

High performance LaSrCoFeO cathode for intermediate temperature SOFC application

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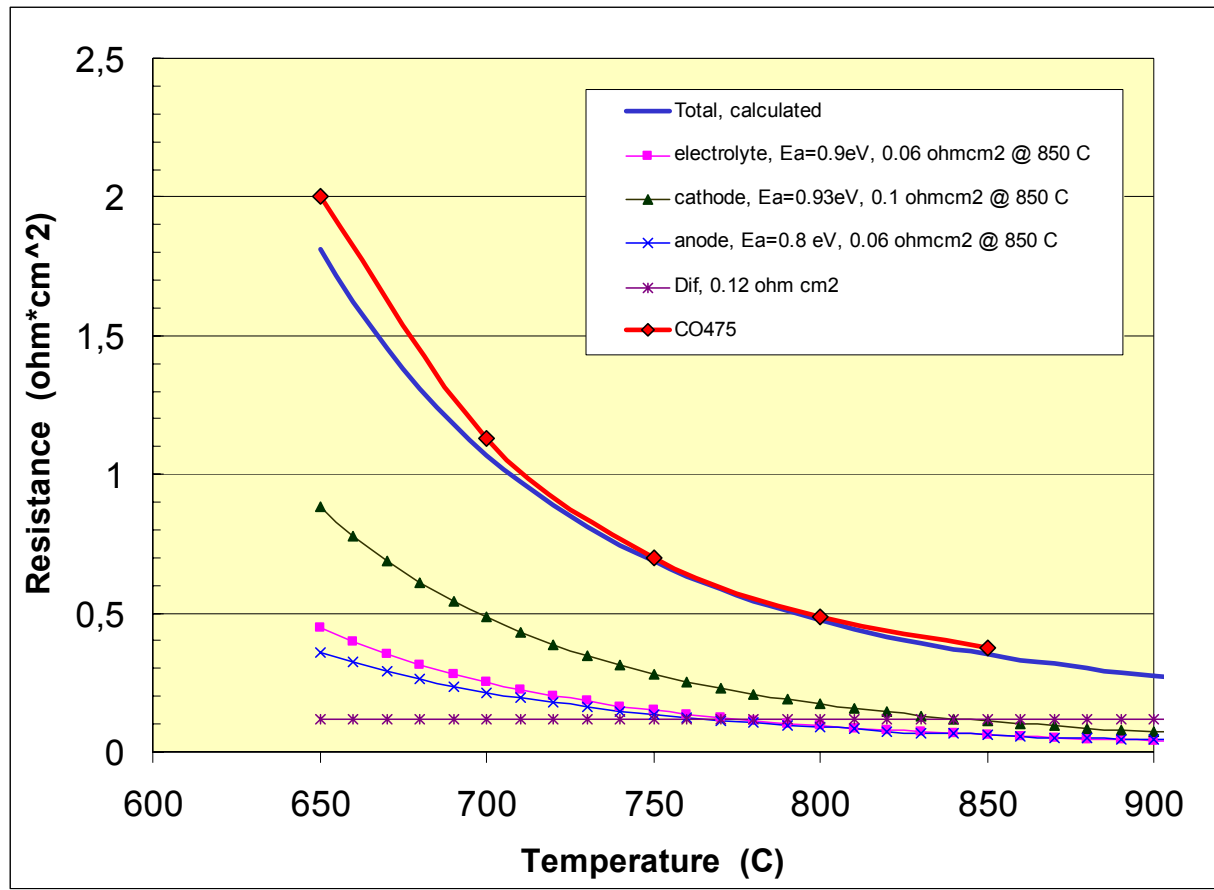
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Outline of the talk:

