Supporting information for

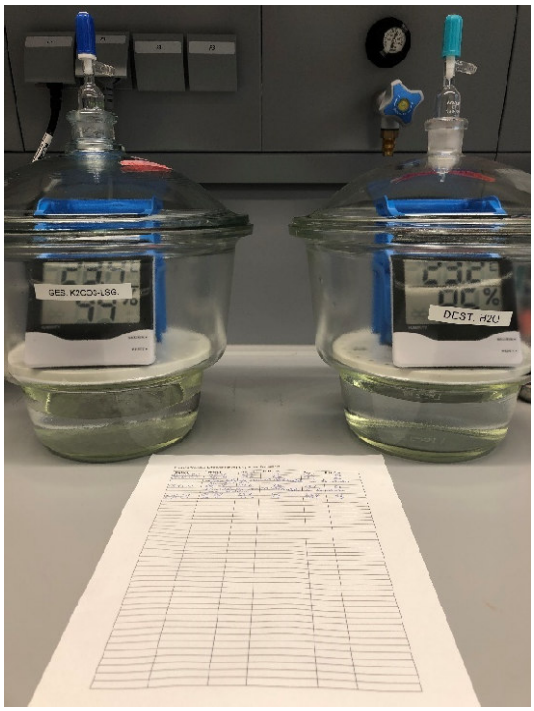
Humidity-Induced Degradation of Lithium-Stabilized Sodium-Beta Alumina Solid Electrolytes

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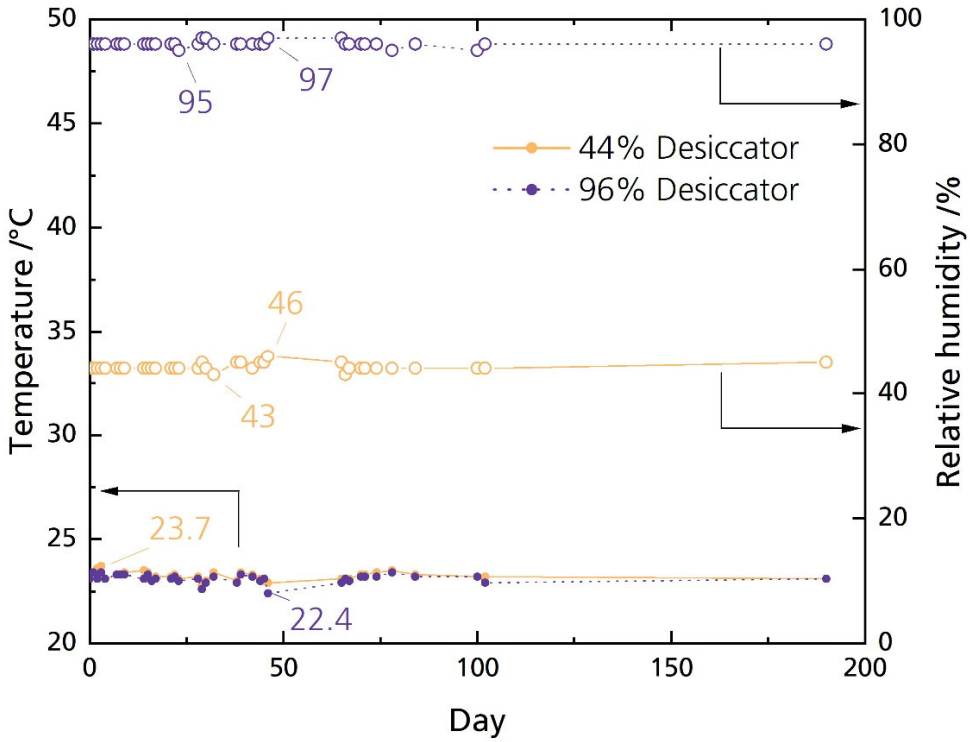


Figure S 1. (Top) Storage of the specimens in two desiccators filled with a saturated potassium carbonate solution and distilled water. (Bottom) History of temperature and relative humidity in the desiccators. The numbers represent the minimum and maximum values reached in the time interval.



Figure S 2. Abrasion of sanded disks. Upper half shows the abrasion of a disk stored for 21 days in 44% r.h. in a desiccator, while the powder in the lower half corresponds to the abrasion of a disk stored for 21 days in 96% r.h. in a desiccator.

