Supplementary information for

How interdiffusion affects the electrochemical performance of $LiMn_2O_4$ thin films on stainless steel

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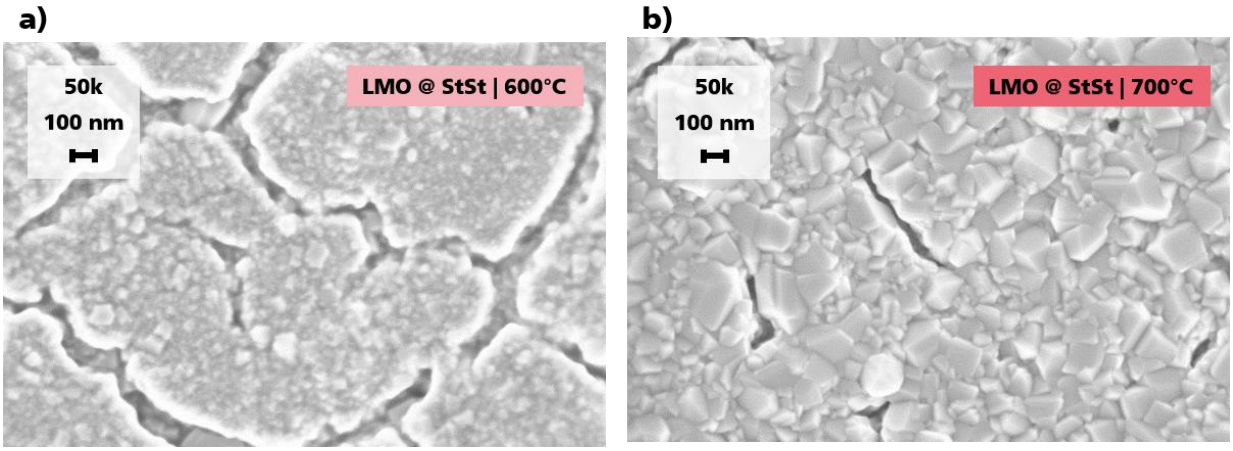
Fig. S1: Top View SEM images

Besides the increase of particle size with elevated temperature, the samples show difference in particle shape based on the interlayer or substrate. LMO @ StSt crystallized at 600 °C, for instance, appears with larger particle size and crystallite shape than LMO @ ITO crystallized at 600 °C. Further crystallite shapes show up in less amount considering the LMO @ Au and LMO @ Pt sample crystallized at 600 °C. Additionally, the LMO @ StSt sample crystallized at 700 °C has another morphology than the other samples. It seems that the morphology and particle shape correlates with the degree of interdiffusion.



