

## The relationship between crystal orientation, strontium segregation and oxygen exchange rate in $\text{La}_{0.6}\text{Sr}_{0.4}\text{Co}_{0.2}\text{Fe}_{0.8}\text{O}_{3-\delta}$

Mathew Niania ([mn207@ic.ac.uk](mailto:mn207@ic.ac.uk)) (1), Richard Chater (1), John Kilner (1,2)

(1) Imperial College London, Department of Materials, SW7 2AZ, UK

(2) International Institute for Carbon Neutral Energy Research, Kyushu University, Japan

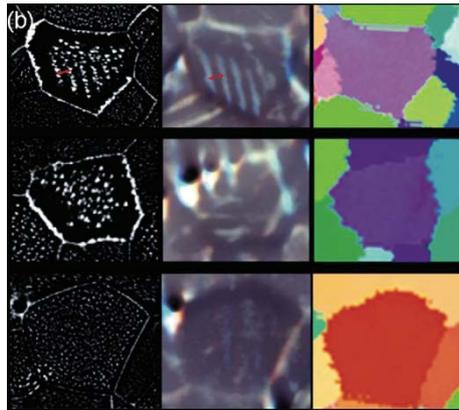


Fig 1 – Showing strontium particle growth (column 1) in comparison to foreshattered electron orientation contrast (column 2) and grain orientation (column 3).

Mixed ionic-electronic conducting (MIEC) materials such as  $\text{La}_{0.6}\text{Sr}_{0.4}\text{Co}_{0.2}\text{Fe}_{0.8}\text{O}_{3-\delta}$  (LSCF), are commercially promising as SOFC cathodes due to their high ionic conductivity and high electronic conductivity at the operating temperatures of Intermediate-Temperature SOFCs (IT-SOFCs). The presence of both ionic and electronic conductivity is believed to enhance the oxygen reduction reaction (ORR) by increasing the total active area of the electrode [1]. Whilst the precise ORR mechanisms are not yet known, methodologies exist for measuring the overall surface exchange rate ( $k$ ). The common methodologies tend to measure this rate across the whole sample surface (or over a significant number of grains) thus cannot easily discern relationships between the surface microstructure and the surface exchange rate.

Previous studies on different MIEC materials have shown that there is no dependence between crystal orientation and oxygen exchange rate [2]–[4], however, recent work has shown that there is a crystallographic dependence for strontium particle growth on LSCF (Fig. 1) [5]. A-site cation segregation has been linked directly to a reduction in cell performance [6] and thus it follows that the surface exchange coefficient should be affected by the presence of strontium at the surface. This work investigates the relationship between crystallographic orientation, surface segregation, precipitates and surface exchange rate for LSCF ceramic materials.

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