SURFACE MODIFICATION THROUGH OXIDE ALD TO IMPROVE OXYGEN EXCHANGE RATE ON PEROVSKITE SURFACE

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Segregation and phase separation on perovskite oxide (ABO_3) surface have been considered as a key detrimental factor to the performance of energy conversion devices such as solid oxide/electrolysis cells. Recently, the overcoat of less reducible cations has been suggested as a way to suppress the surface Sr segregation on Sr-containing perovskite oxides. However, the detailed requirements of the coating layer to sufficiently stabilize the perovskite surface hasn't been systematically investigated yet. In this wok, we fabricate $La_{0.6}Sr_{0.4}CoO_3$ (LSC) thin-film model electrode *via* pulse layer deposition and observe how the degree of Sr segregation varies with the type and thickness of the overcoat layer. Al_2O_3 and HfO_2 with different thickness are coated on LSC *via* ALD, and the oxygen exchange rate of both bare and ALD-coated samples is measured *via* electrical conductivity relaxation. It is found that both Al_2O_3 and HfO_2 layers suppress the Sr segregation only within a narrow thickness range, i.e., 1-2 nm for Al_2O_3 and 0.2 – 0.4 nm for HfO_2, respectively. These observations are discussed with solubility and diffusivity of Al and Hf in the host oxide lattice, providing a critical guideline of a new surface modification method to stabilize the perovskite surface at high temperatures.

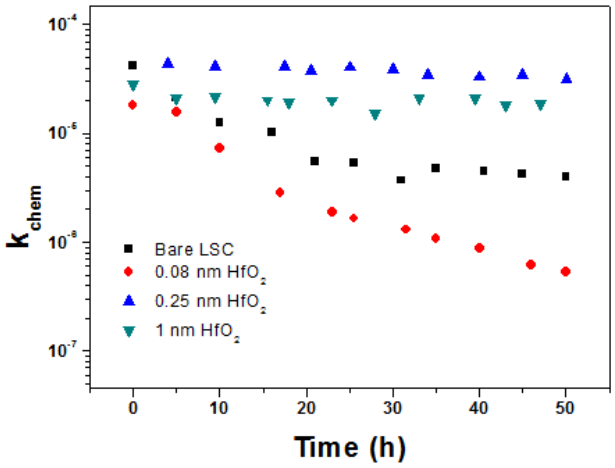

Figure 1 – The surface oxygen exchange coefficient (k_{chem}) of LSC film with and without HfO_2 coating