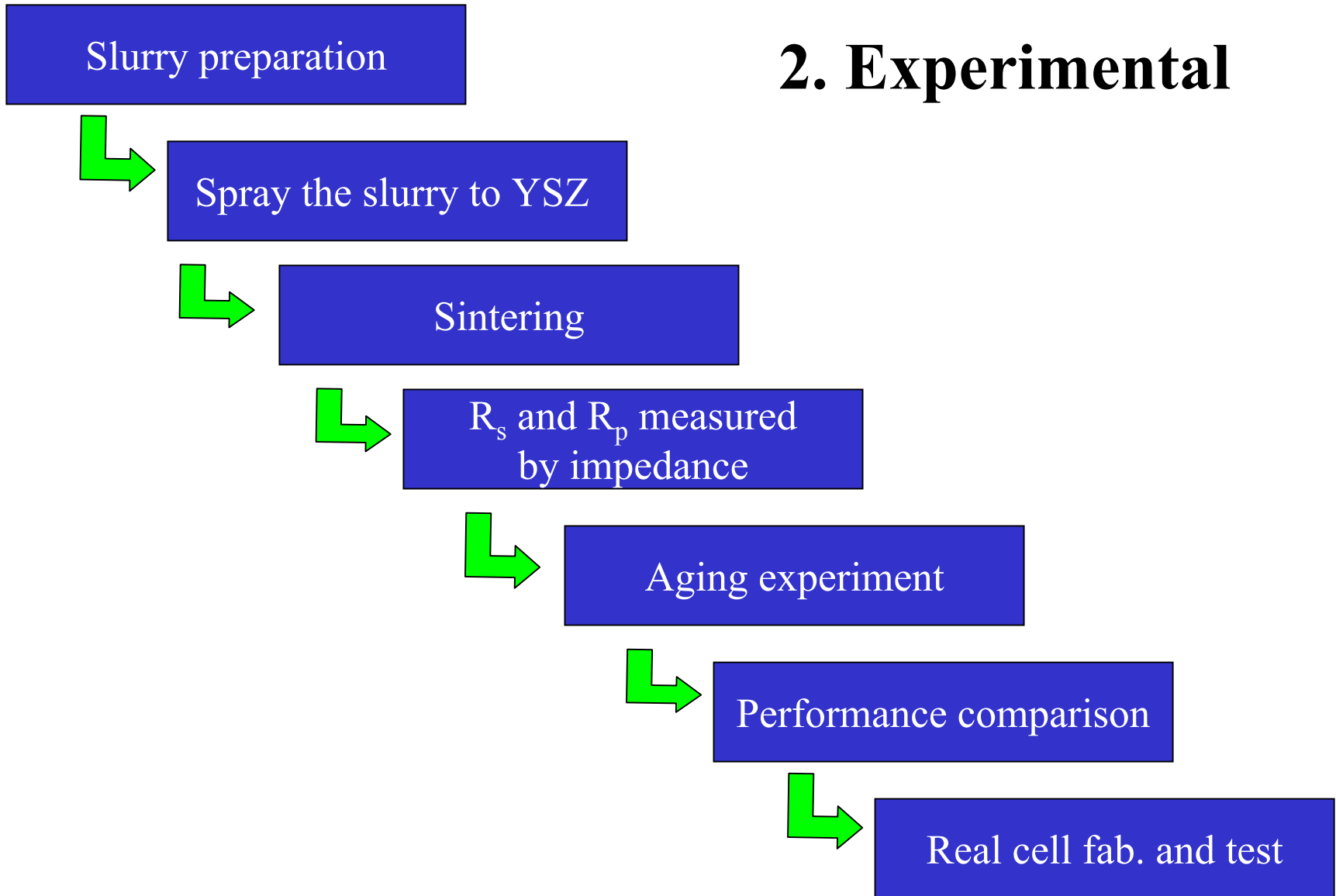
- 1. Introduction**
- 2. Experimental**
- 3. Preparation of symmetric cathode cells**
- 4. Symmetric cathode cell results and discussion**
- 5. Comparison of the performance in various cathodes**
- 6. Aging effect of the cathode LSCFO on YSZ directly**
- 7. Conclusions**