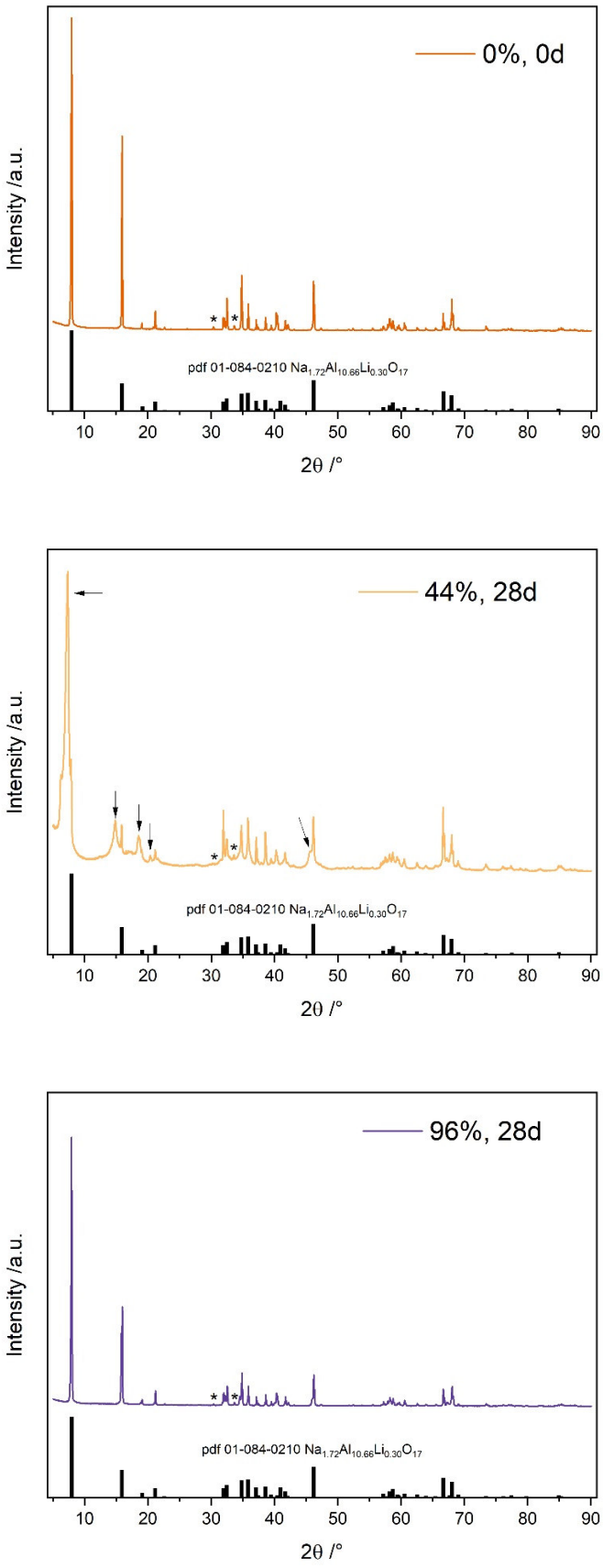


Figure S 3. Enlarged diffractograms of (top) the pristine disk and the disks stored for 28 days in (middle) 44% relative humidity (r.h.) and (bottom) 96% r.h.

