Supporting Information

Anion Doping of Ferromagnetic Thin Films of $La_{0.74}Sr_{0.26}MnO_{3-\delta}$ via Topochemical Fluorination

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EFTEM analysis

EFTEM also indicates that the top layer of the LSMO film appears to be poorer in fluorine compared to the main part of the film closer to the STO substrate. At the same time, the oxygen content of the top-layer of the film is found to be increased. Investigating the structure further by HRTEM (see Figure S 1), a small change of the (XY0) reflection intensities with X+Y odd was found, which could indicate slight structural changes within the top layer (e. g., from symmetry of composition). The strain state of the film is of importance for topochemical reactions, which can enhance [30,31] or decrease [17] during the reaction depending on the chemically incorporated species. As indicated from the analysis of the out-of-plane lattice parameters, the epitaxial strain is lower for LSMO_F films compared to the LSMO_O films, and this might explain why an enrichment of fluorine species takes place closer to the STO substrate.

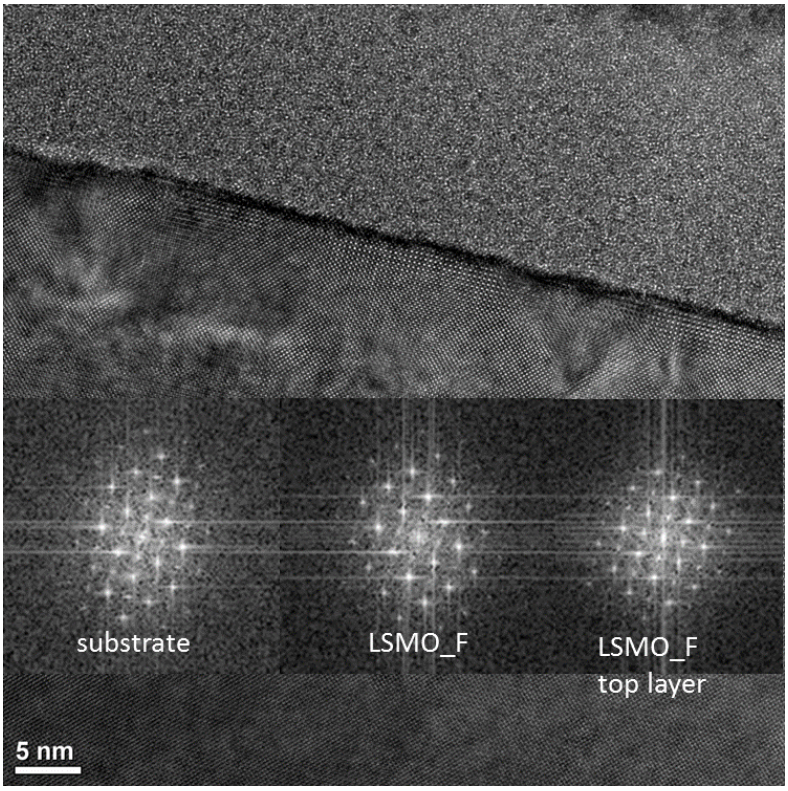

Figure S 1. HRTEM image of the LSMO_F film imaged in [001] zone axis with FFTs corresponding to different parts of the film.

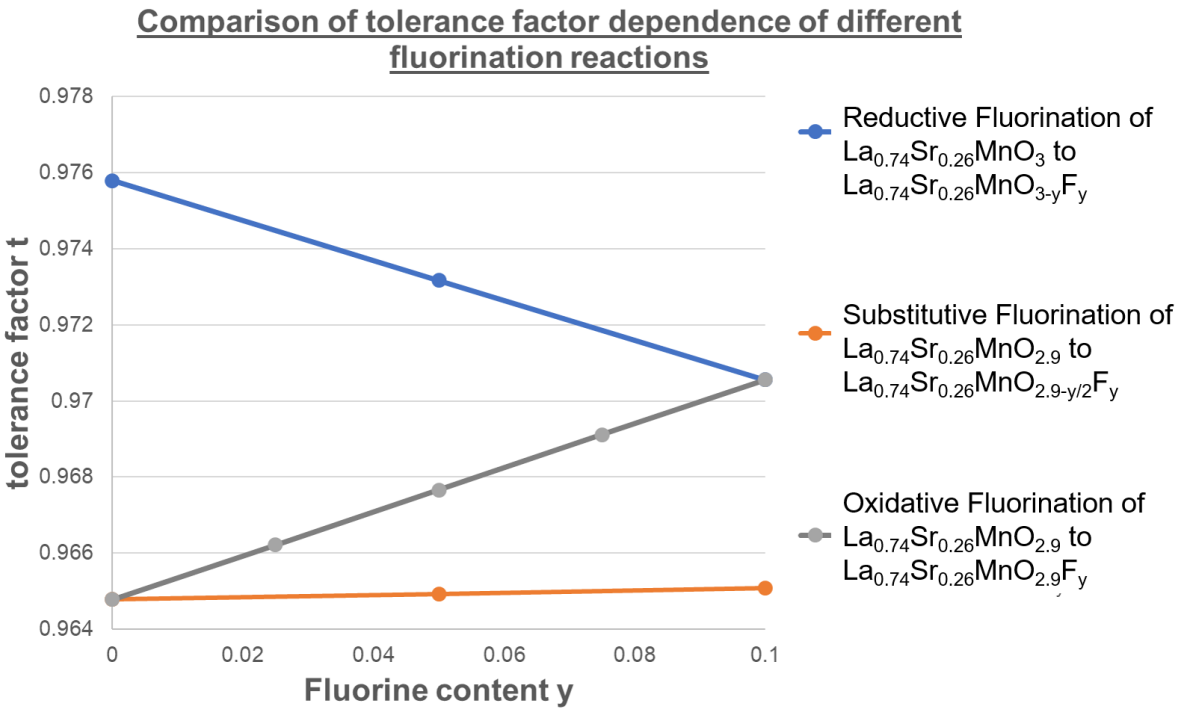

Figure S 2. Dependence of Goldschmidt's tolerance factor for the different types of fluorination reactions under neglectance of ordering effects for anion deficient systems.