In-situ temperature sensing of SOFC during anode reductions and cell operations using multi-junction thermocouple network

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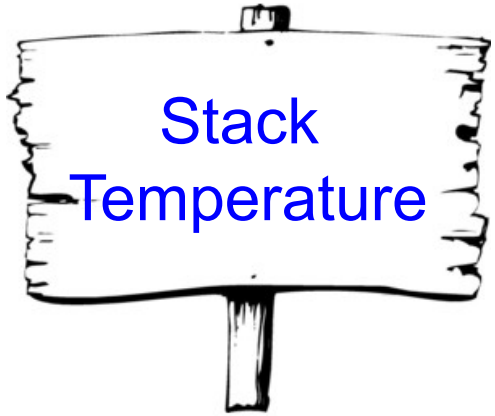
Outline

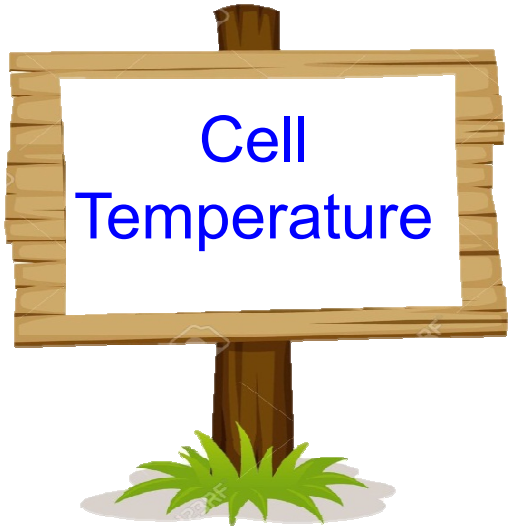
- Research Focus
- Approach
- Sensor development and testing
- Application in SOFC
- Conclusions & Future works

Research Focus

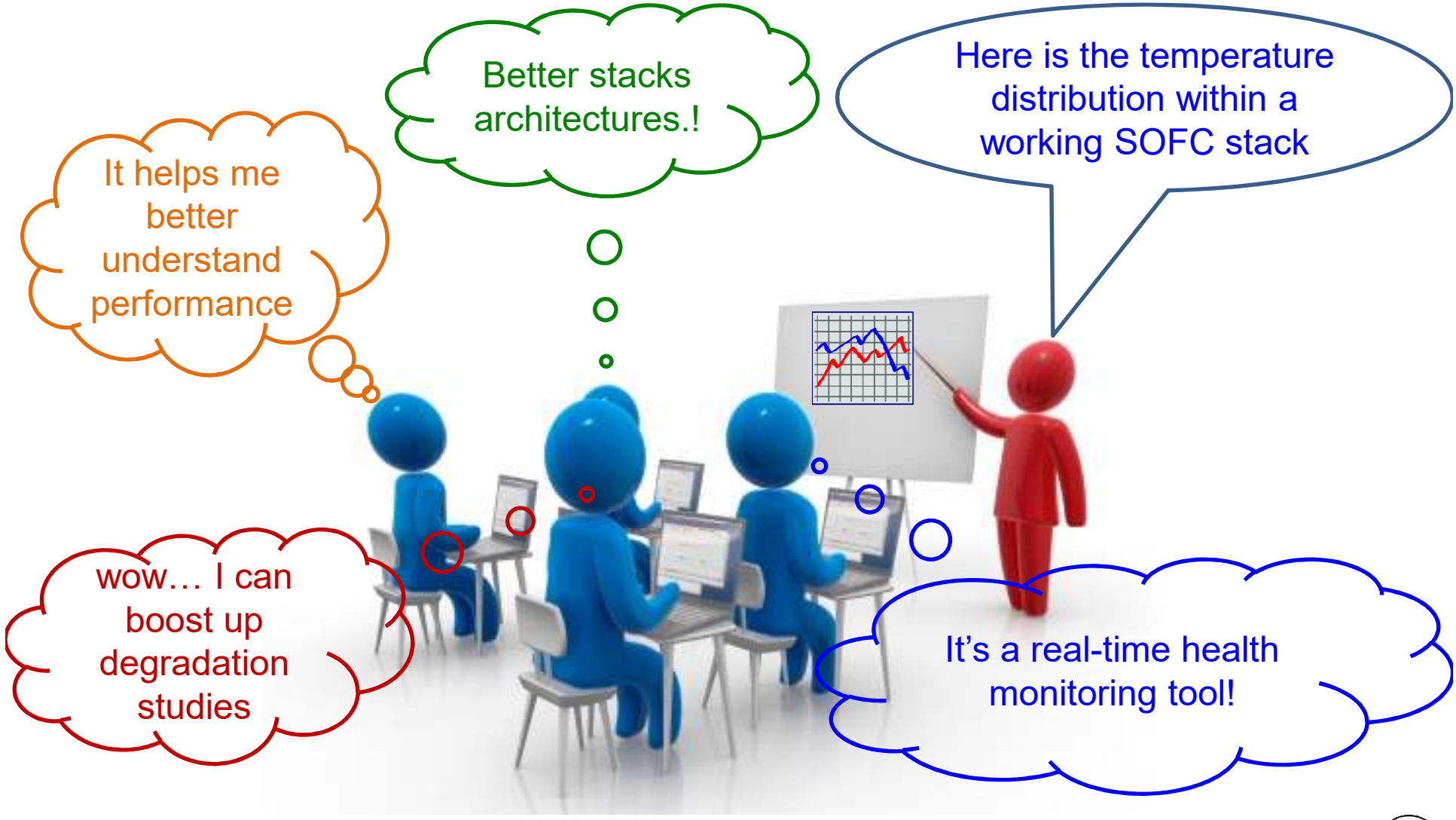
Developing a technology to in-situ monitor the temperature from an operating SOFC stack