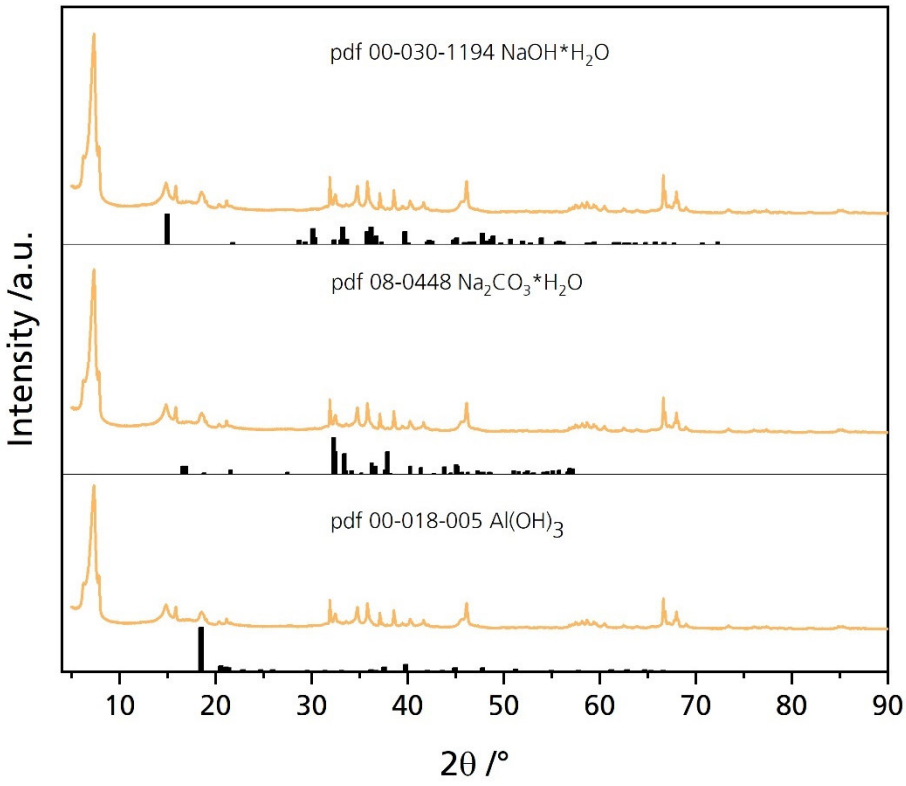


Figure S 4. Diffraction pattern of the sample stored for 28 days in 44% r.h. with reference patterns of $NaOH \cdot H_2O$ (pdf 00-030-1194), $Na_2CO_3 \cdot H_2O$ (pdf 08-0448) and $Al(OH)_3$ (pdf 00-018-005).

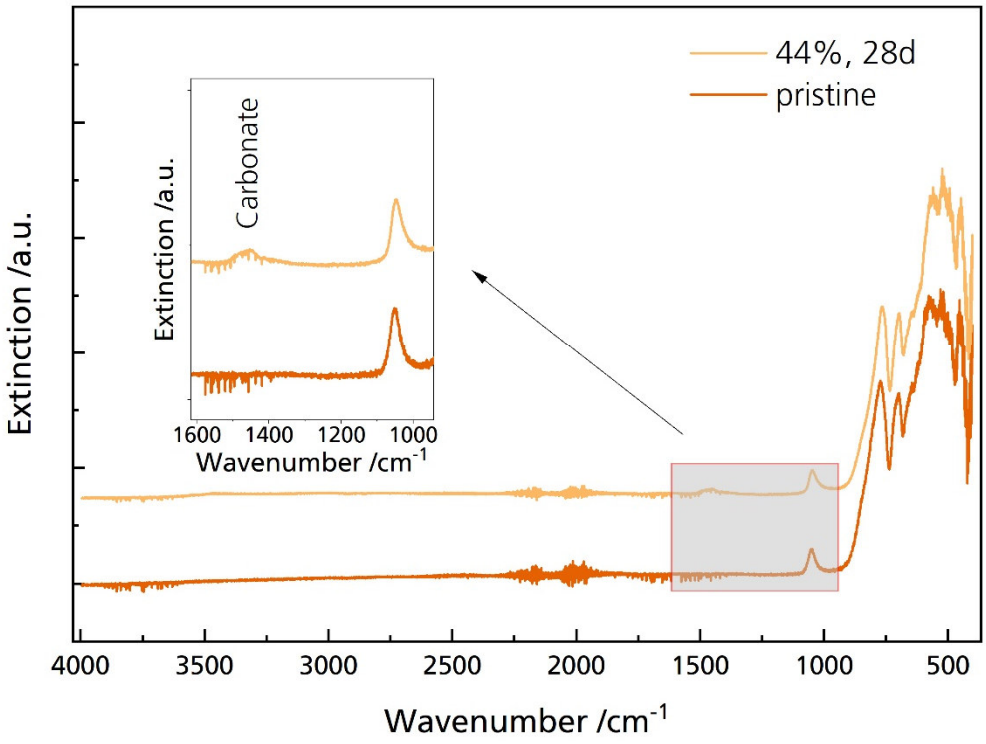


Figure S 5. Peak evolution at 1450 cm^{-1} was observed with ATR-IR after storing a specimen for 28 days in 44% r.h.



Figure S 6. Cracking of a BASE observed after roughly sixth month of storage time in 96% r.h.

