ESRF	Experiment title: Novel mixed-conducting cathodes for solid-oxide cells: compatibility with anion-conducting and proton- conducting electrolytes	Experiment number : ME-1546
Beamline:	Date of experiment:	Date of report:
ID21	from: 17/11/20 to: 21/11/20	26/4/23
Shifts:	Local contact(s):	Received at ESRF:
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Report:

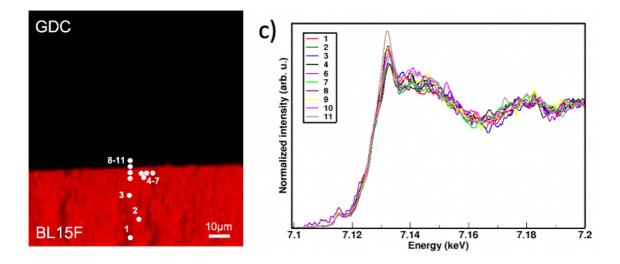
 $Ba_{0.95}La_{0.05}FeO_3$ (BL5F), $Ba_{0.85}La_{0.15}FeO_3$ (BL15F) and $Ba_{0.50}La_{0.50}FeO_3$ (BL50F) were prepared by coprecipitation from nitrates and calcined at 1000 °C for 8 h. $Ba_{1.015}Zr_{0.825}Y_{0.175}O_3$ (BZY) was prepared by solid-state reaction, with 0.5 wt% of NiO as a sintering aid. The mixed powders were wet milled in propanol for 24h and calcined in air at 1500 °C for 4h. $Ce_{0.8}Gd_{0.2}O_2$ (GDC) powder was used as received. GDC and BZY dense pellets (d > 95%) were obtained by isostatic pressing at 4.1 kbar for 5 min, and sintered at 1500°C for 10 and 5 hours, respectively.

The cathode/electrolyte couples were prepared by surrounding the GDC / BZY dense electrolyte pellets with the cathode powder, and isostatic pressing at 4 kbar for 5 min to obtain a core/shell structure. The bilayer pellets were then annealed at 1100°C for 72h to simulated thermal aging. The annealed couples were embedded in epoxy resin and cut into slices to expose the cross-section.

The experiment was carried out in fully remote mode, with samples shipped inside the ID21 sample holders and local contact mounting them at the beamline. The remote acquisition GUI was still somewhat erratic and crashed frequently during the experiment. The beam size was 800 x 330 nm (H x V), with a flux of 3 x 10^{10} ph/s.

Micro XRF maps were recorded at 7.3 keV, and micro-XANES spectra were recorded at both the Fe K-edge (in both Fe-containing cathodes and at the interface after diffusion) and the Gd L_3 -edge (in Gd-doped CeO₂ electrolytes and at the interface after diffusion). Data reduction and XRF maps were obtained with PyMca 5.6.7.

An example of XRF map and microXANES spectra is shown below:



All results, together with XRD from mixed powders, are reported in manuscript "Interface diffusion and compatibility of (Ba,La)FeO_{3-δ} perovskite electrodes in contact with barium zirconate and ceria", which has been submitted to *ACS Applied Materials & Interfaces* for publication.