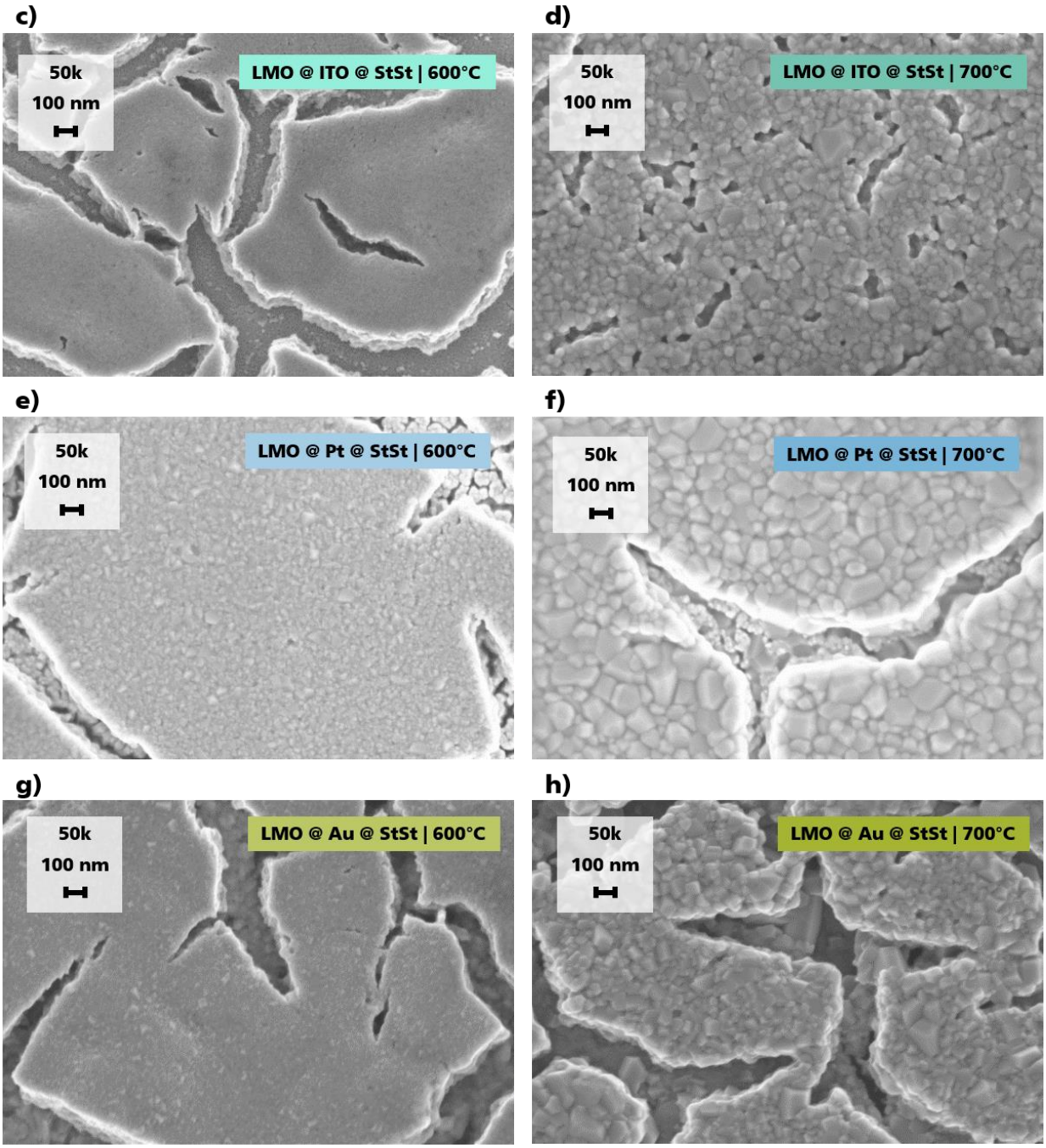