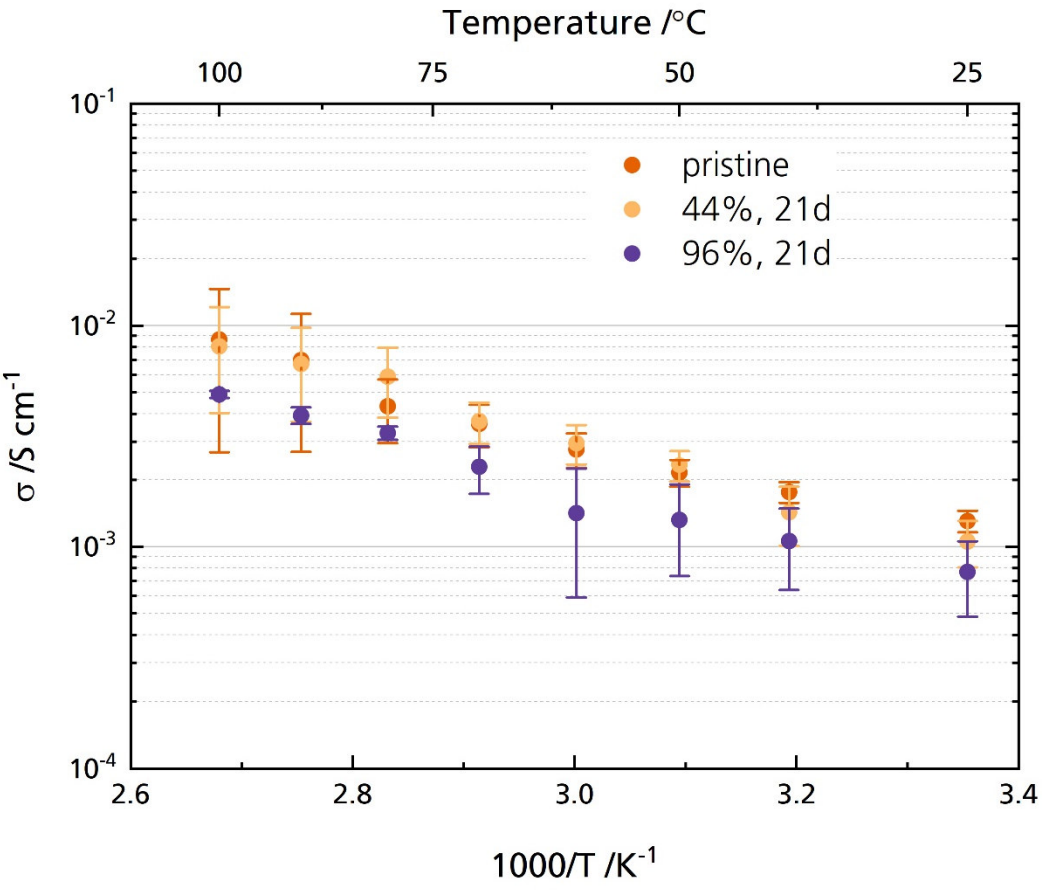


Figure S 7. Ionic conductivity of the pristine disks and disks stored in 44% r.h. and 96% r.h. for 21 days is plotted over 1000/T, instead of ln(σT) over 1000/T. Please note the logarithmic y-axis. The error bars represent the standard deviation.

