



ELECTRA
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ELECTRA

High Temperature Electrolyser with Novel Proton Ceramic Tubular Modules of Superior Efficiency, Robustness and Lifetime Economy

List of Beneficiaries

No.	Organisation name	Country
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2	Inst. Chem. Technology, University P. Valencia	Spain
3	Stiftelsen SINTEF	Norway
4	MARION Technologies	France
5	CoorsTek Membrane Sciences AS	Norway
6	Abengoa Hidrógeno SA	Spain
7	Carbon Recycling International	Iceland



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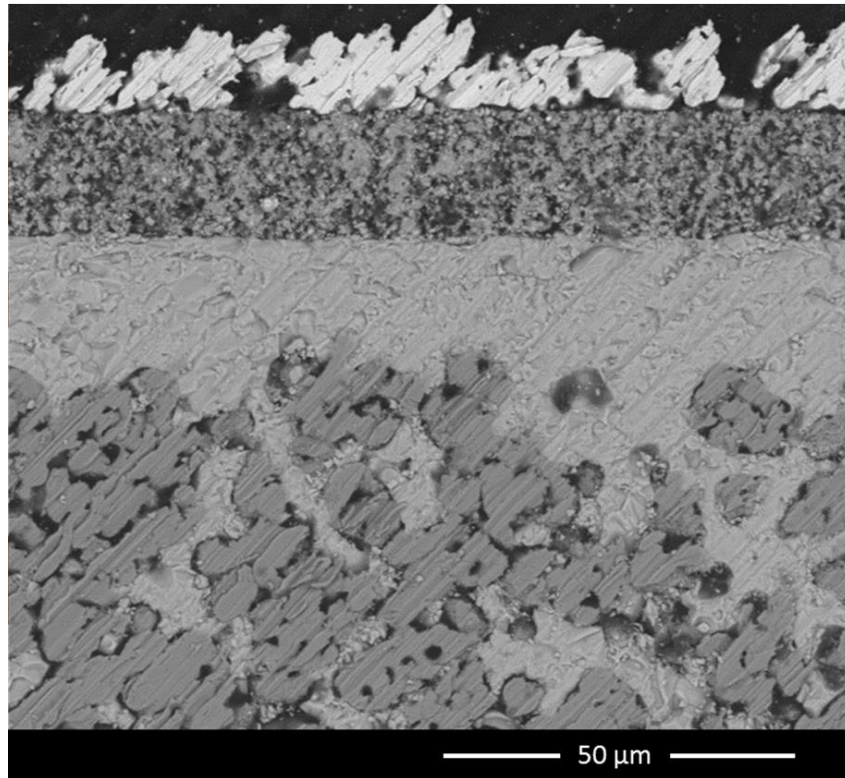


Figure 1. Cross sectional SEM image of porous Ni-BZCY cermet support tube wall (bottom), dense BZCY electrolyte, porous BGLC-BZCY cermet anode, and metallic current collector. This illustrates the typical microstructure of Generation 1 and Generation 2 tubular PCEs developed in ELECTRA.

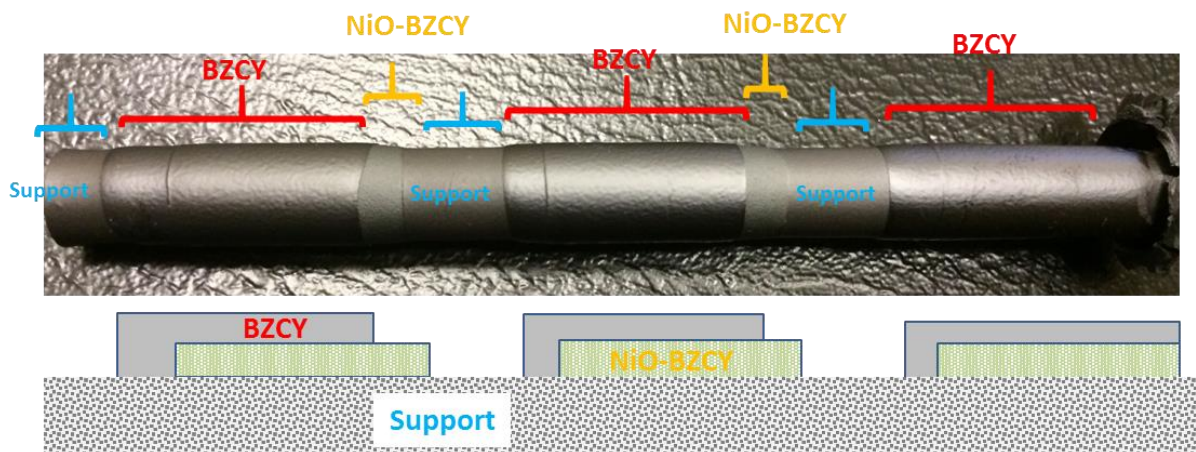


Figure 2. Camera picture of 3-segment tube (top) and schematic wall structure (bottom) of Generation 3 showing inert porous support tube with co-sintered NiO-BZCY cermet cathode and electrolyte layers (interconnect and anode not yet deposited). The segmented-in-series geometry allows higher packing density, higher voltage, and lower overall current, and hence lowers demand on current collectors for tubular electrochemical cells.

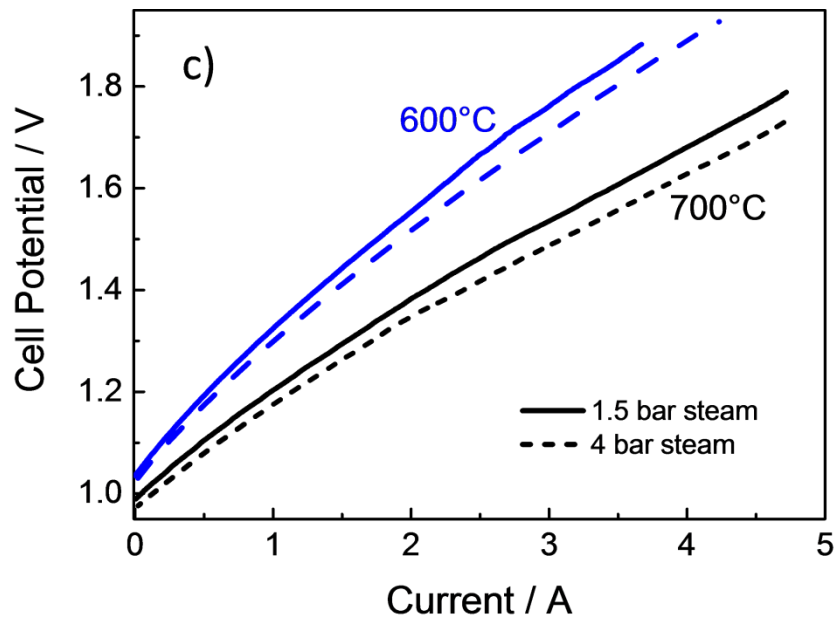


Figure 3. Cell potential vs current for tubular segment during operation in electrolysis mode showing positive effects of temperature (700 vs 600°C) and steam pressure (4 vs 1.5 bar). These results represent a step-change improvement in the performance of intermediate-temperature steam electrolyzers based on proton ceramics.



Figure 4. Multi-tubular 1 kW 20 bar electrolyser module unit for 18 tubes with easy tube insertion from cold side and individual monitoring, shut-off, and replacement during operation.