1. Introduction

Dominant loss from cathode in an anode supported cell

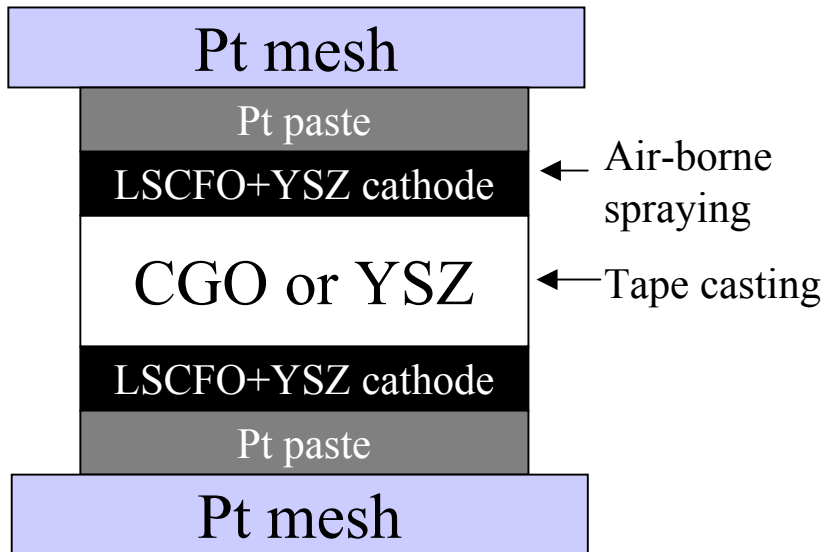


2. Experimental



3. Preparation and optimisation of the cathode symmetric cells

Symmetric cathode cell

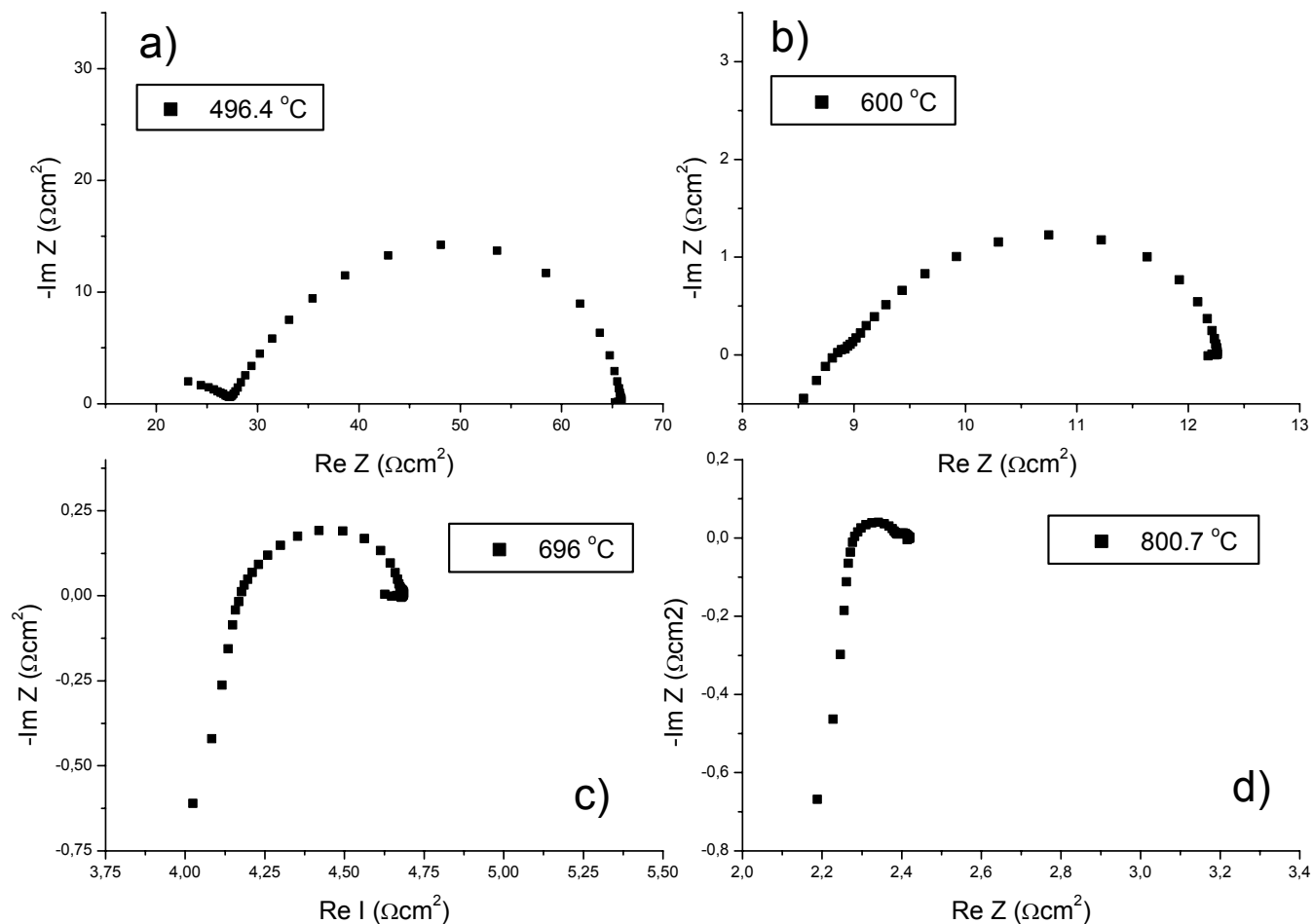


Optimisation:

