

Supplementary Material

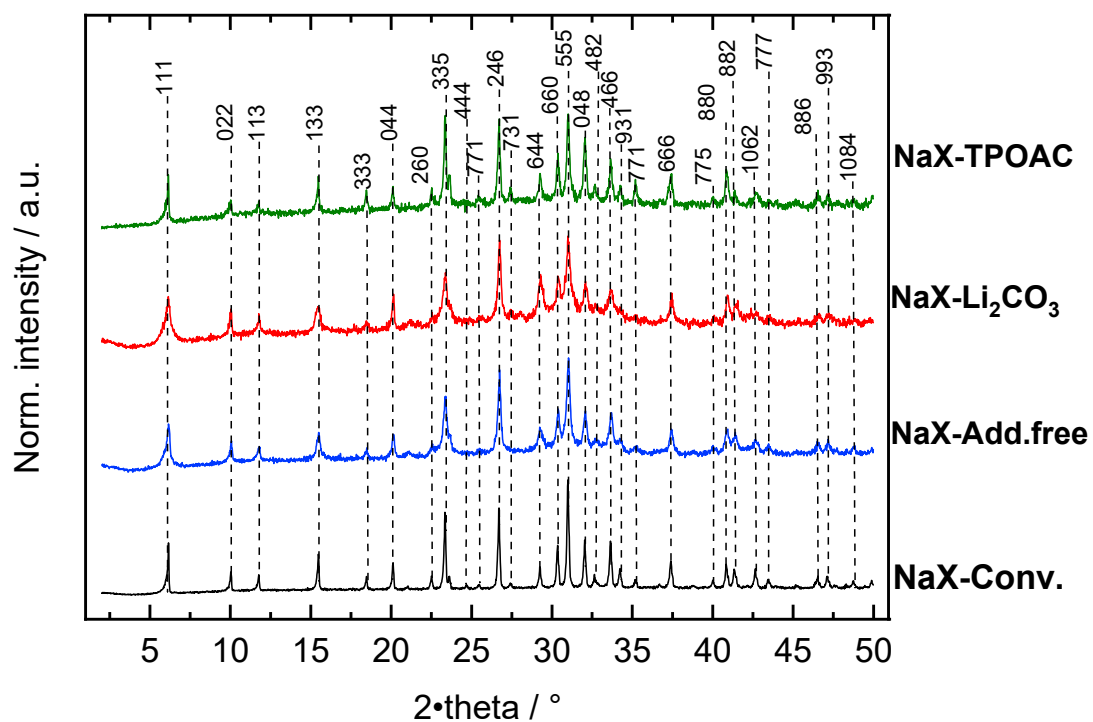
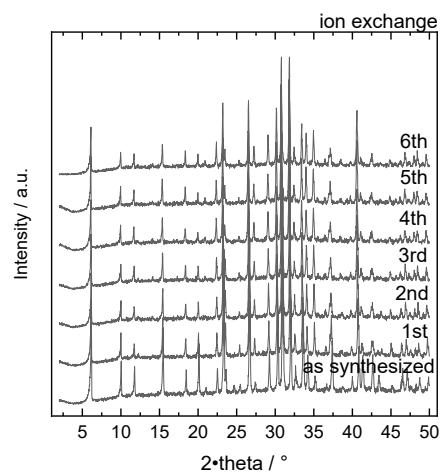
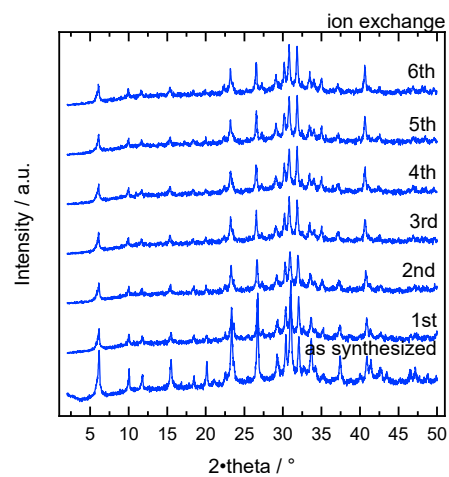


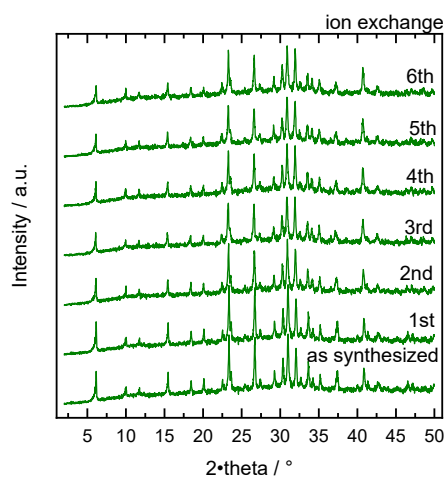
Figure S1: XRD patterns of all four parent NaX samples with the hkl assignments associated with FAU(X) structure according to the ICSD database.