Research Focus



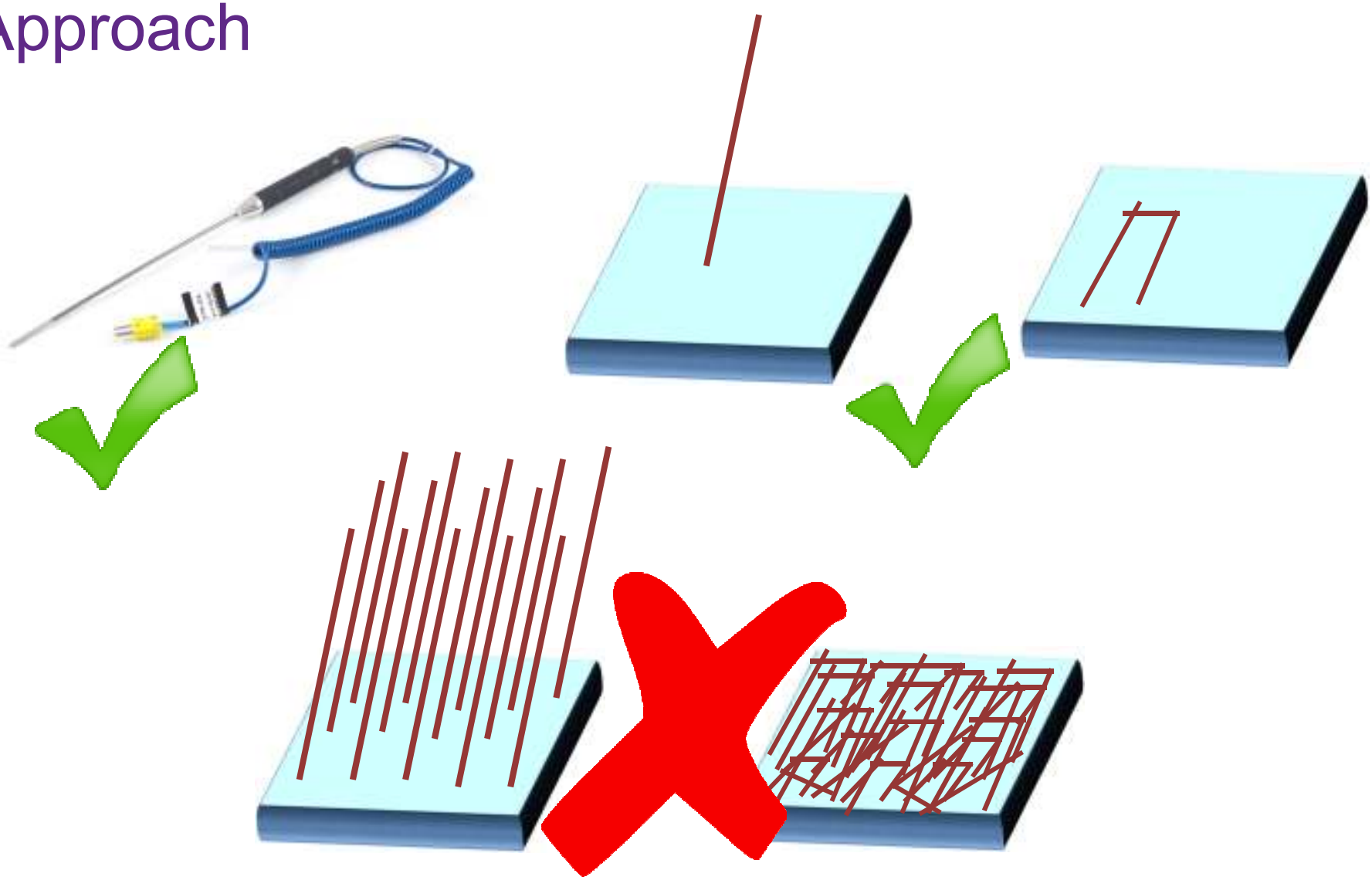


Introduction & research focus



Research Approach