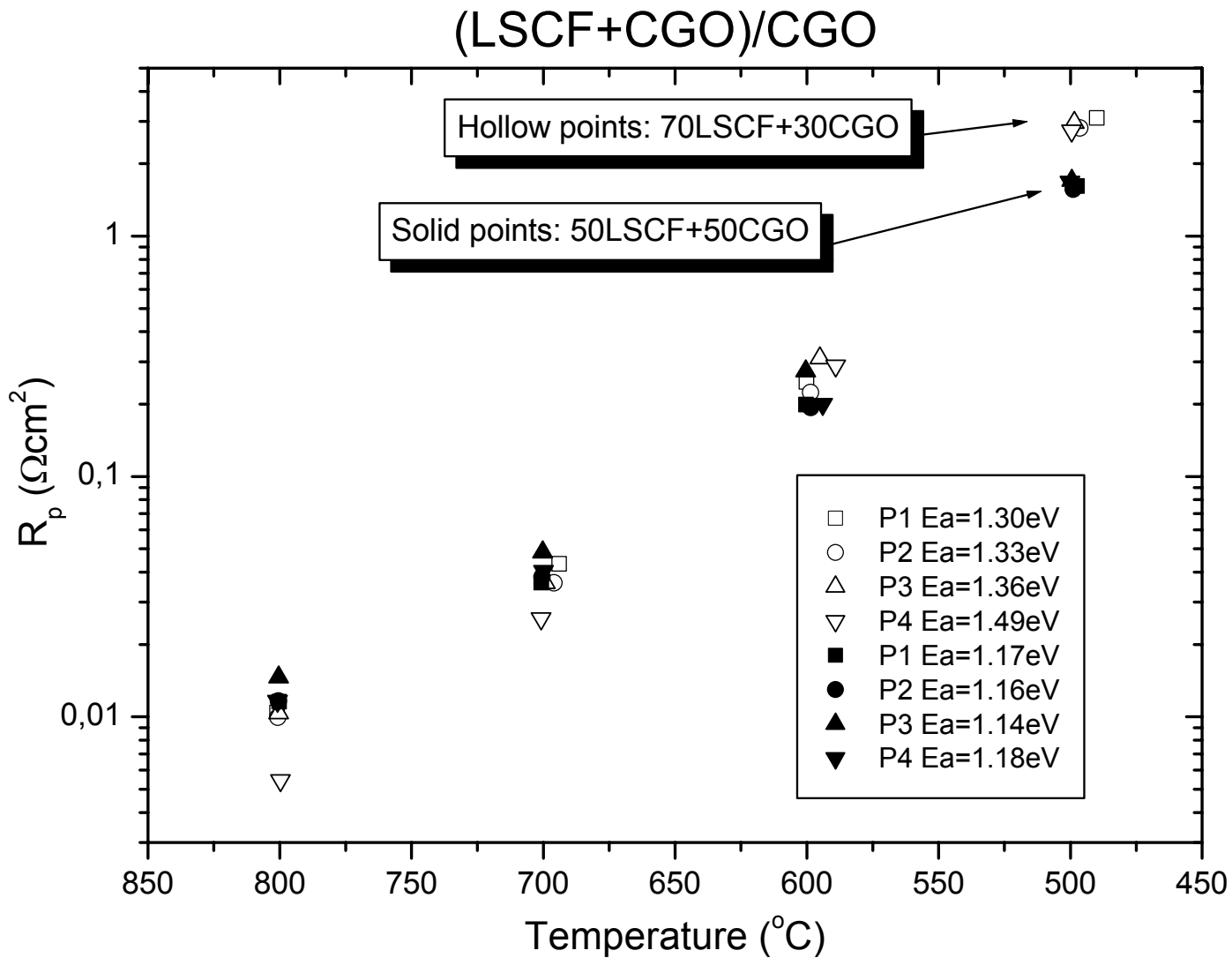
- $\text{La}_x\text{Sr}_y\text{Co}_z\text{Fe}_{1-z}\text{O}_3/\text{Ce}_{0.9}\text{Gd}_{0.1}\text{O}_3$
(LSFC/CGO)
- Calcinations of the LSFC powder
- Composite cathode composition
- Particle size distribution
- Slurry composition
- Heat treatment

W.G. Wang, et. al, Proceedings of Eighth International Symposium on Solid Oxide Fuel Cells (SOFC-VIII), Paris, France. PV 2003-07, 400.

