Electronic supplementary information

High performance nanostructured bismuth oxide-cobaltite as a durable oxygen electrode of reversible solid oxide cells

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Fig. S1  SEM micrographs of surface of directly assembled (a) decorated ESB-SmCPd composite electrode and (b) pristine SmCPd electrode.
Fig. S2  EDS spectra derived from surface of ESB decorated SmCPd electrode.
**Fig. S3** Raman spectra of SmCPd powder, ESB powder, and ESB decorated SmCPd composite powder calcined at 750 °C. A 532 nm laser in conjunction with a Renishaw Invia Raman microscope with a 50x objective was used.
Fig. S4  XRD patterns of Bi$_2$SmO$_4$ to be synthesized, after being calcined at 700 and 800 °C for 3 h.
Fig. S5  Polarization performance of a cell with directly assembled pristine SmCPd oxygen electrode as a function of polarization time at 750 °C at 0.1 A cm⁻² for 20 h and 0.5 A cm⁻² for 100 h in fuel cell mode: (a) polarization curves, (b) impedance spectra, and (c) stability curve.
**Fig. S6**  Polarization curves of two identical cells with directly assembled, decorated ESB-SmCPd oxygen electrodes as a function of polarization time at 0.5 A cm$^{-2}$ and 750 $^\circ$C in fuel cell mode for 20 h: (a) Cell-#2 and (b) Cell-#3.
Fig. S7  Comparison of peak power densities of the cells with directly assembled decorated 40%ESB-SmCPd and decorated 40%ESB-LSM electrodes as a function of temperature.
Fig. S8 Activation energy plots of half cells with directly assembled pristine (a) SmCPd and (b) LSM\textsuperscript{2} oxygen electrodes on GDC electrolytes as a function of cathodic polarization time at 0.5 A cm\textsuperscript{-2} and 750 °C. $R_P$ values were derived from the impedance spectra measured at different temperatures (800-600 °C).
Fig. S9  Activation energy plots of single cells with directly assembled 40 wt% ESB decorated SmCPd and 40 wt% ESB decorated LSM oxygen electrodes. $R_p$ values were derived from the impedance spectra measured at different temperatures (750-550 $^\circ$C). Prior to the tests, the cells were polarized at 0.5 A cm$^{-2}$ and 750 $^\circ$C for 20 h in fuel cell mode.

References
