

ENHANCED OXYGEN EXCHANGE OF PEROVSKITE OXIDE SURFACES THROUGH STRAIN-DRIVEN CHEMICAL STABILIZATION

WooChul Jung, Dept. of MSE, KAIST
wcjung@kaist.ac.kr

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Surface cation segregation and phase separation, of strontium in particular, have been suggested to be the key reason behind the chemical instability of perovskite oxide surfaces and the corresponding performance degradation of solid oxide electrochemical cell electrodes. However, there is no well-established solution for effectively suppressing Sr-related surface instabilities. Here, we control the degree of Sr-excess at the surface of $\text{SrTi}_{0.5}\text{Fe}_{0.5}\text{O}_{3-\delta}$ thin films, a model mixed conducting perovskite O_2 -electrode, through lattice strain, which significantly improves the electrode surface reactivity. Combined theoretical and experimental analyses reveal that Sr cations are intrinsically under a compressive state in the $\text{SrTi}_{0.5}\text{Fe}_{0.5}\text{O}_{3-\delta}$ lattice and that the Sr–O bonds are weakened by the local pressure around the Sr cation, which is the key origin of surface Sr enrichment. Based on these findings, we successfully demonstrate that when a large-sized isovalent dopant is added, Sr-excess can be remarkably alleviated, improving the chemical stability of the resulting perovskite O_2 -electrodes

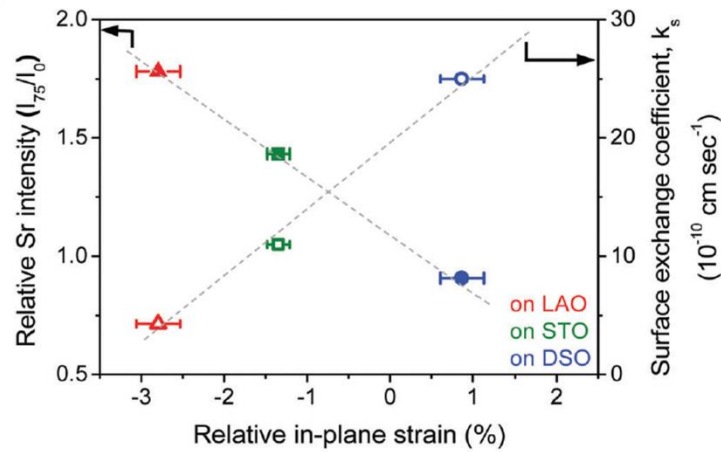


Figure 1 – Comparison of the relative surface Sr enrichment and the surface oxygen exchange coefficient of epitaxial $\text{SrTi}_{0.5}\text{Fe}_{0.5}\text{O}_{3-\delta}$ thin films with the degree of induced in-plane strain