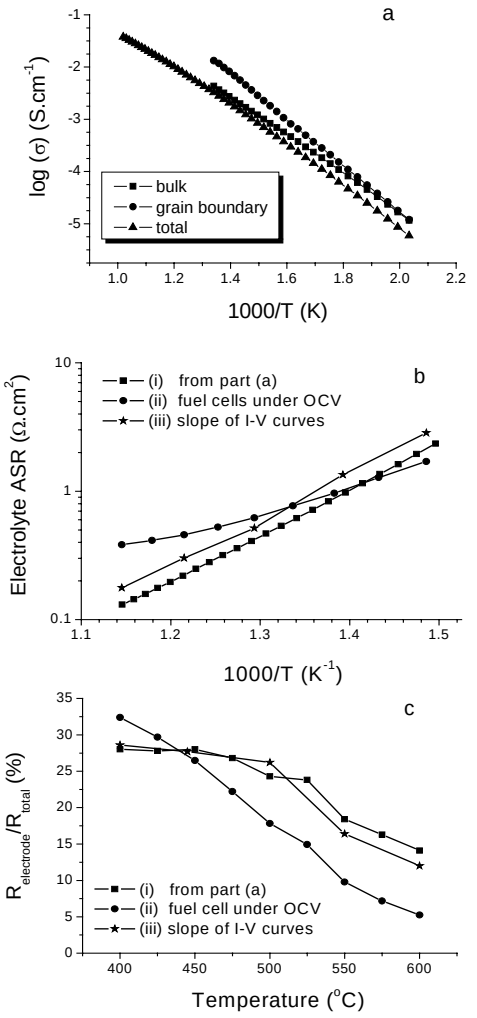

Supplementary Figure. 5 (a) The conductivity ($S.cm^{-1}$) of SDC ($Ce_{0.85}Sm_{0.15}O_{1.925}$, NexTech, sintered at 1350 ^{o}C in air) as measured in-house by a.c. impedance spectroscopy (Solartron 1260 A) using a 2 mm thick pellet; (b) a comparison of the area specific resistance of 20 μm ceria ($\Omega.cm^2$) as determined (i) from the data of part a (total conductivity); (ii) by impedance spectroscopy of fuel cells exposed to 3% humidified hydrogen at the anode and air at the cathode and held under open circuit conditions; and (iii) from the electrolyte ASR implied by the slope of the I-V curves of Fig. 2a of the main paper; (c) electrode ASR (anode plus cathode measured under OCV) as a percentage of the total of fuel cell ASR as a function of temperatures, where (i), (ii) and (iii) have the same meanings as in part (b).

The electrolyte resistance implied by the I-V polarization curves of Figure 2a of the main paper agrees well with that determined from the electrolyte conductivity measured by a.c impedance spectroscopy, compare (iii) in (i) in (b). The values obtained from the two-electrode impedance measurements of fuel cells under OCV conditions are of the same order of magnitude as the other two sets of values, but are visibly different. The difference is most likely due to resistance through the lead wires for which corrections were not applied during two-electrode impendance measurements. Taking curves (i) and (iii) to be most representative of fuel cell behavior, the electrodes resistance amounts to just 14 and 26 % of the resistance of the whole cell at 600 ^{o}C and 500 ^{o}C, respectively (part c).

It is noteworthy that the total electrode ASR shown in (b) is less than that obtained for the cathode ASR under symmetric cell conditions, Figure 1a of the main paper. We attribute this behavior to the influence of the mixed conducting electrolyte which, even under nominally OCV fuel cell conditions, leads to a significant leakage current. Based on the current density under short circuit conditions and the electronic transference number, the leakage current is estimated as ~ 220 $mA.cm^{-2}$ at 500°C. This leakage current induces a net oxygen flux, which as shown in Figure 1a of the main text, lowers the cathode ASR relative to a true OCV condition.