

Supplementary Information

**Stable High Current Density Operation of  $\text{La}_{0.6}\text{Sr}_{0.4}\text{Co}_{0.2}\text{Fe}_{0.8}\text{O}_{3-\delta}$  Oxygen Electrodes**

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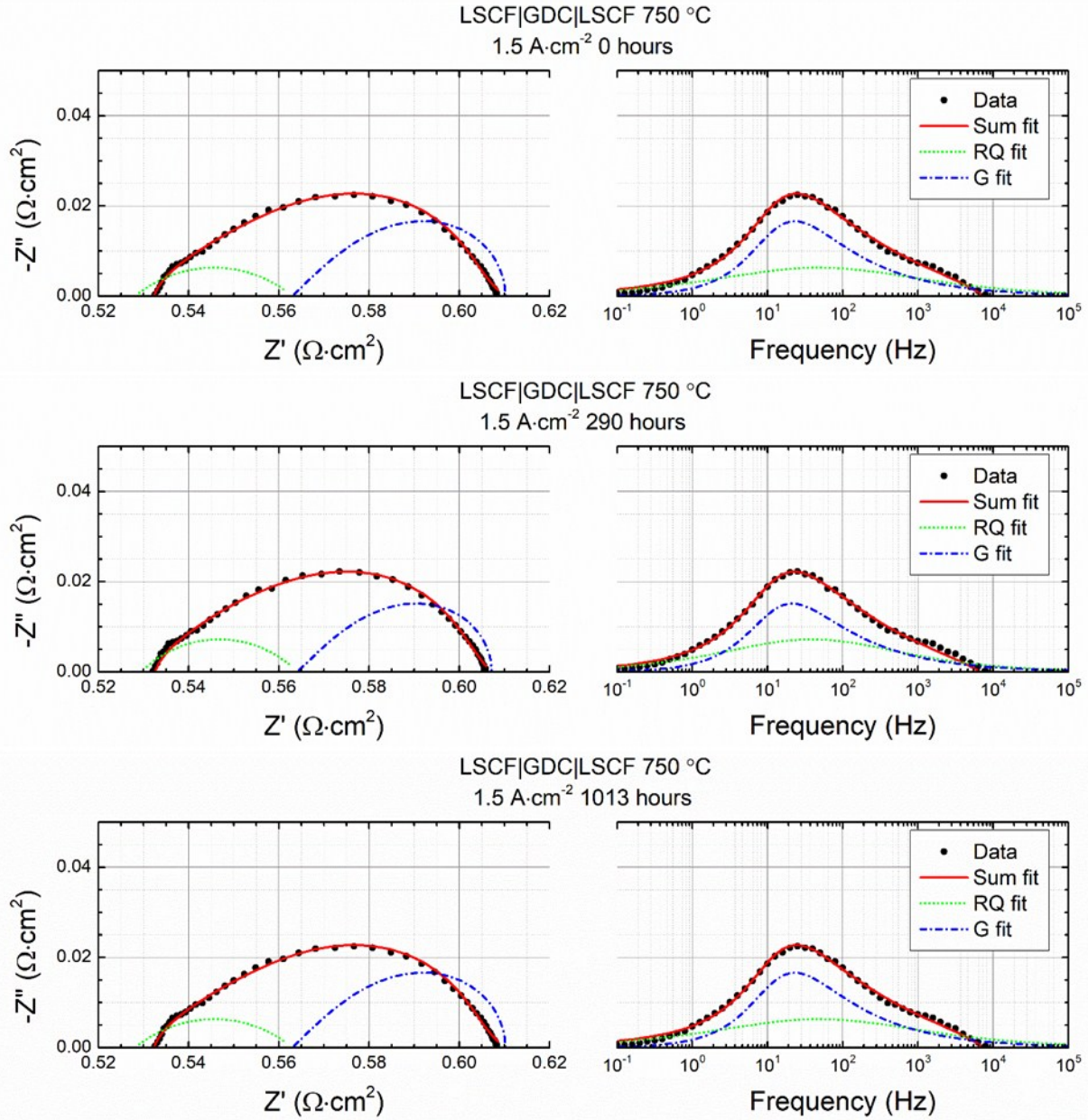
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Supplementary Fig. 1 shows the evolution of the Nyquist and Bode plots for the electrode

