

## Electronic Supplementary Information

### **Direct application of cobaltite-based perovskite cathodes on yttria-stabilized zirconia electrolyte for intermediate temperature solid oxide fuel cells**

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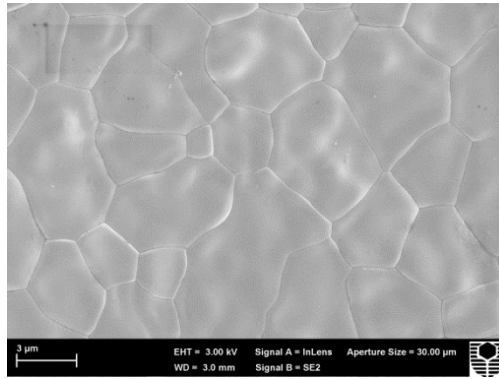
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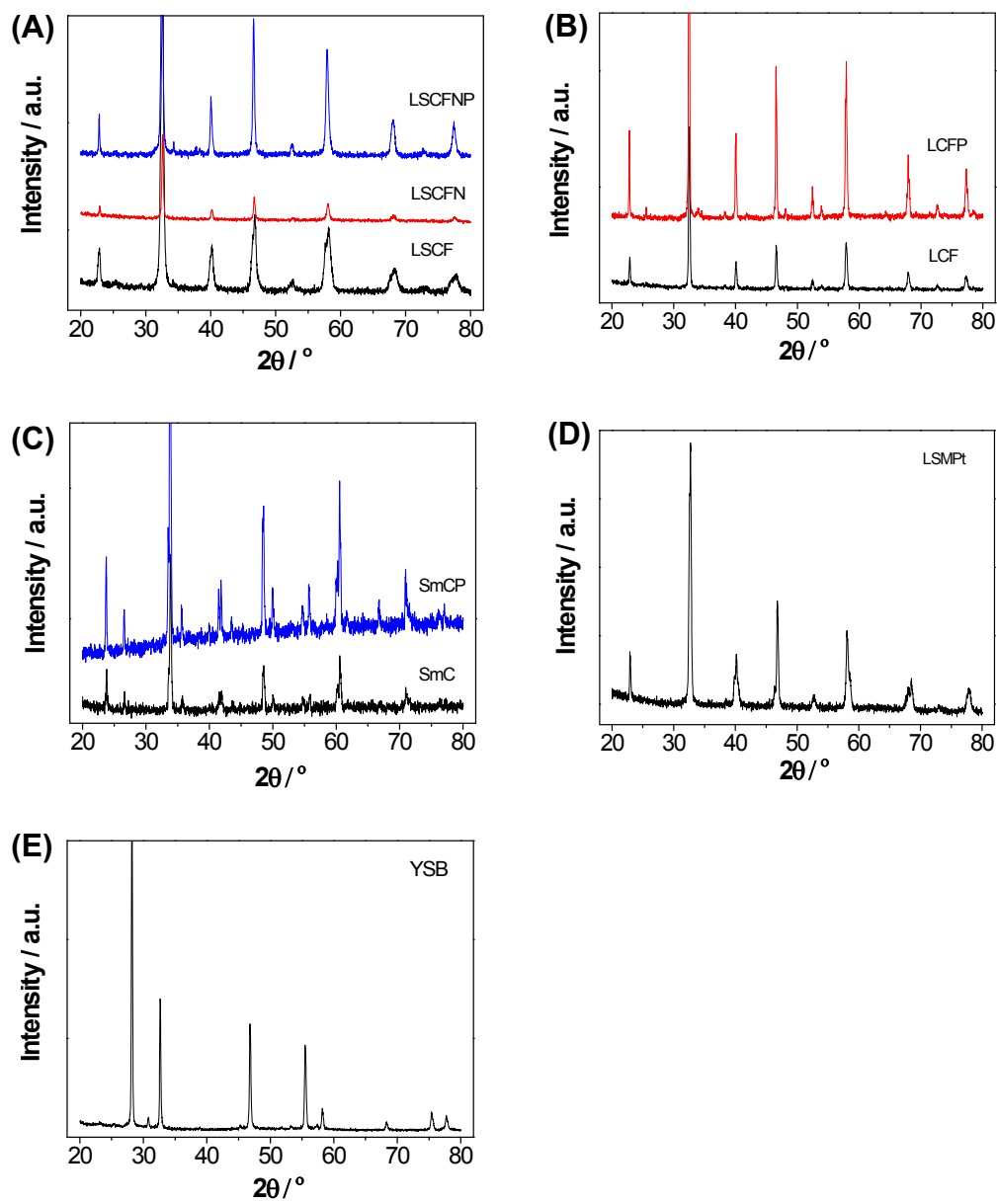
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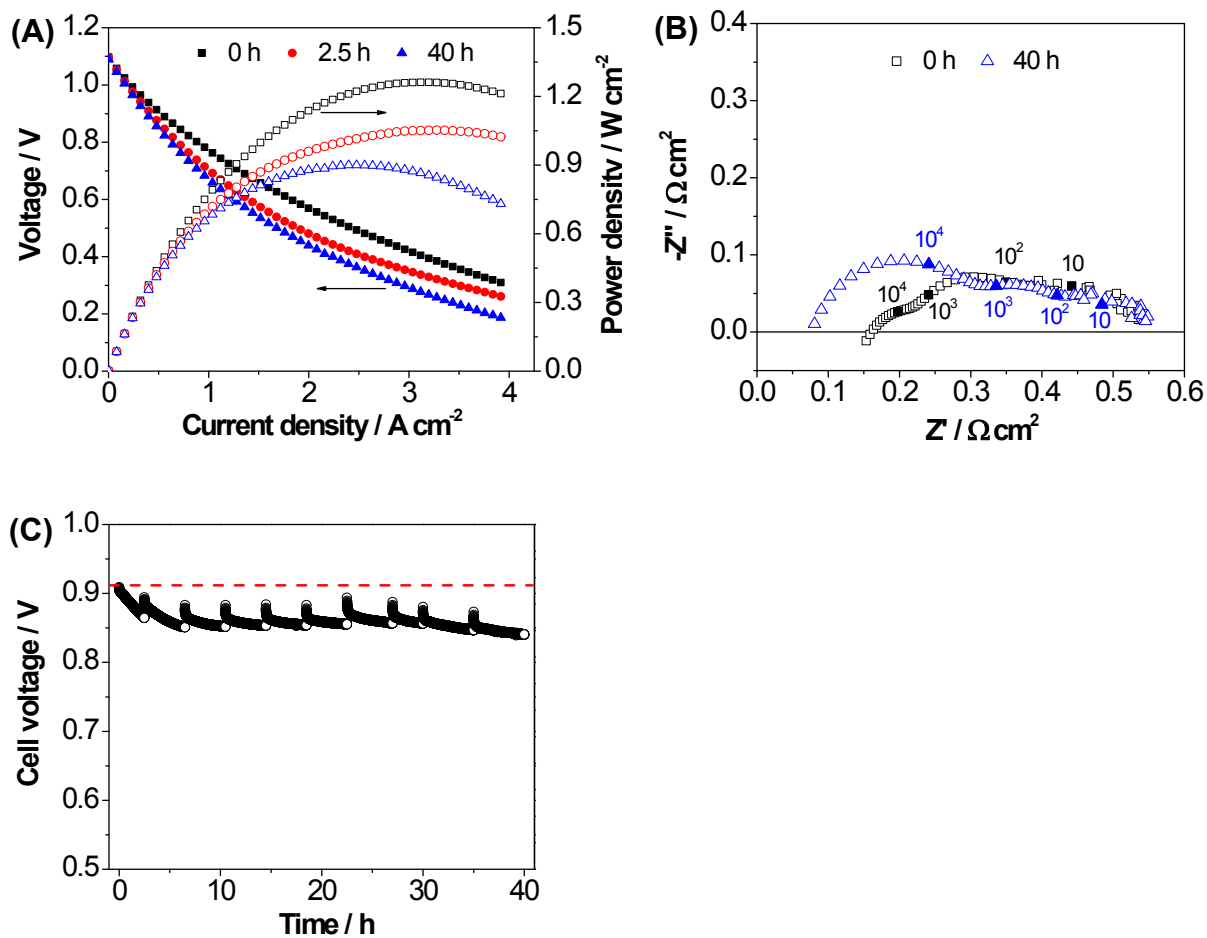
<sup>‡</sup>These authors contributed equally.



