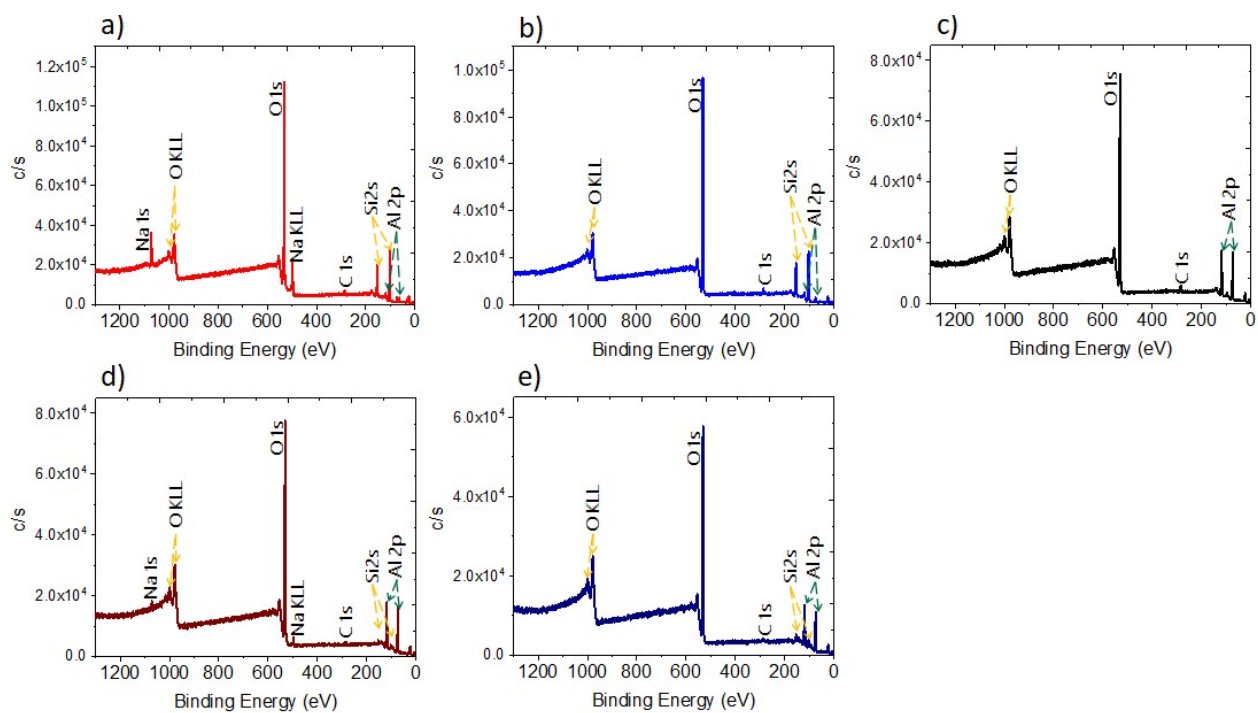
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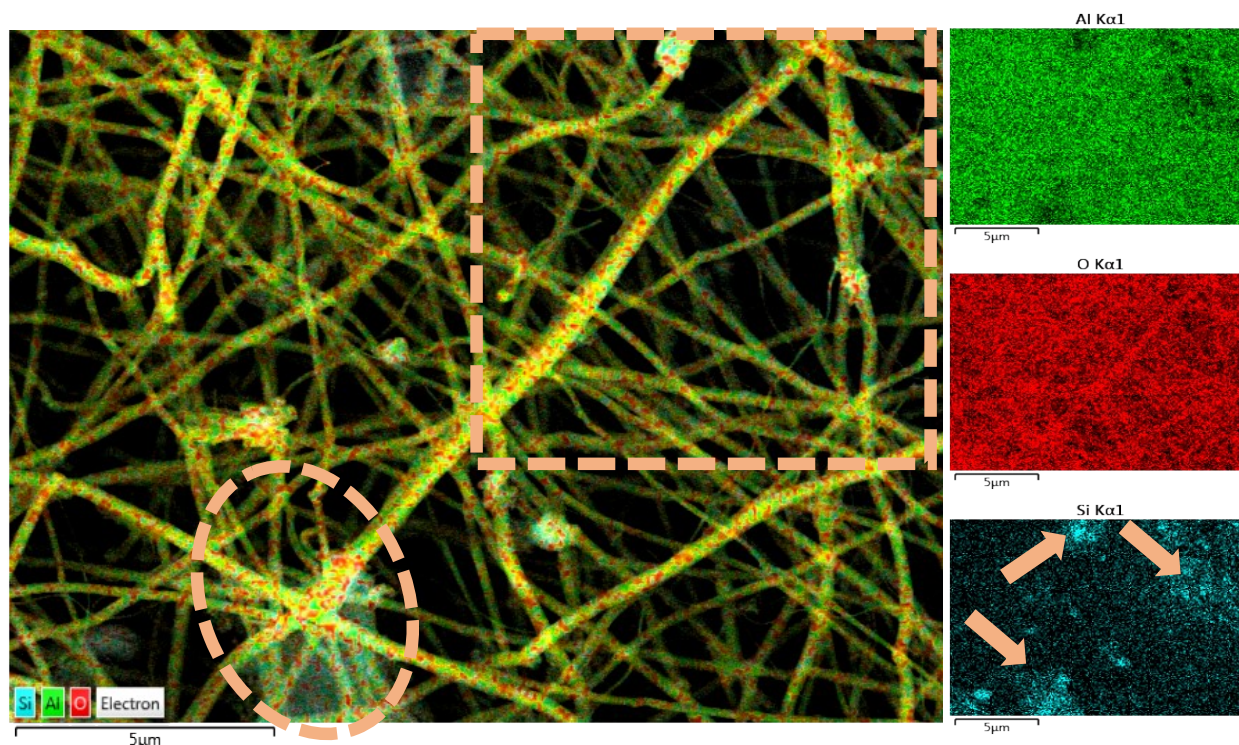
Figure S3. EDS mapping of ANF-HMOR. Silicon signal is color-coded in blue, Oxygen signal in red, and Al signal in green.