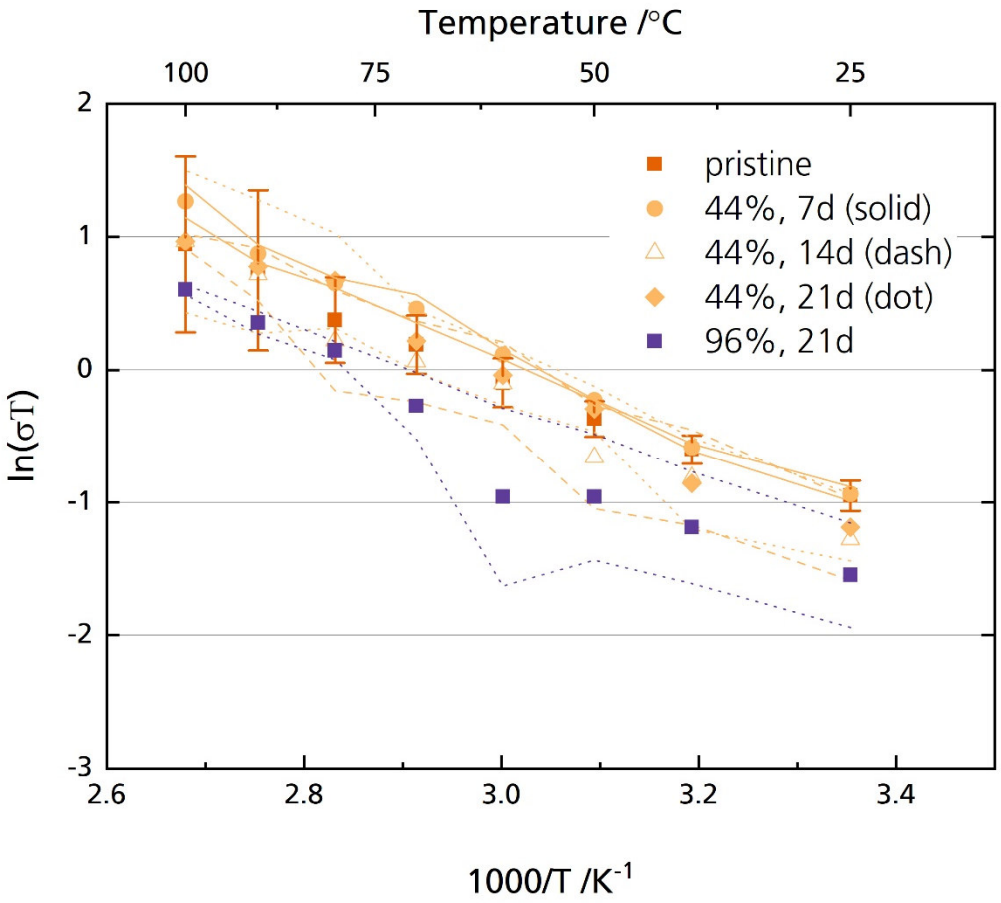


Figure S 8. Arrhenius plot of the pristine sample, samples stored over 21 days in 44% r.h. and the sample stored for 21 days in 96% r.h. The samples were polished with corundum sandpaper before measurement. The standard deviation is given as connected lines for better visualization because otherwise, there would be too much overlap.

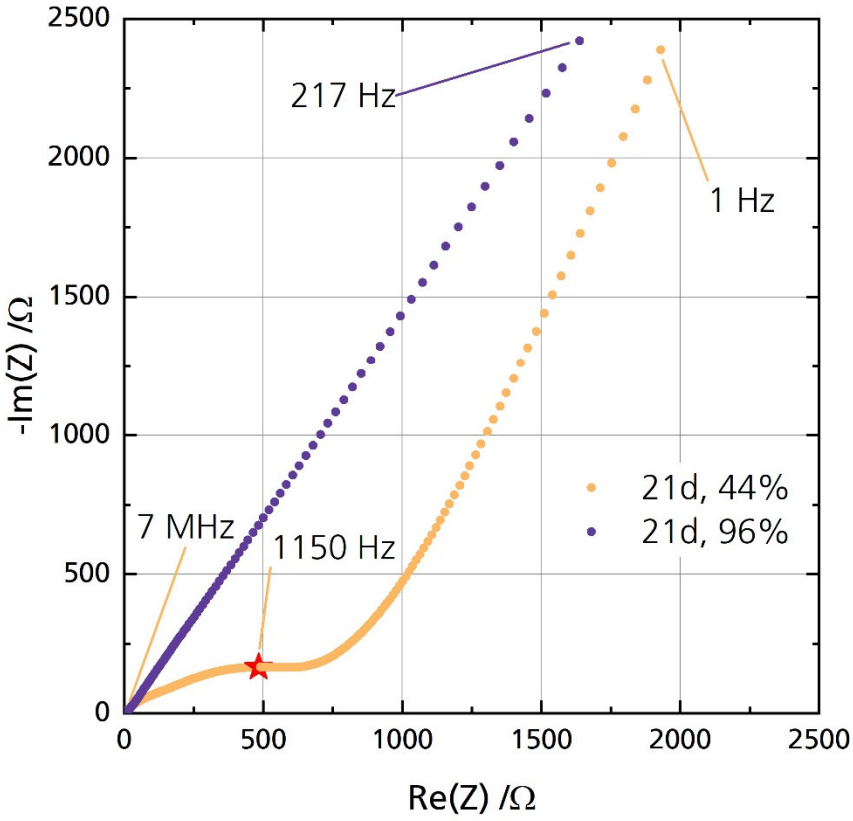


Figure S 9. Nyquist plot of the samples stored for 21 days in 44% and 96% r.h.