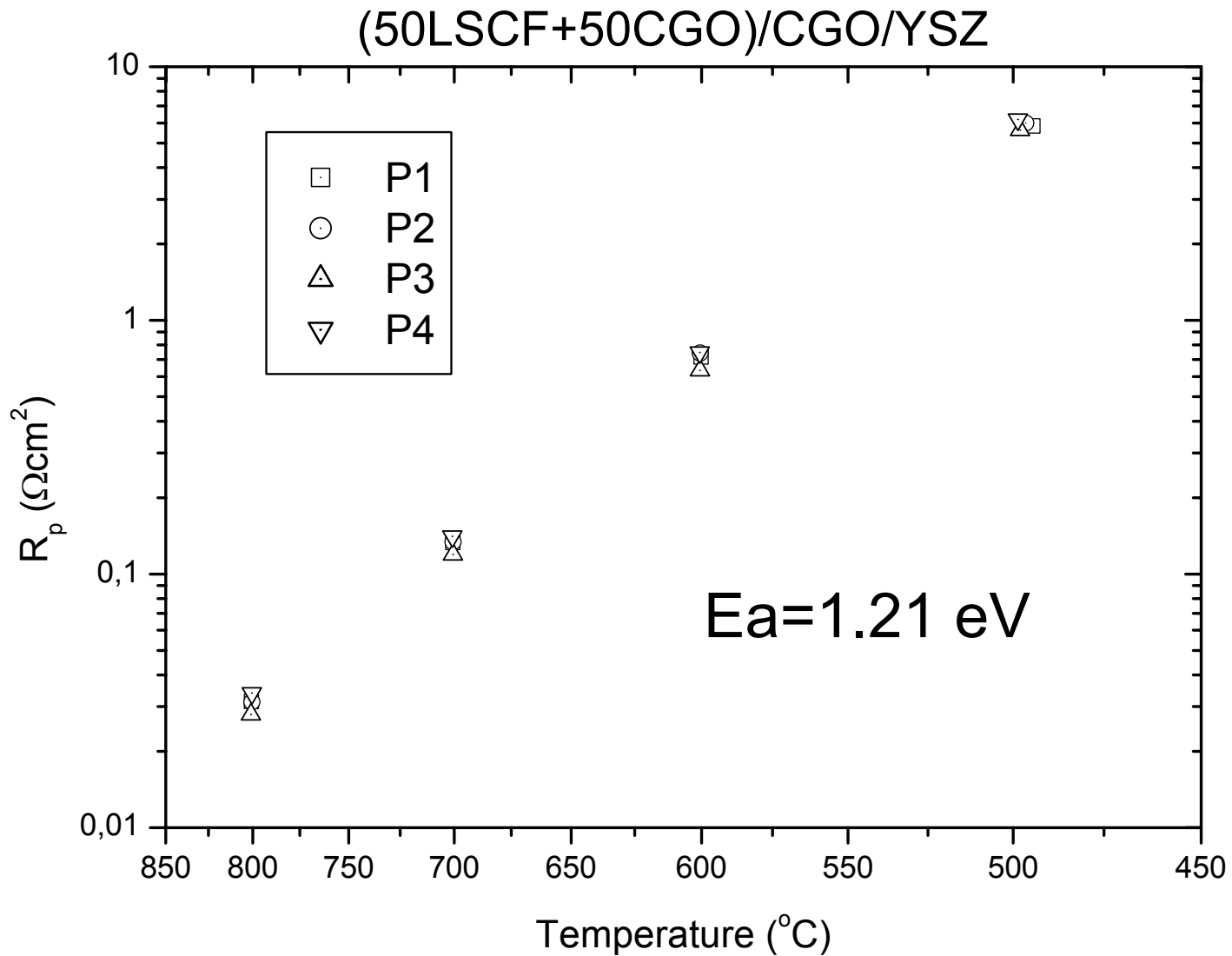
4. Symmetric cell results and discussion



Typical impedance spectra were obtained in air and OCV.
The area of the cells is approximately $0.4 \times 0.4 \text{ cm}^2$.