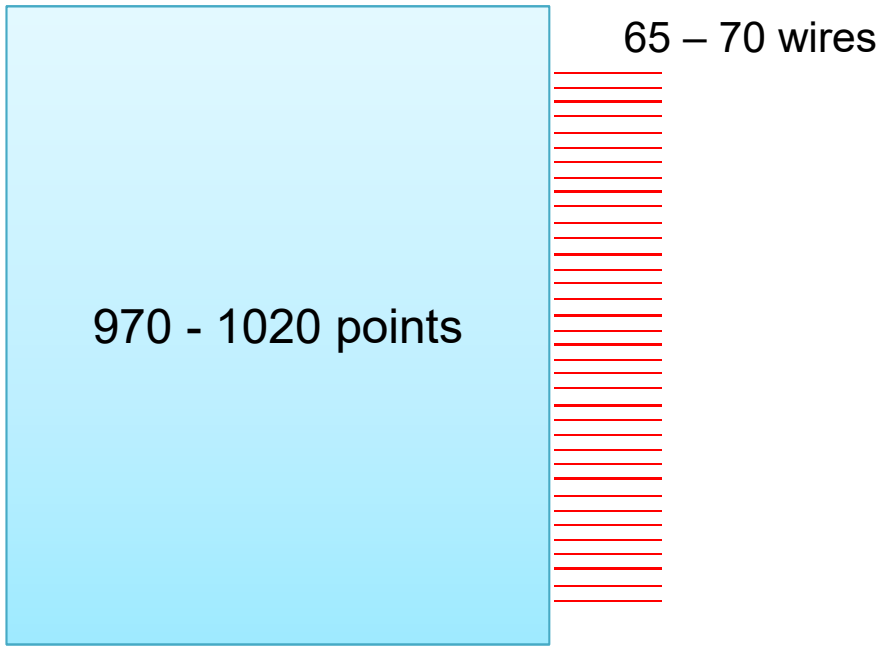
Approach



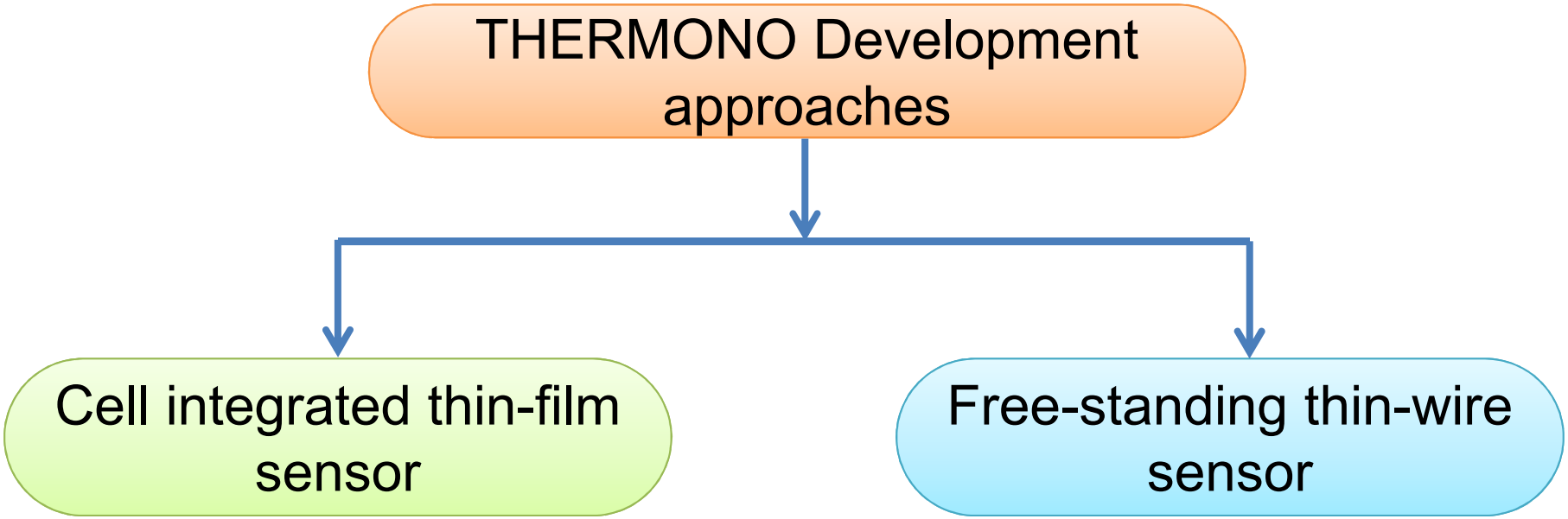
New thermocouple architecture was developed

