



- **Carbon Tolerant Anodes**
- **IT-SOFC**
- **Chemical cogeneration**

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Carbon Tolerant Anodes

Up to now...

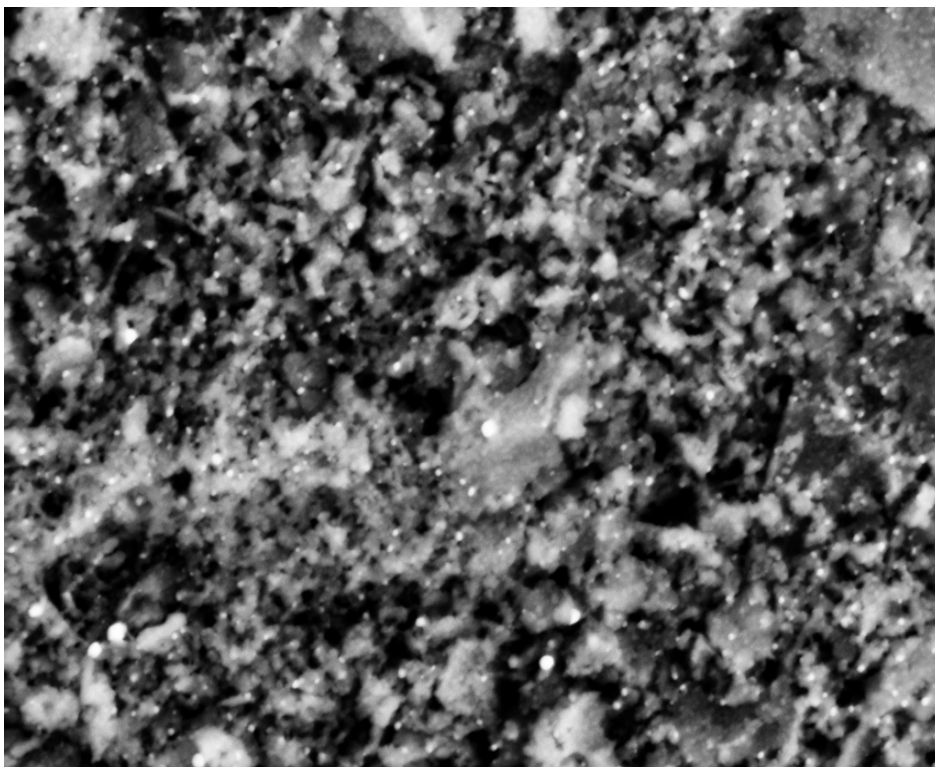
- ❌ **Previous** techniques for Au or Ag impregnation did not succeed

However...

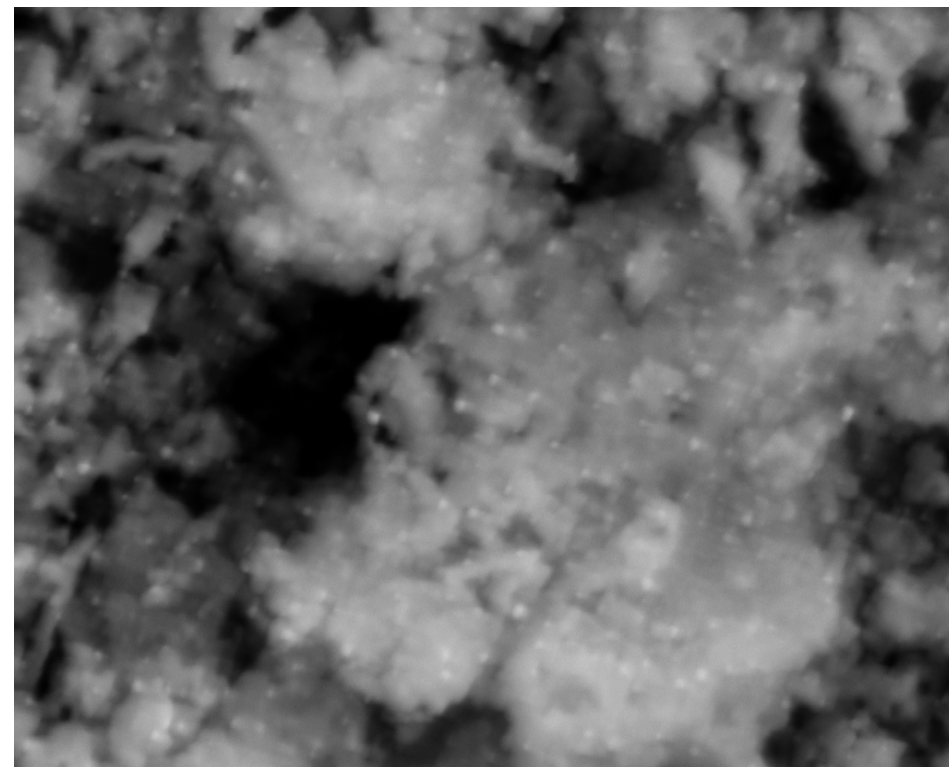
- ❖ A recent procedure for Au deposition on ECN_NiOCGO powder has revealed promising results