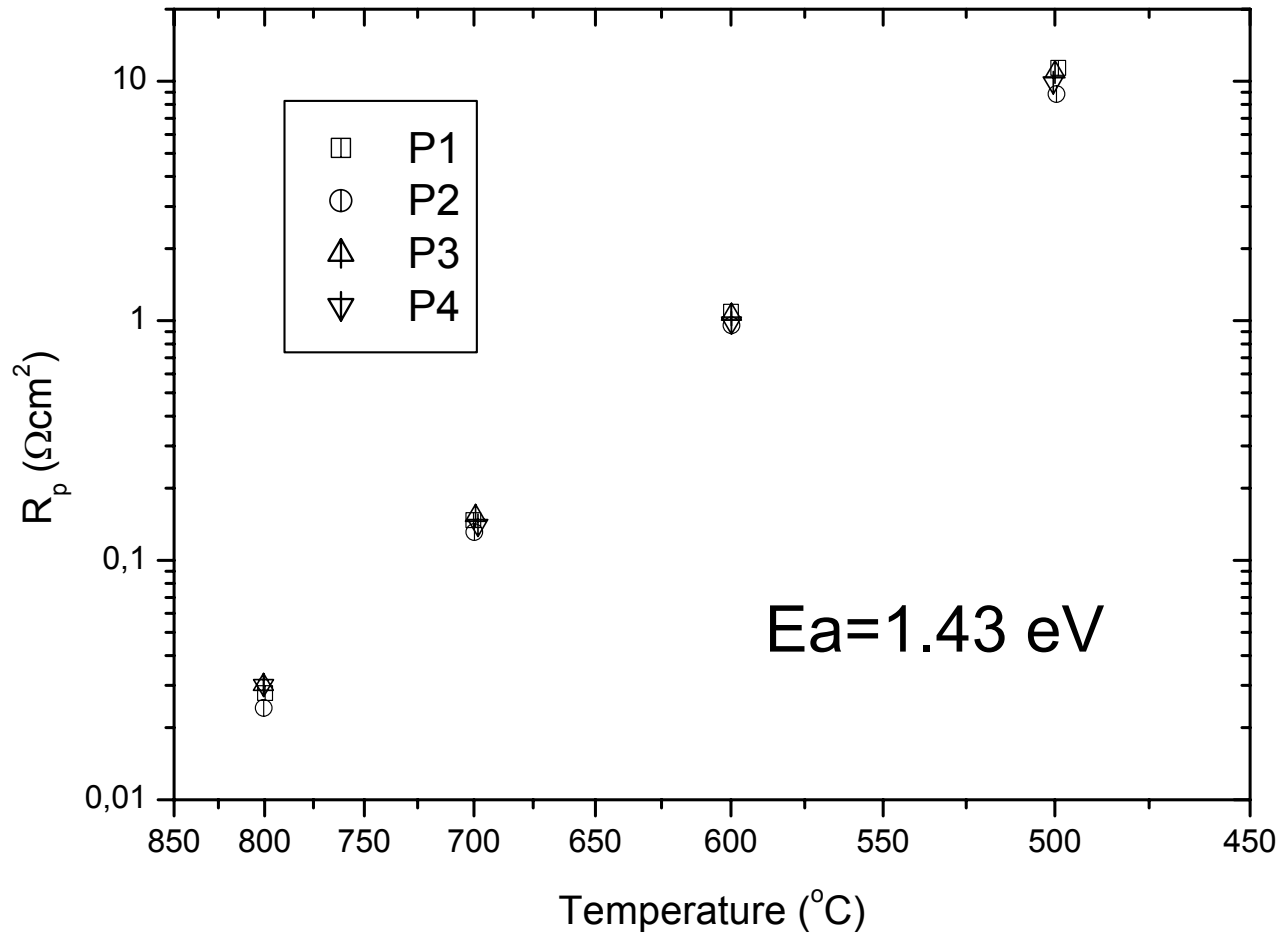


Polarization resistances measured at different temperature and activation energies on CGO electrolyte



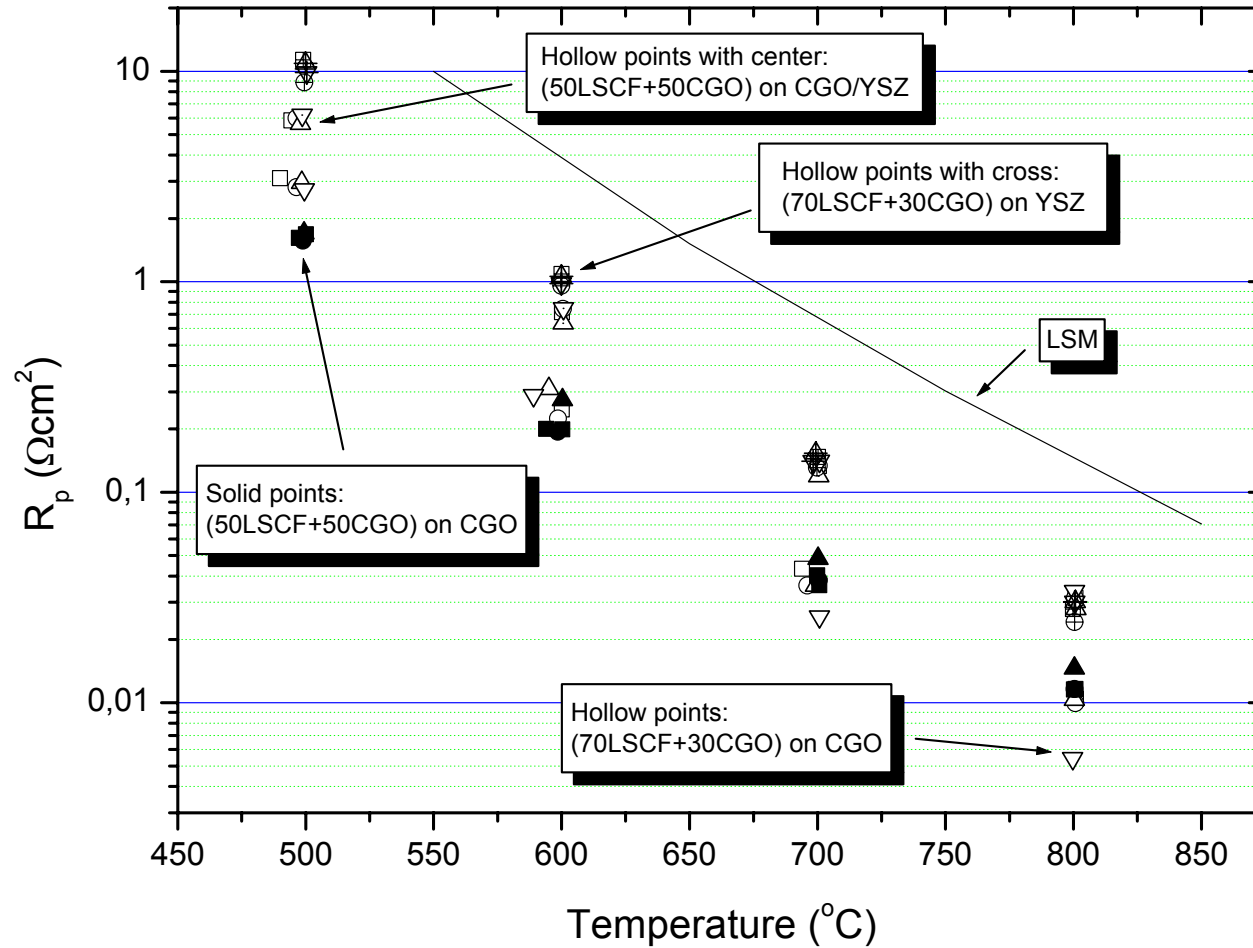
Polarization resistances measured at different temperature and activation energy with cathode on YSZ electrolyte with thin CGO barrier