This requires much less number of thermo-elements

Increases the spatial resolution of measurements



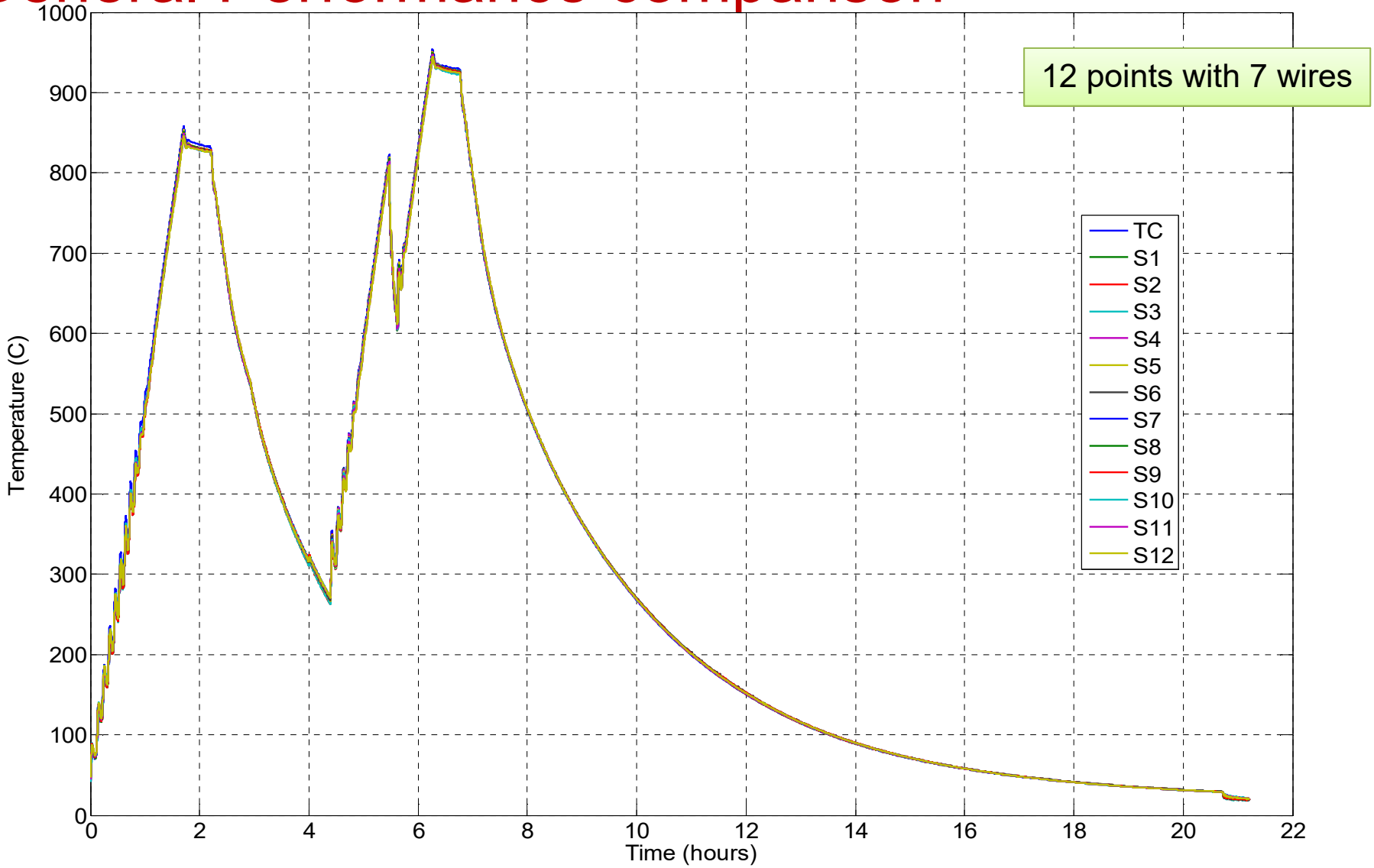