1. Fine dispersed nano-particles of Au



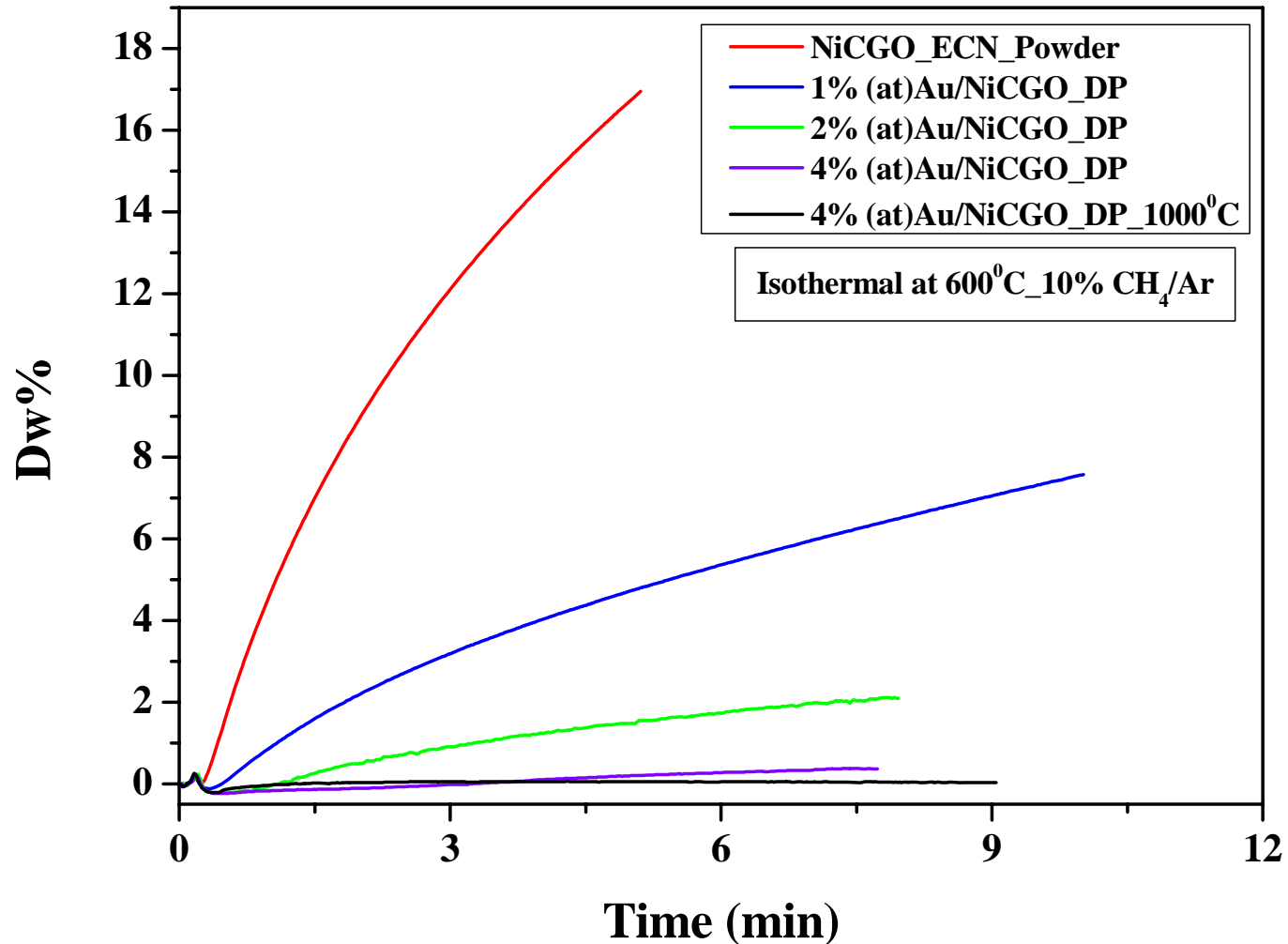
Mag = 11.35 K X EHT = 15.00 kV Date :20 Nov 2008 FORTH/ICE-HT
1µm WD = 9 mm Time :13:32:04 LEO SUPRA 35VP
Signal A = RBSD Noise Reduction = Line Avg