The presence of HMOR in the ANFs is indirectly confirmed with EDS. HMOR composition is mainly aluminum (green), oxygen (red), and silicon (blue), while ANFs are composed of aluminum and oxygen. Aluminum and oxygen signals have a color overlap, leading to yellow color. However, EDS shows the presence of silicon, which can be related to MOR nanocrystals. MOR has been found denser over the nanofiber architectures (see the dashed square in light orange). MOR has also been found distributed out of the non-woven nanofiber network as inhomogeneity (see the dashed ellipse in light orange). To facilitate the reader, compare with the EDS signal of silicon (right bottom panel). Here, denser silicon signals are highlighted with light orange arrows.

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Figure S4. Chemical composition at the surface of a) NaMOR, b) HMOR, c) ANFs, d) ANF-NaMOR, and e) ANF-HMOR obtained with XPS.
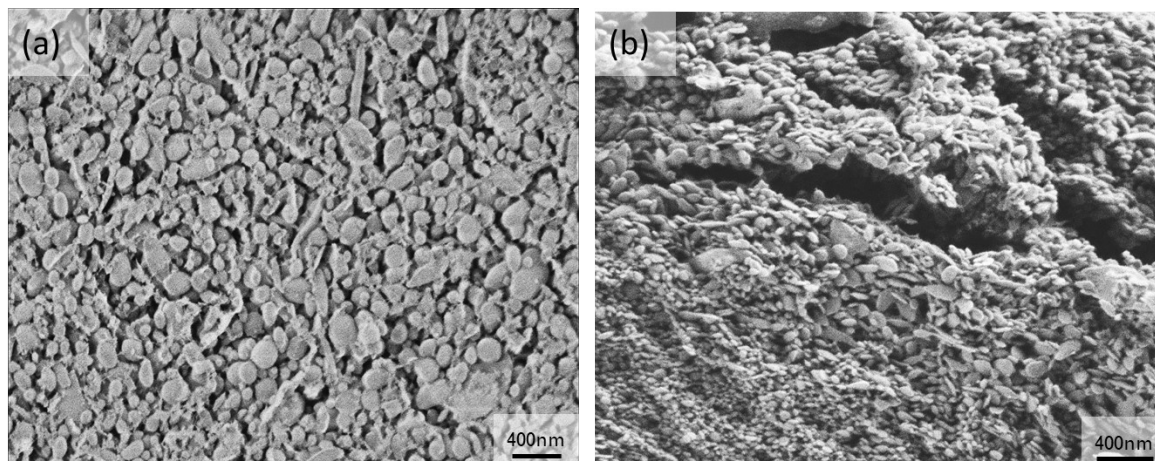
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Table S1. Atomic percentage (at.%) of the different samples evaluated with XPS in **Figure S4**.

