

# Status of Elcogen unit cell and stack development

**Matti Noponen**

Elcogen

Biologinkuja 5

02150 Espoo Finland

Tel.: +358-40-732-9696

matti.noponen@elcogen.com

## Abstract

Elcogen is manufacturer of solid oxide fuel cell (SOFC) and solid oxide electrolysis (SOE) unit cells and stacks. The competitive advance of Elcogen unit cells is their performance characteristics at reduced temperatures. The unit cells are based on anode supported structure with standard material system from anode to cathode corresponding to NiO/YSZ – YSZ – GDC – LSC. Figure 1a depicts the unit cell polarization measured with hydrogen at 600°C, 650°C and 700°C ( $U_f = 20\%$ ,  $U_o = 20\%$  @  $0.4 \text{ A.cm}^{-2}$ ). The high open circuit voltages measured with dry hydrogen (Figure 1a) is a direct indication of the low gas permeability of the electrolyte layer. The high performance of the unit cells can be seen from the polarization curves, e.g. the cell voltage at 650°C and  $0.3 \text{ A.cm}^{-2}$  is 1.00V corresponding to an area specific resistance of  $0.24 \Omega.\text{cm}^2$ .

Elcogen stacks like its unit cells are optimized for reduced operating temperatures. Elcogen is providing its 500W stack design for evaluation purposes and the development is focused on commercialization of 1500 W stack design. The active area as well as the number of unit cells has been increased in the new stack design. Figure 1b depicts the comparison of stack polarization between the 500W and 1500W designs in equal testing conditions ( $U_f = 46\%$ ,  $\text{H}_2/\text{N}_2 = 50/50$ ,  $U_a = 25\%$ ,  $T_{\text{stack}} = 700 \text{ }^\circ\text{C}$ ) and with equal material systems. The Elcogen 500W design has been tested for its endurance over 2500 h with degradation less than  $20 \text{ m}\Omega.\text{cm}^2.\text{kh}^{-1}$ .

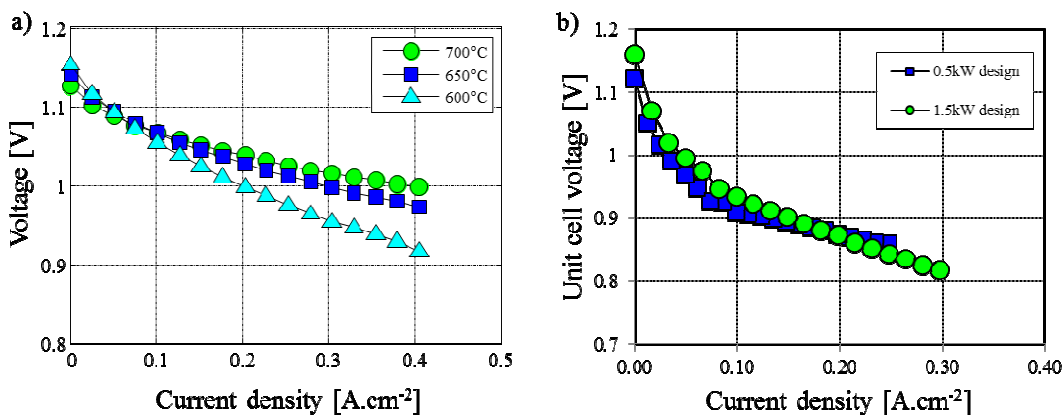


Figure 1. a) IV-characteristics of Elcogen unit cells; b) comparison of Elcogen 500W and 1500W stack performance