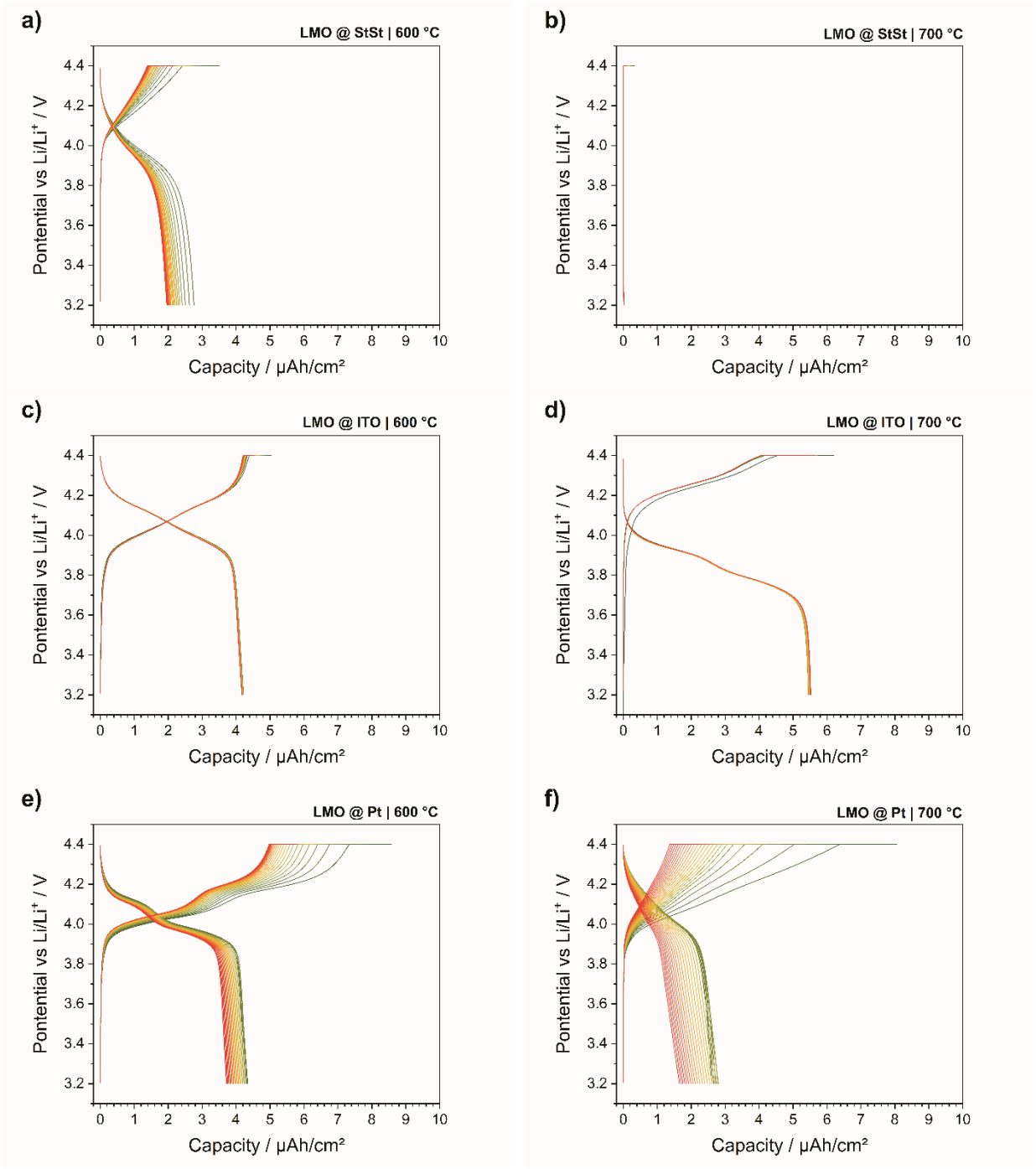