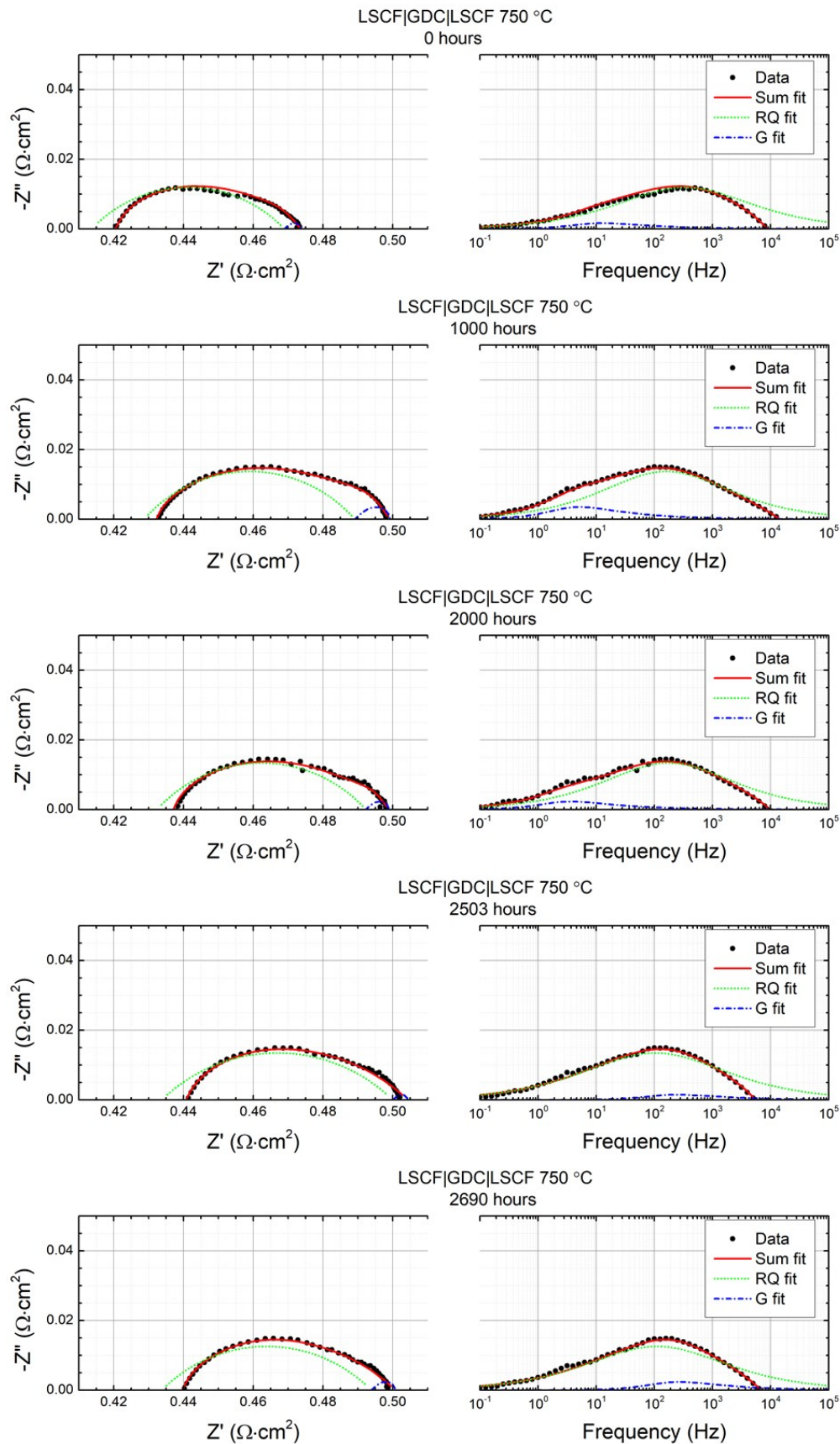
tested at 750 °C and  $j = 1.5 \text{ A} \cdot \text{cm}^{-2}$  at 0, 290, and 1013 hours. The cell shows remarkable

stability with no significant changes in either plot.



**Supplementary Figure 1.** Evolution of Nyquist and Bode plots for LSCF|GDC|LSCF cells. Impedance spectra are shown at 0, 290, and 1013 hours during operation at 750 °C and  $j = 1.5 \text{ A} \cdot \text{cm}^{-2}$ .

21           Supplementary Fig. 2 shows the evolution of the Nyquist and Bode plots for the electrode  
22 undergoing surface cleaning at 0, 1000, 2000, 2503, and 2690 hours. The cell shows a reset in  
23 the Nyquist plot with small variations, mostly in the ohmic resistance which is likely due to  
24 variations in temperature from removing the cell from the furnace multiple times. Slight changes  
25 are seen in  $R_G$ , which is likely due to small differences in the time the impedance spectra was  
26 taken and when the furnace was calibrated to 750 °C.



28 **Supplementary Figure 2.** Nyquist and Bode plots for LSCF|GDC|LSCF cells after each surface  
29 cleaning step at 0, 1000, 2000, 2503, and 2690 hours using deionized water at room temperature  
30 and thermal annealing at 750 °C.