(70LSCF+30CGO)/YSZ

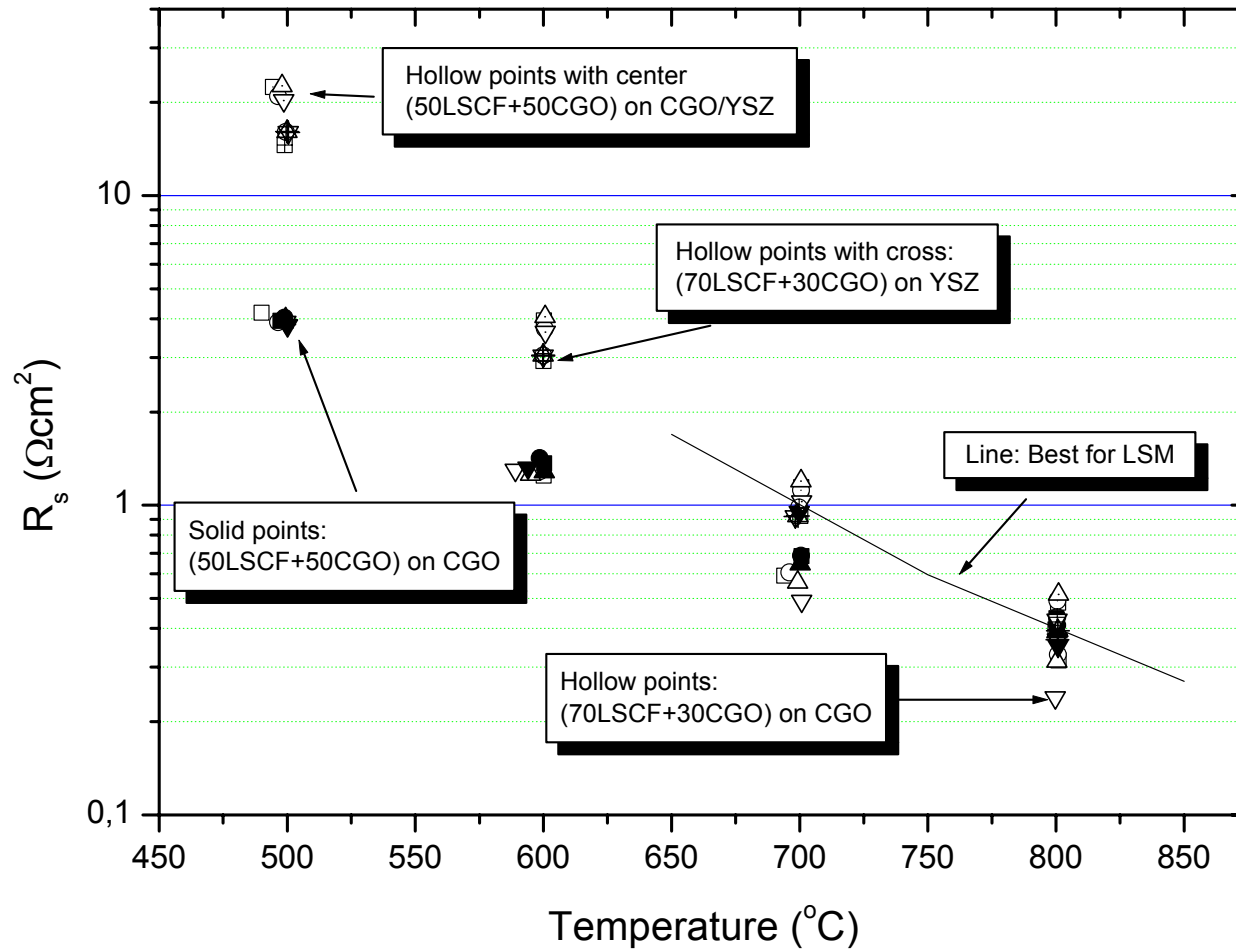


Polarization resistances measured at different temperature and activation energy with cathode directly on YSZ electrolyte