Fig. S1 SEM top view images of all samples

Fig. S2: Charge/Discharge curves of all samples over 24 cycles

The charge/discharge curves reflect the results in the publication. LMO @ ITO annealed at 600 °C represents the most stable electrochemical behaviour. The 700 °C sample shows the high overvoltage and the uncompleted charging until 4.4 V vs. Li/Li^+. The rest of the charging takes place in the constant voltage step afterwards. LMO @ StSt crystallized at 700 °C just polarize. LMO @ Pt demonstrates the low coulombic efficiency. LMO @ Au shows high charge capacities in the first 6 cycles. Afterwards it just polarize. It seems that a side reaction at the charging process exist, which is probably related to the Au alloys represented in the GIXRD spectra.



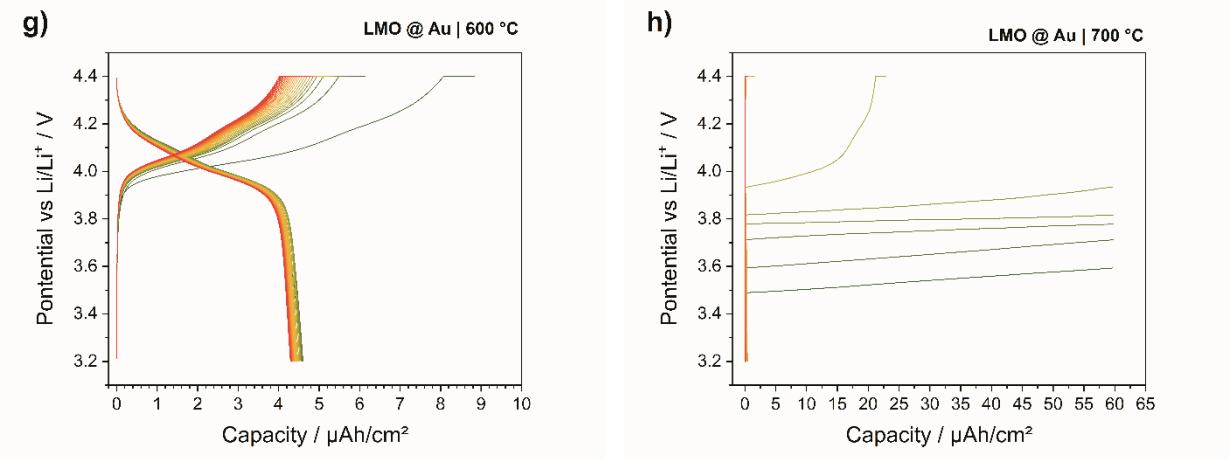
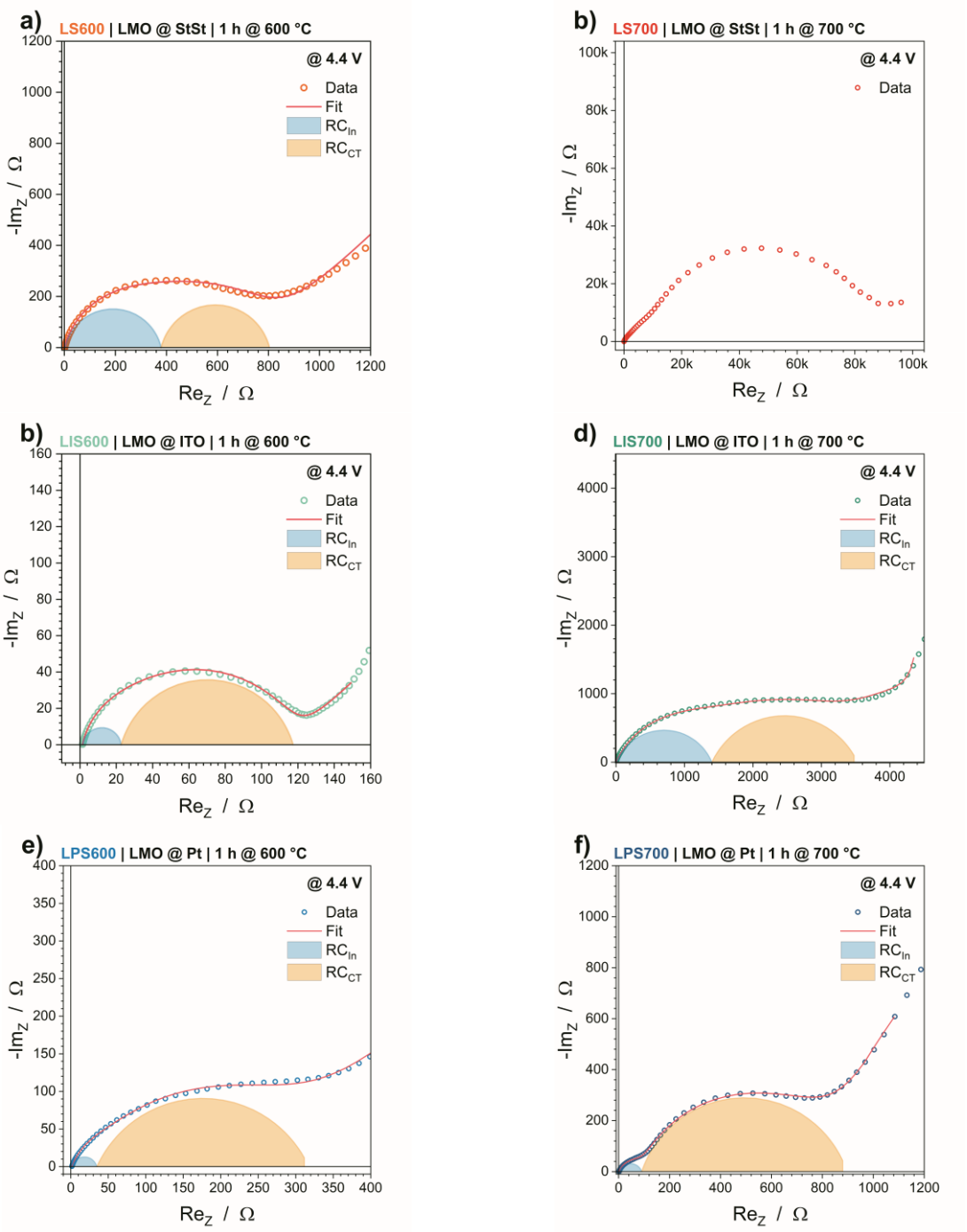