Sample	C	Si/Al	O	Na	N
NaMOR	3.6	7.9	64.1	6.53	0.1
HMOR	4.9	7.3	64.5	0.3	2.3
ANFs	5.2	26.9 at.% of Al	67.7	-	-
ANF-NaMOR	2.5	0.05	68.5	1.6	-
ANF-HMOR	2.5	0.10	68.7	-	-

Table S1 shows the presence of silicon, aluminum, oxygen, and sodium in NaMOR. HMOR contains the same elements plus nitrogen, indicating the presence of NH_4^+. The ANF-NaMOR and ANF-HMOR show the same elemental composition. A decrease in the Si/Al has been seen compared to NaMOR or HMOR. Furthermore, no nitrogen has been observed for ANF-HMOR. However, the detection of Na and Si indicates the presence of MOR in the hybrid ANFs. It should be noted that the low Si/Al is expected due to the high Al content of the ANFs. The general XPS survey in Table S1 revealed the presence of C 1s in all cases.
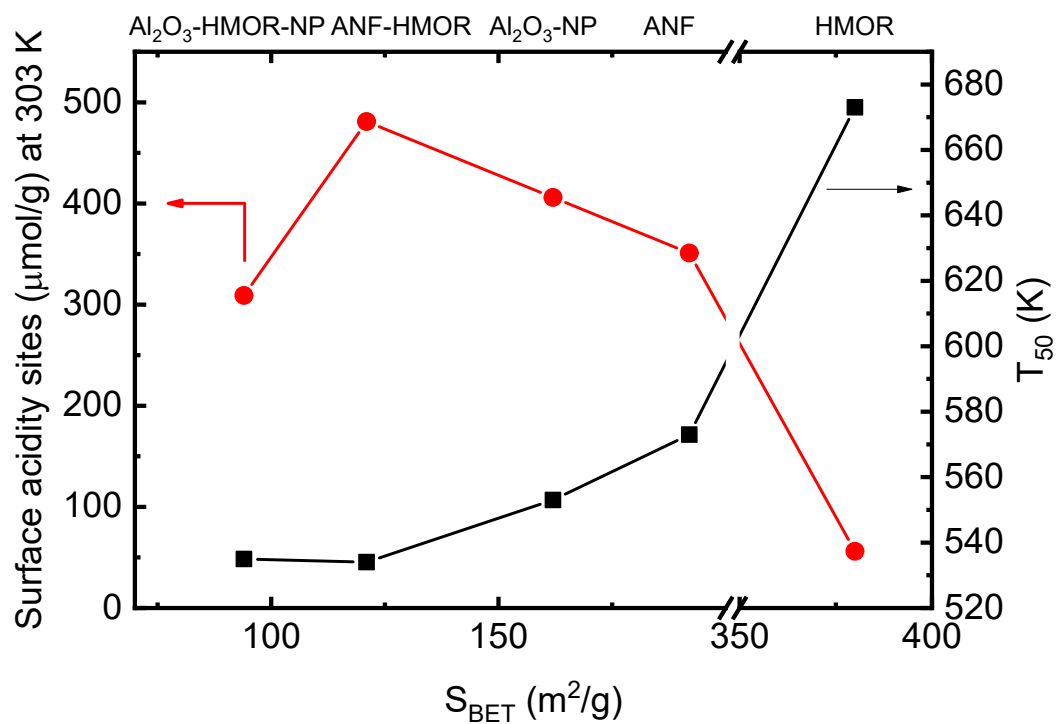
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Figure S5. SEM images of a) Al_2O_3-NP and b) Al_2O_3-HMOR-NP.

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Figure S6. Acid sites (μmol/g) and T_{50} (K) as a function of the surface area (m^2/g) for the unstructured catalysts (HMOR, Al$_2$O$_3$-NP, and Al$_2$O$_3$-HMOR-NP) and nanofibers (ANF, and ANF-HMOR).