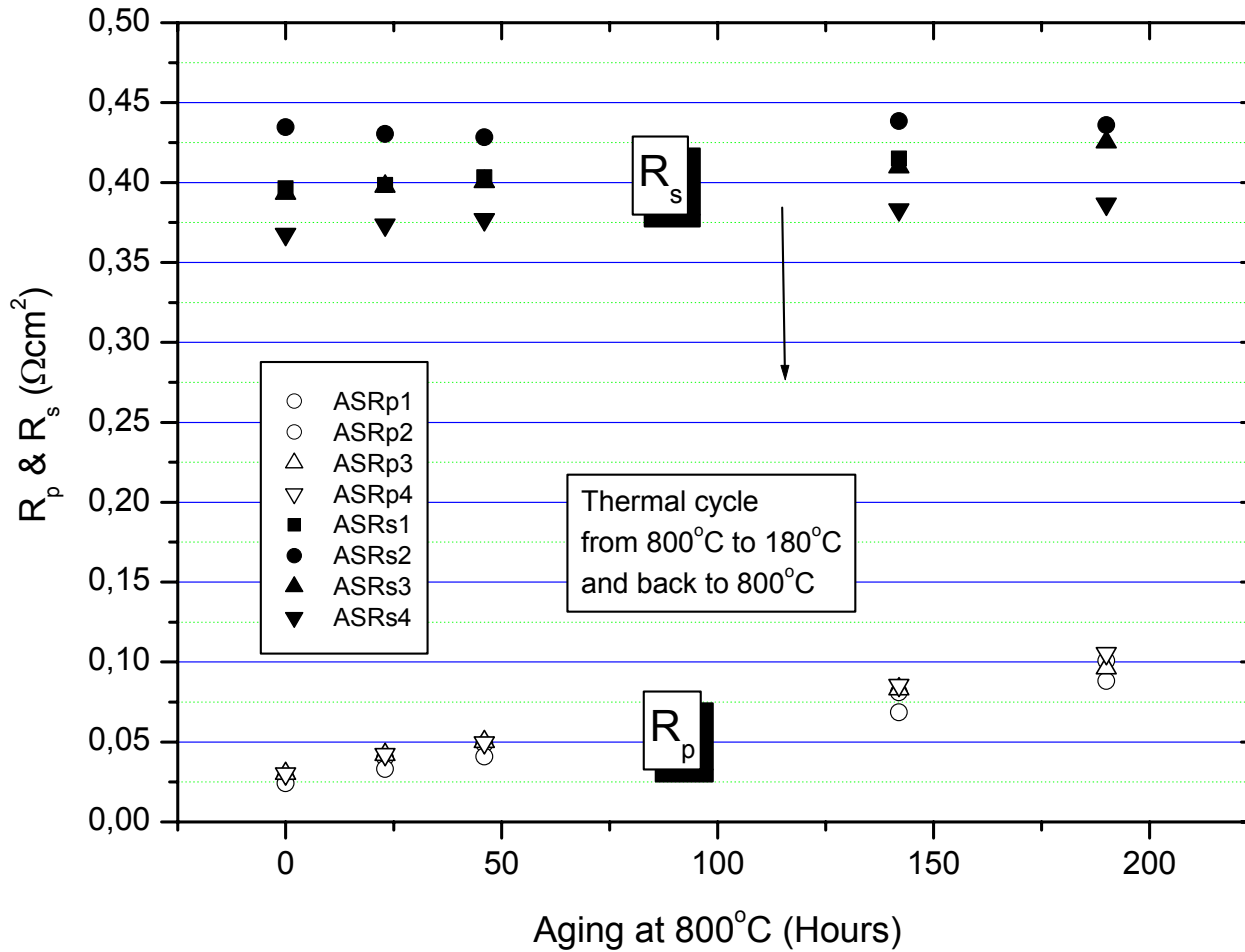
5a. Comparison of polarization resistances (R_p) at different temperature for various samples



5b. Comparison of series resistances (R_s) at different temperature for various samples



6. Aging effect of the LSCF cathode directly on YSZ electrolyte



7. Conclusions

1. R_p of $0.18\Omega\text{cm}^2$ at 600°C and $0.028\Omega\text{cm}^2$ at 700°C were obtained using LSCF/CGO cathode on CGO electrolyte.
2. On the YSZ electrolyte with thin layer CGO coating, R_p of $0.6\Omega\text{cm}^2$ at 600°C and $0.12\Omega\text{cm}^2$ at 700°C were obtained.
3. On the YSZ electrolyte directly, R_p of $0.9\Omega\text{cm}^2$ at 600°C and $0.13\Omega\text{cm}^2$ at 700°C were achieved.
4. Slightly higher R_s was observed in the samples with LSCF/CGO cathode on the YSZ electrolyte with CGO coating in comparison of the samples without.
5. For the samples with LSCF/CGO on YSZ, the R_s was the same as that of our best LSM samples, which indicates good adhesion between LSCF/CGO cathode and YSZ electrolyte.
6. Aging experiment at 800°C for the cathode of LSCF/CGO on YSZ electrolyte shows a degradation rate of $5\times 10^{-4}\Omega\text{cm}^2/\text{h}$ in R_p , while the R_s has no obvious change.