Fig. S2 Charge/Discharge curves of all 24 cycles from green (cycle 1) to red (cycle 24).

Fig. S3: all Fit data plots of EIS measurements



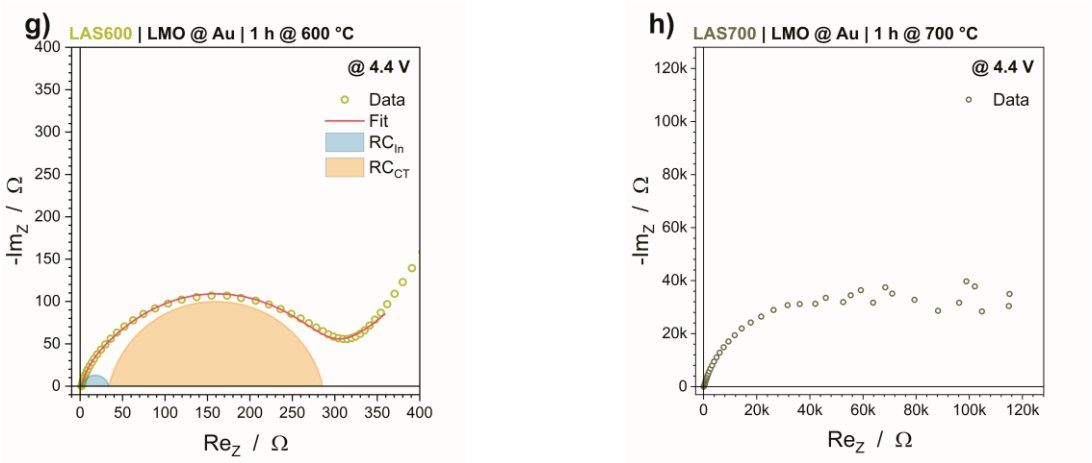


Fig. S3 Nyquist plots and Fits for all samples.

Fig. S4: ToF-SIMS plots of 600 °C samples

The ToF-SIMS depth profiles of the 600 °C annealed samples show already the same trend like the 700 °C annealed samples. Interdiffusion processes already take place, but in a lower amount. In general, the overlap of the signals is less than at 700 °C and the peak widths are narrower. Pt diffuses less in the LMO layer, as well as Al and Cr for all samples. Furthermore, Li depletion, for instance, is reduced at 600 °C, thus higher discharge capacities can be measured.