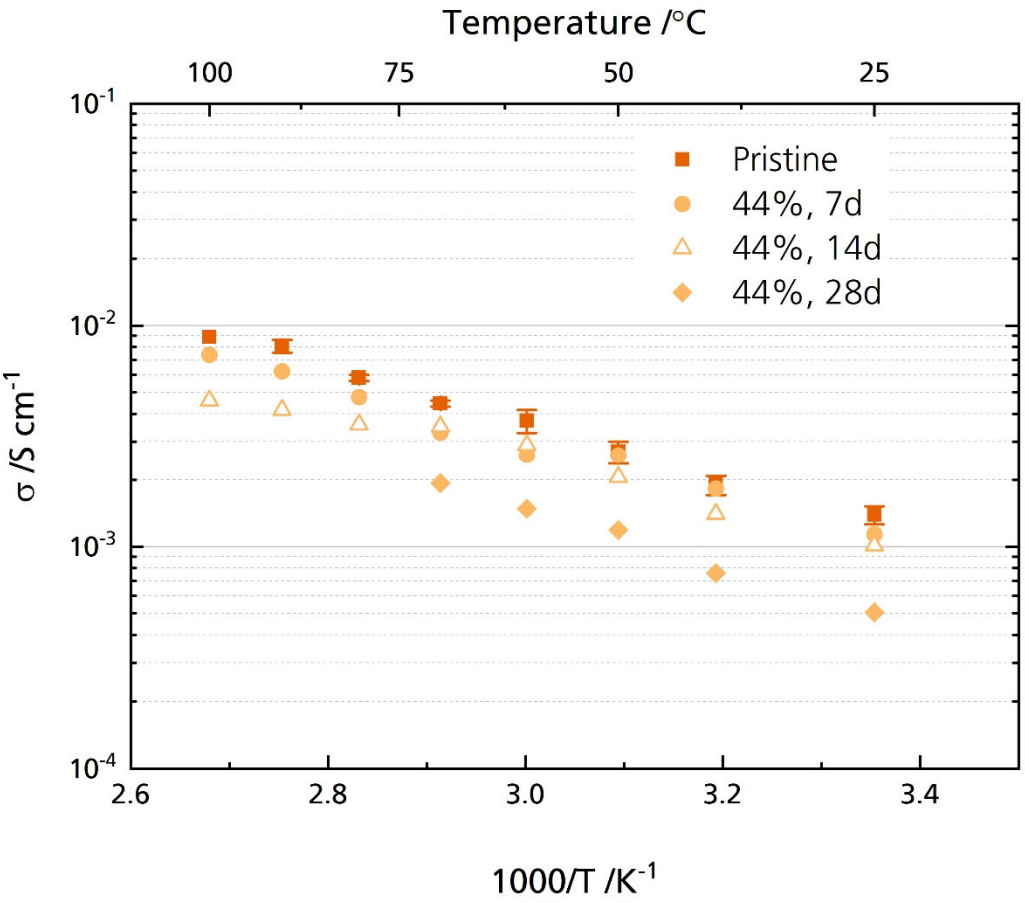


Figure S 10. Ionic conductivity of the pristine sample and the samples stored for 7, 14 and 28 days in 44% r.h. is plotted over 1000/T, instead of ln(σT) over 1000/T. Please note the logarithmic y-axis.