We named this sensor as THERMONO



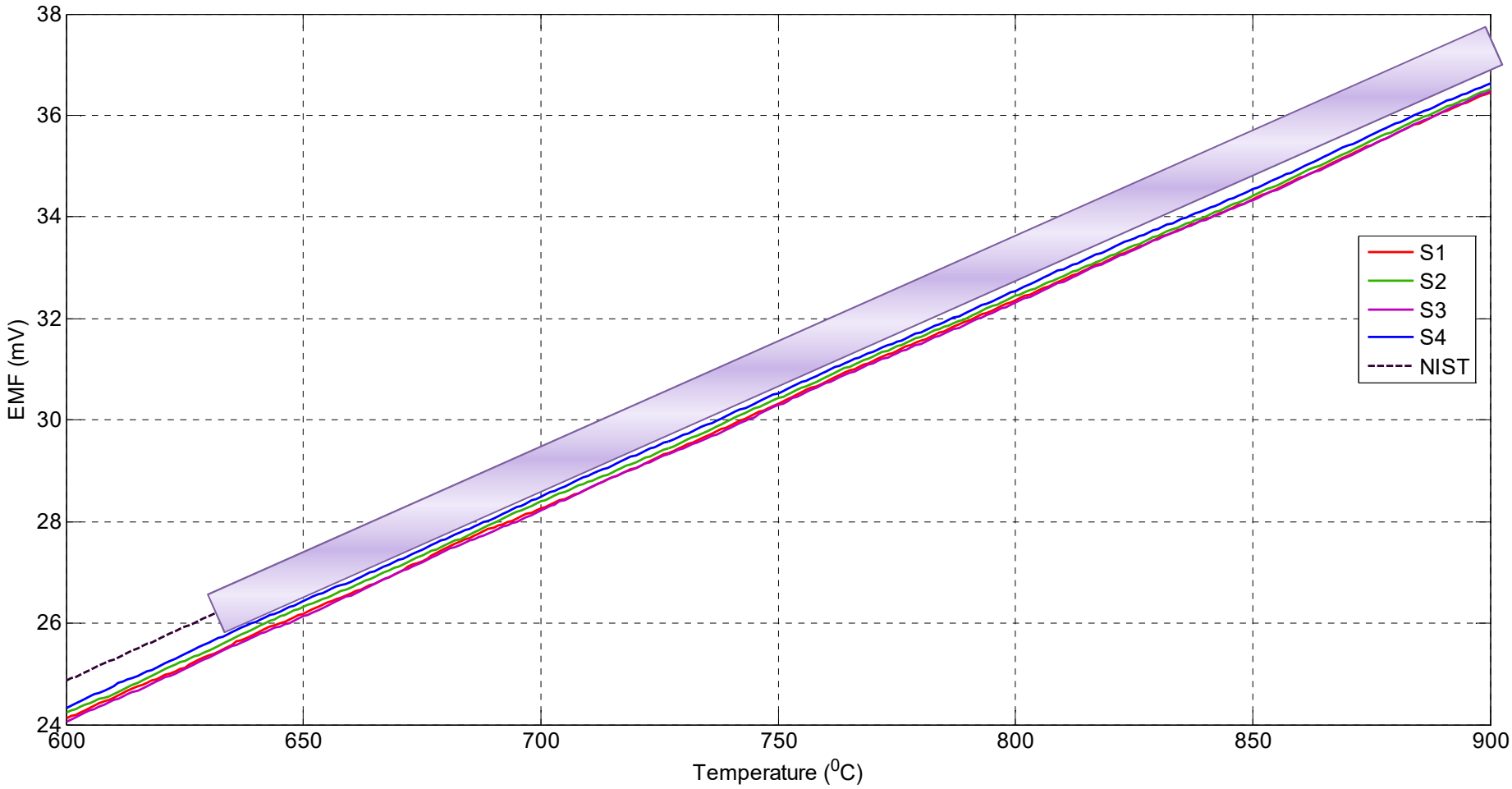
Sensor development and testing

(tested with Alumel and Chromel wires of Φ0.5mm and Φ 0.25mm)