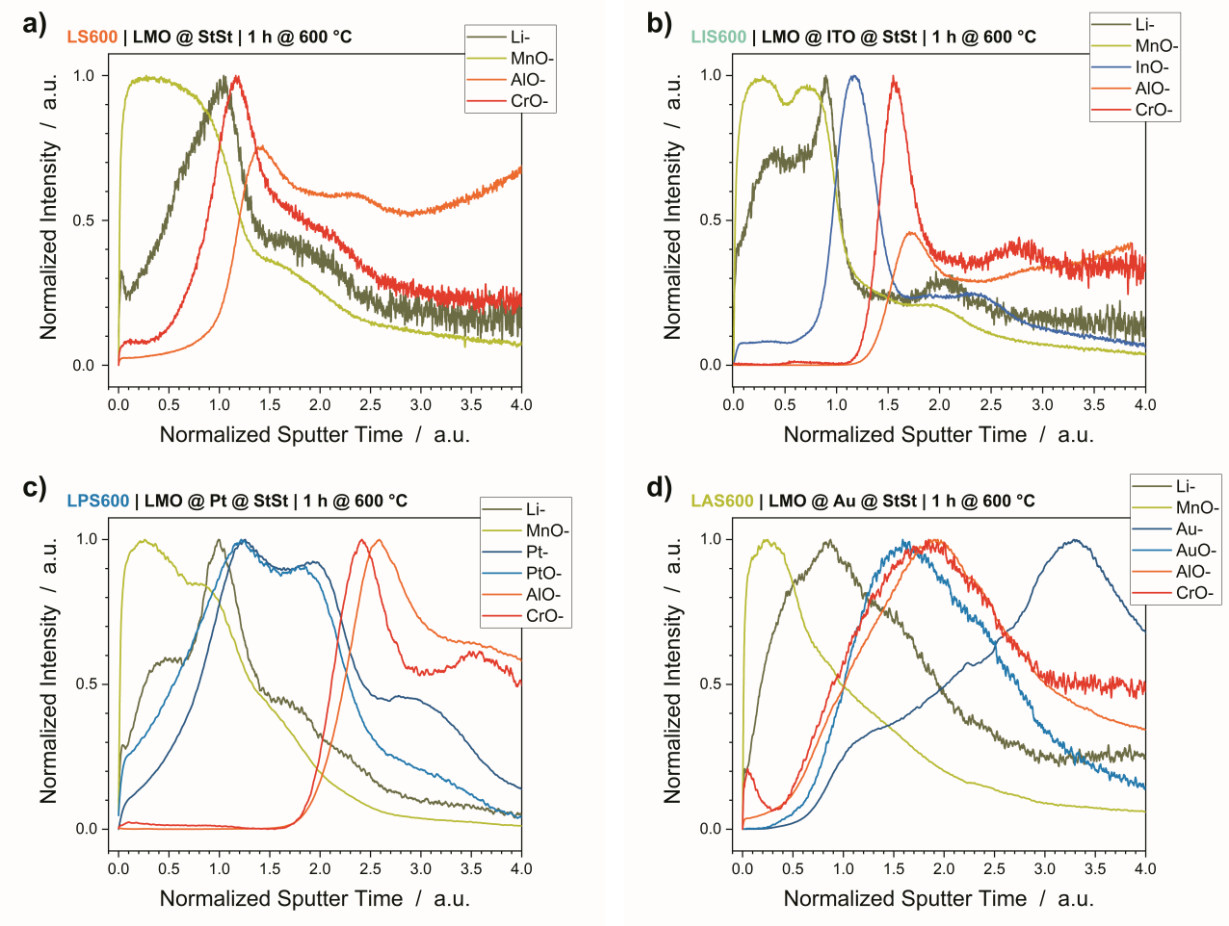


Fig. S4 ToF-SIMS depth profiles of 600 °C annealed a) LMO @ StSt, b) LMO @ ITO, c) LMO @ Pt and d) LMO @ Au. Sputter time is normalized to 1 for the interface between LMO and interlayer. LMO elements (Li^- and MnO^-) in green, StSt elements (AlO^- and CrO^-) in red and interlayer elements (InO^-, Pt^-, PtO^-, Au^- and AuO^-) in blue.