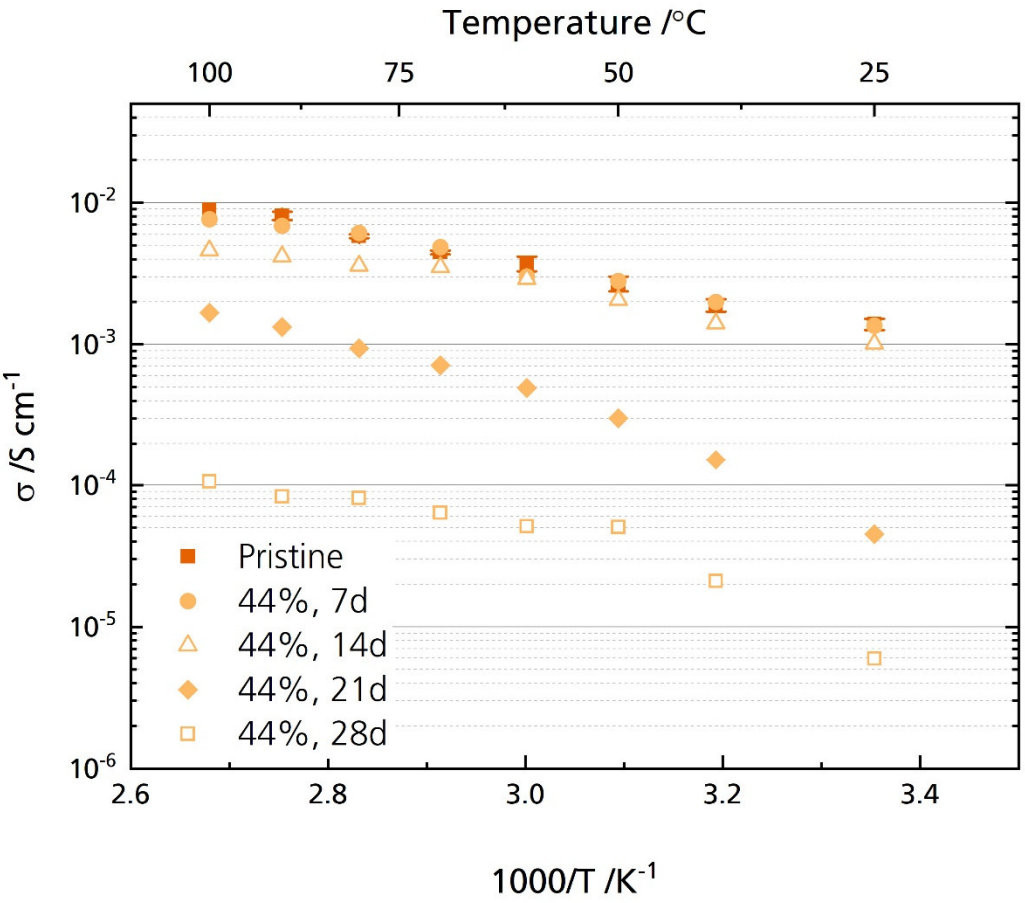


Figure S 11. Ionic conductivity of the pristine disk and the specimens stored in 44% r.h for 7, 14, 21 and 28 days considering the whole frequency range. The ionic conductivity is plotted over 1000/T, instead of ln(σT) over 1000/T. Please note the logarithmic y-axis.

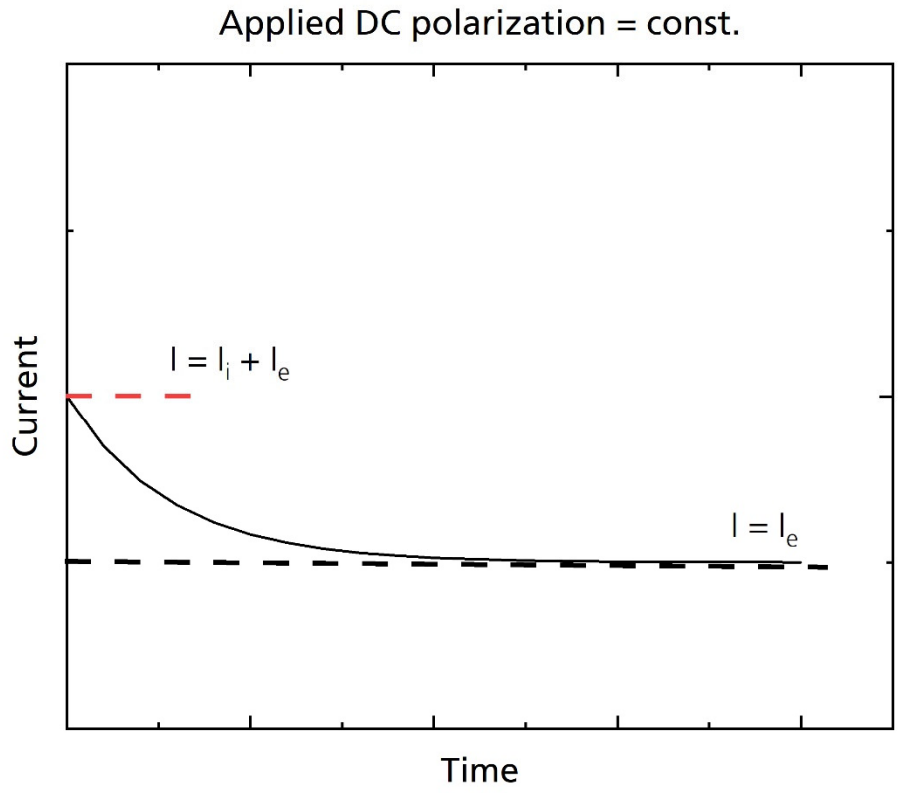


Figure S 12. Schematic of the current over time function when a constant DC polarization is applied to the specimen.