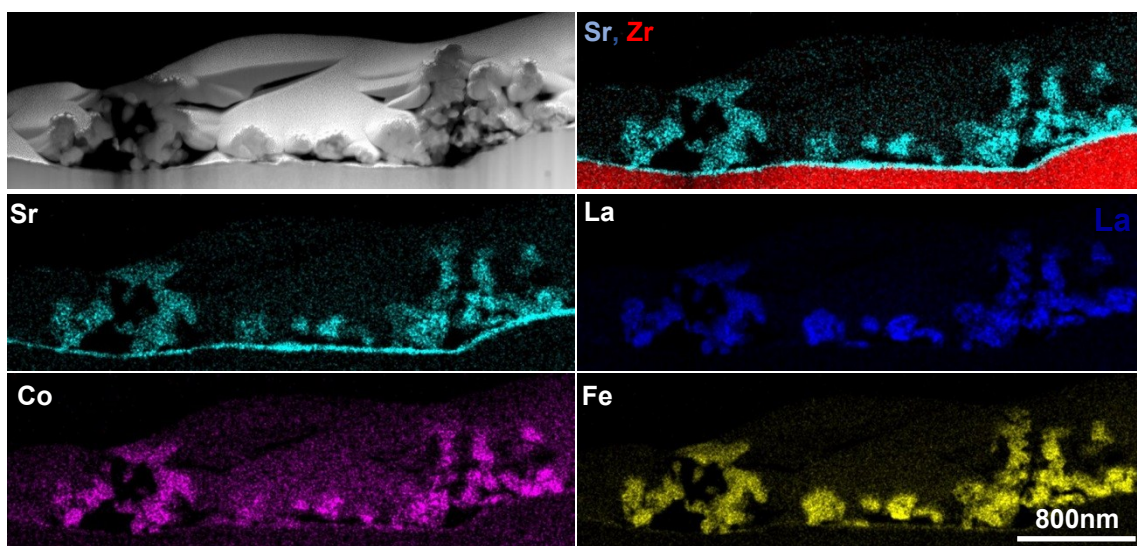
**Figure S1.** Typical SEM image of surface of a sintered YSZ electrolyte film.



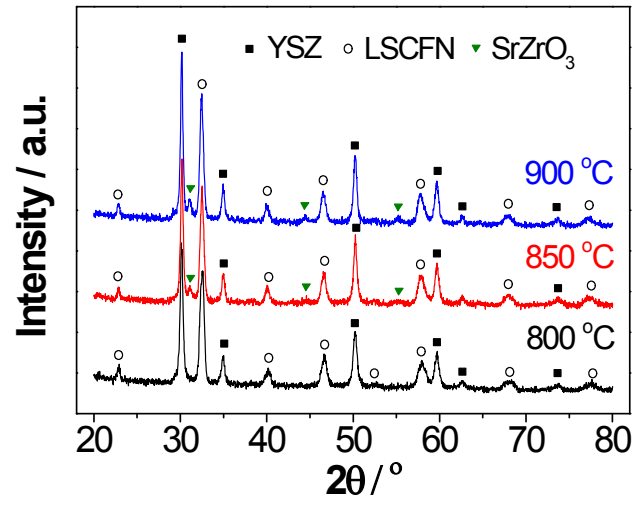
**Figure S2.** XRD patterns of as-prepared cathode and electrolyte powders: (A) LSCF, LSCFN and LSCFNP, (B) LCF and LCFP, (C) SmC and SmCP, (D) LSMPt, and (E) YSB.