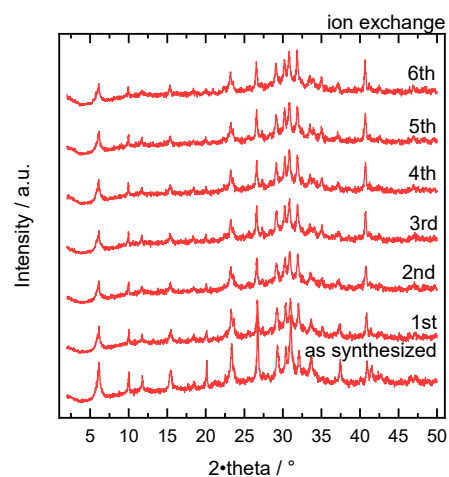
X-Conv



X-Addfree

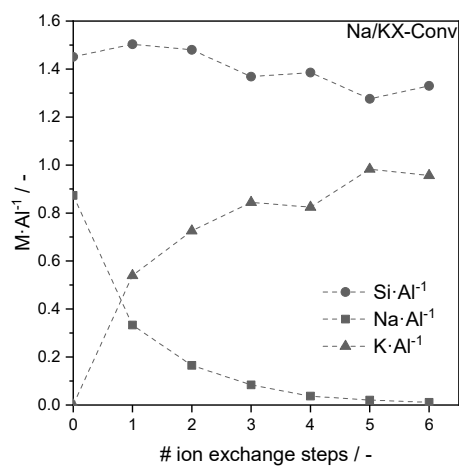


X-TPOAC

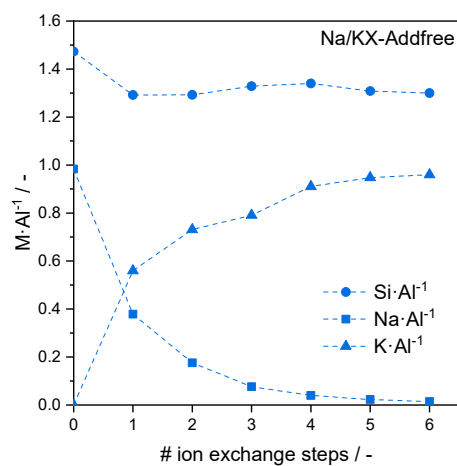


X- Li_2CO_3

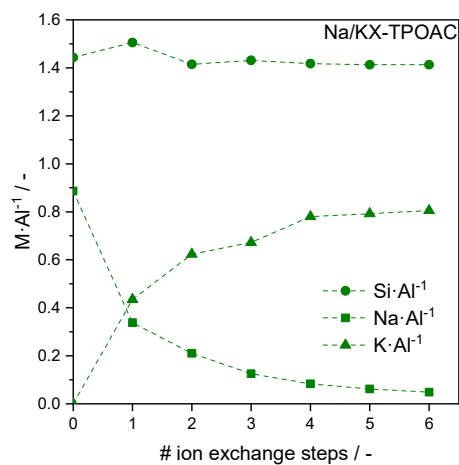
Figure S2: XRD patterns of X-Conv, X-Addfree, X- Li_2CO_3 and X-TPOAC before and after each of the 6 consecutive potassium exchange steps



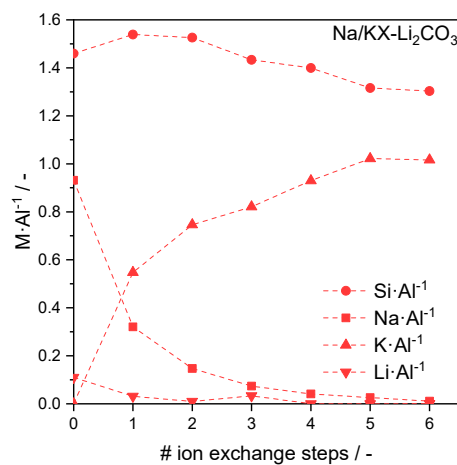
X-Conv



X-Addfree



X-TPOAC



X-Li₂CO₃

Figure S3: Changes in the molar composition of all zeolite samples with different morphology through the six consecutive potassium exchange steps determined via ICP-OES.

Estimation of the volume of 1 M NaOH solution needed for catalytic reference test

The volume needed for a comparison of 1 molar sodium hydroxide solution as homogenous catalyst with zeolite X (conventional morphology) as heterogenous catalyst containing the same amount of active centers is calculate below. The values chosen for this calculation are summarised in Table S1.

$$V_{NaOH} = m_{Zeolite} \cdot w_{Al} \cdot M_{Al}^{-1} \cdot c_{NaOH}^{-1}$$

Table S1: Values used to estimate the required amount of sodium hydroxide solution for catalysis

Symbol	Description	Value
$m_{Zeolite}$	Mass of zeolite added to both reactants	40 mg
w_{Al}	Weigh percentage of aluminium determined via ICP-OES of sample NaX-Conv	10.55 %
M_{Al}	Molar mass of aluminium	26,98 g·mol ⁻¹
c_{NaOH}	Sodium hydroxide concentration	1 mol·L ⁻¹