Mag = 26.56 K X EHT = 15.00 kV Date :20 Nov 2008 FORTH/ICE-HT
200nm WD = 10 mm Time :15:35:09 LEO SUPRA 35VP
Signal A = RBSD Noise Reduction = Line Avg

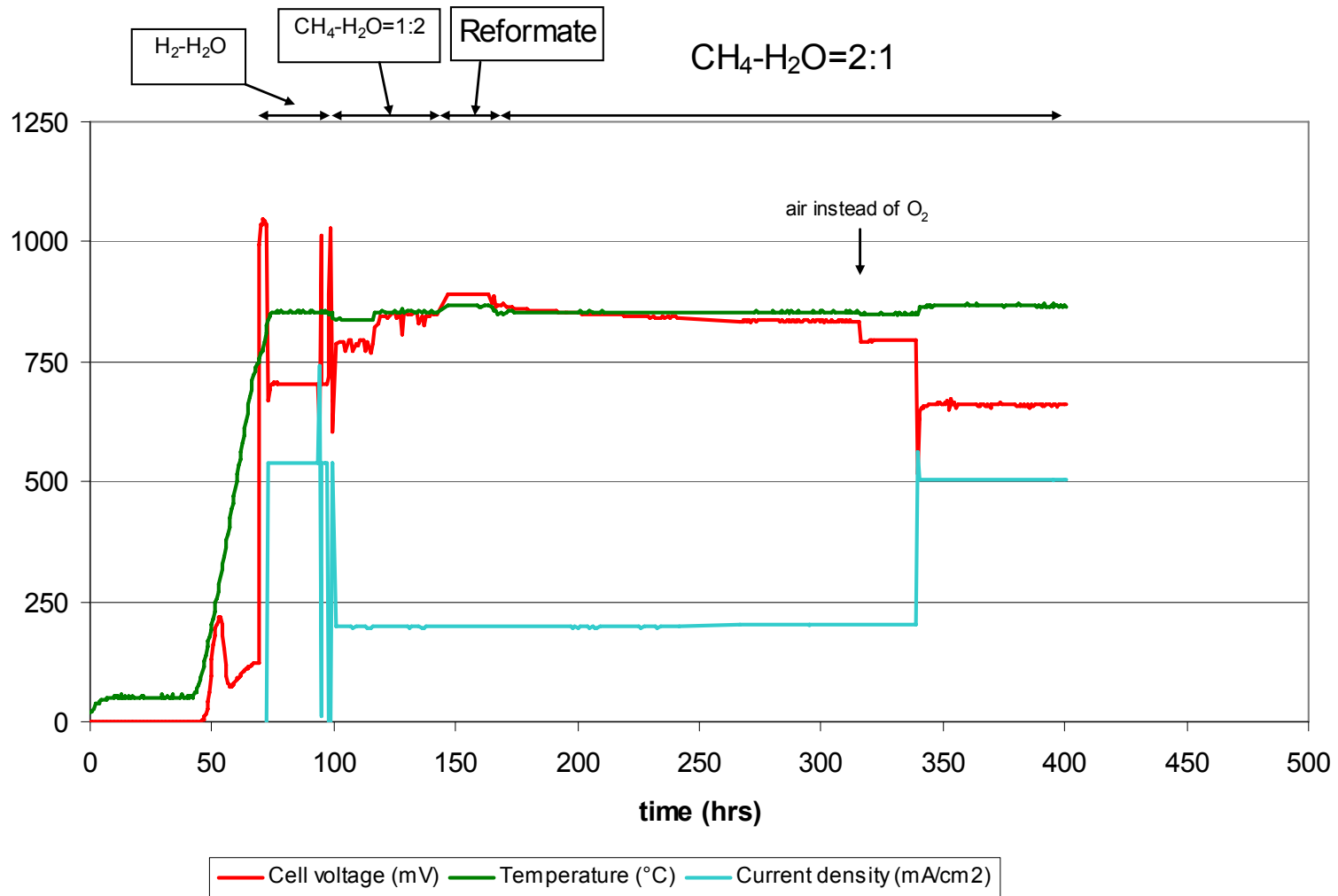


2. Improvement in terms of carbon deposition





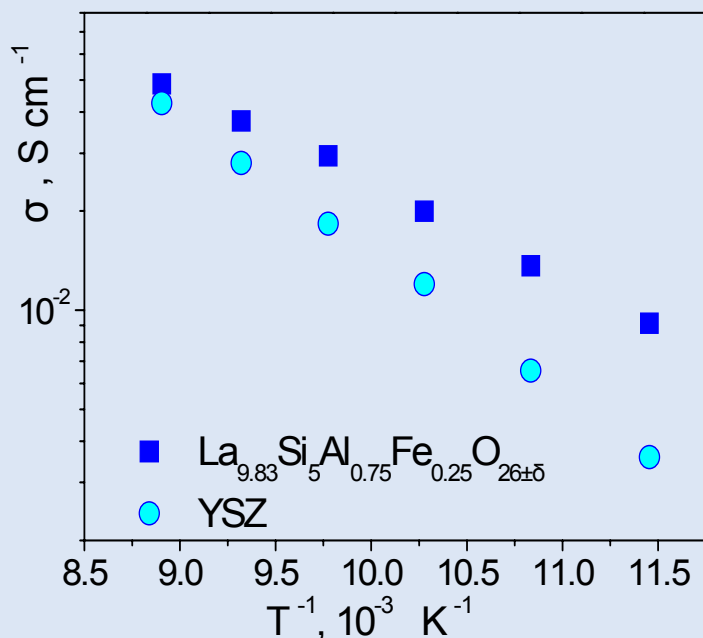
3. Promising electrochemical behavior from (ECN)





YSZ vs. Lanthanum silicate

- ❖ It has been found that partial substitution of Si by **Al** results in the enhancement of the oxide ion conductivity.
- ❖ Doping of $\text{La}_{10-x}\text{Si}_6\text{O}_{26\pm\delta}$ with **Fe** having significant solubility in the Si sublattice was shown to increase the total conductivity (which is mainly ionic) and the sinterability.