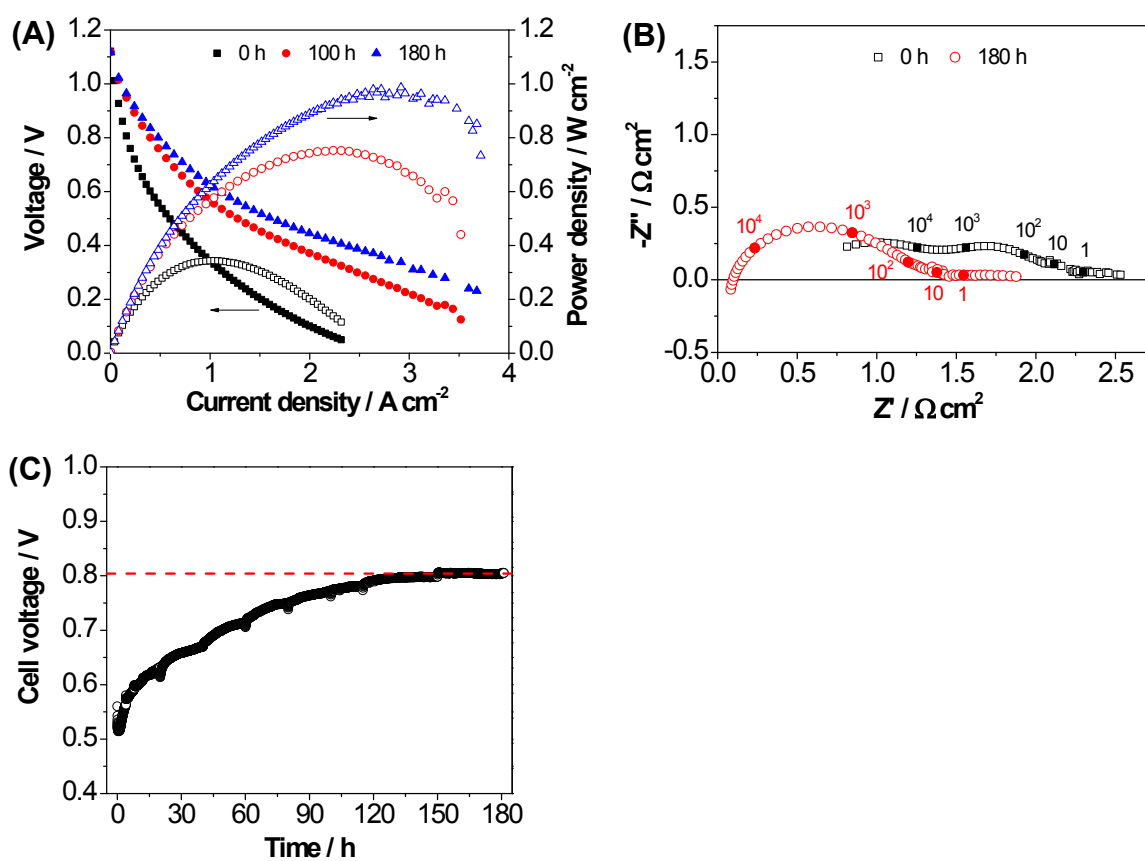
**Figure S3.** Polarization performance of a cell with the *in situ* assembled LSCF-GDC (6:4, w/w) composite cathode as a function of polarization time at 750 °C and 500 mA cm<sup>-2</sup>: (A) polarization curves, (B) impedance curves and the numbers are frequency in Hz, and (C) stability curve.



**Figure S4.** STEM image and elemental maps at the electrode/electrolyte interface of the *in situ* assembled LSCF electrode after the polarization at  $500 \text{ mA cm}^{-2}$ ,  $750 \text{ }^\circ\text{C}$  for 100 h.



**Figure S5.** XRD patterns of LSCFN-YSZ couple powder heat-treated at 800-900 °C.



**Figure S6.** Polarization performance of an anode-supported YSZ film with an *in situ* assembled LSCFN electrodes as a function of polarization time at 500 mA cm<sup>-2</sup>, 750 °C: (A) polarization curves, (B) impedance curves and the numbers are frequency in Hz, and (C) stability curve.