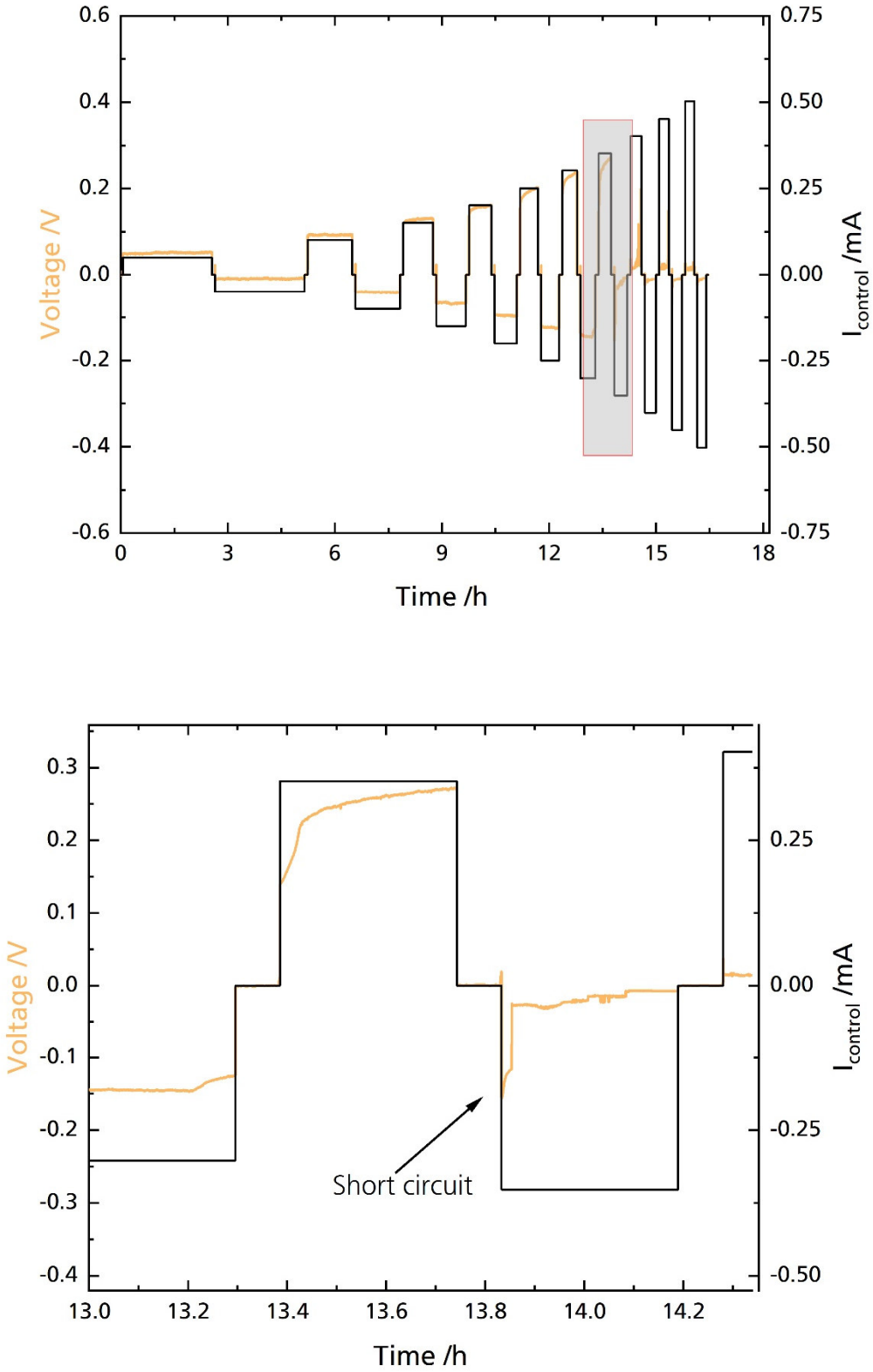


Figure S 13. Representative potential response of a Na/BASE/Na cell at room temperature, in which BASE was stored for 14 days in 44% r.h. The cycled capacity is 0.25 mAh cm^{-2}.