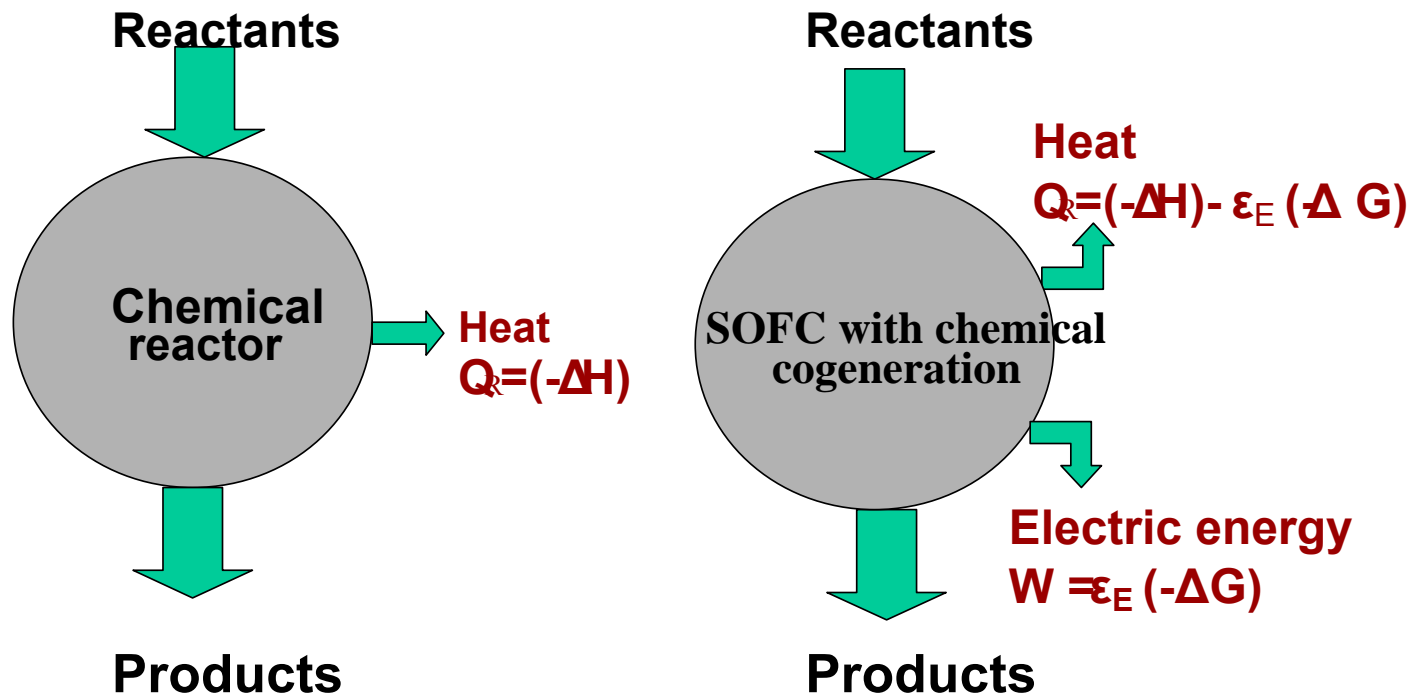


Composition	σ at 700°C S^*cm^{-1}	Activ. Energy, eV
$\text{La}_{9.83}\text{Si}_{4.5}\text{Fe}_{1.5}\text{O}_{26\pm\delta}$	1.16×10^{-2}	0.66
$\text{La}_{9.83}\text{Si}_5\text{Al}_{0.25}\text{Fe}_{0.75}\text{O}_{26\pm\delta}$	1.19×10^{-2}	0.69
$\text{La}_{9.83}\text{Si}_5\text{Al}_{0.75}\text{Fe}_{0.25}\text{O}_{26\pm\delta}$	1.99×10^{-2}	0.57
YSZ	1.12×10^{-2}	0.84



Other possibilities:

Chemical cogeneration in high temperature fuel cells



$$\epsilon_E = W/(-\Delta G) = E/E_{rev} \quad \text{voltage efficiency}$$