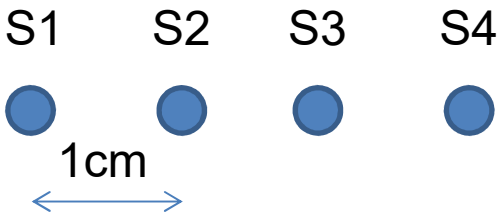
General Performance comparison



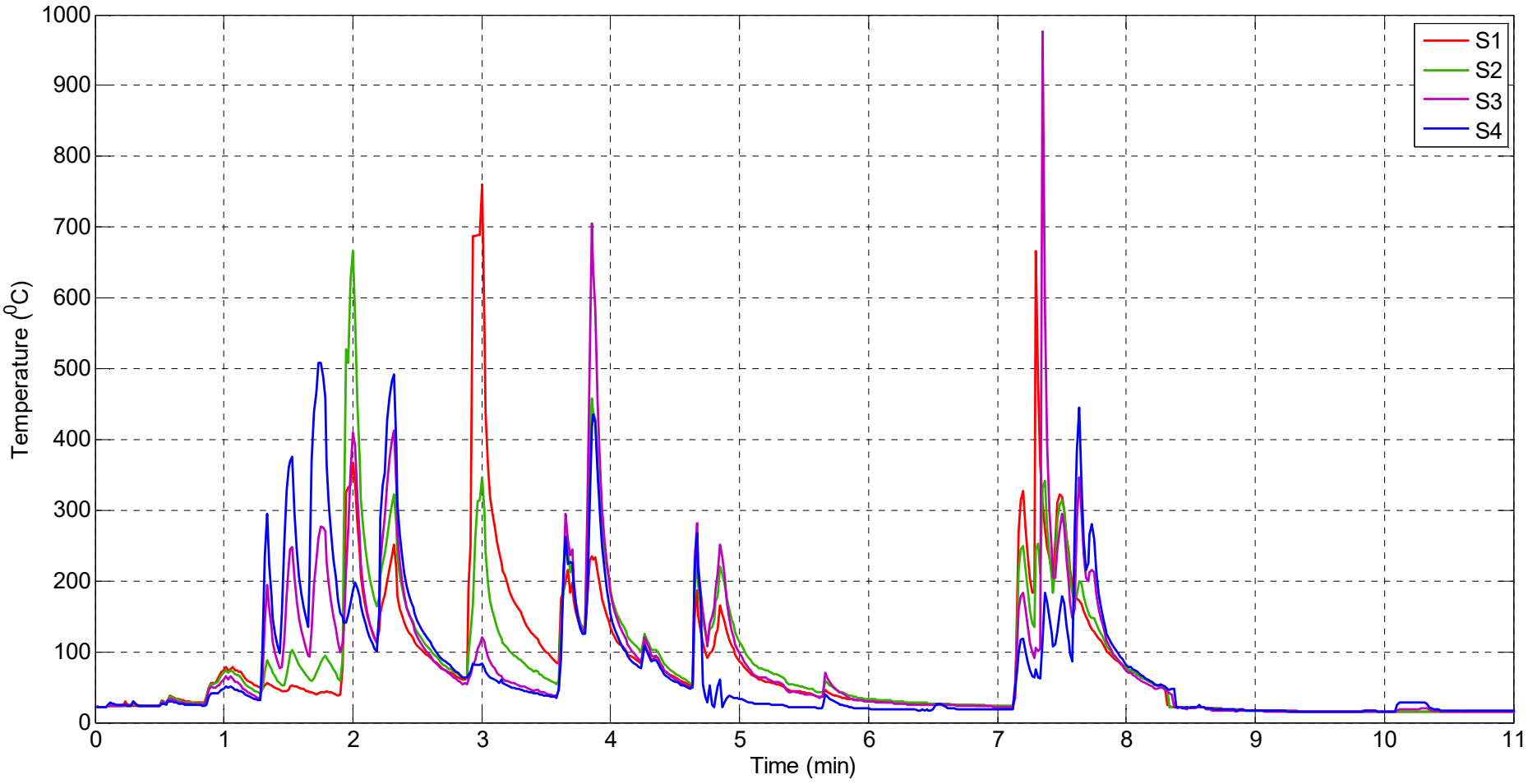
Comparison with international standards



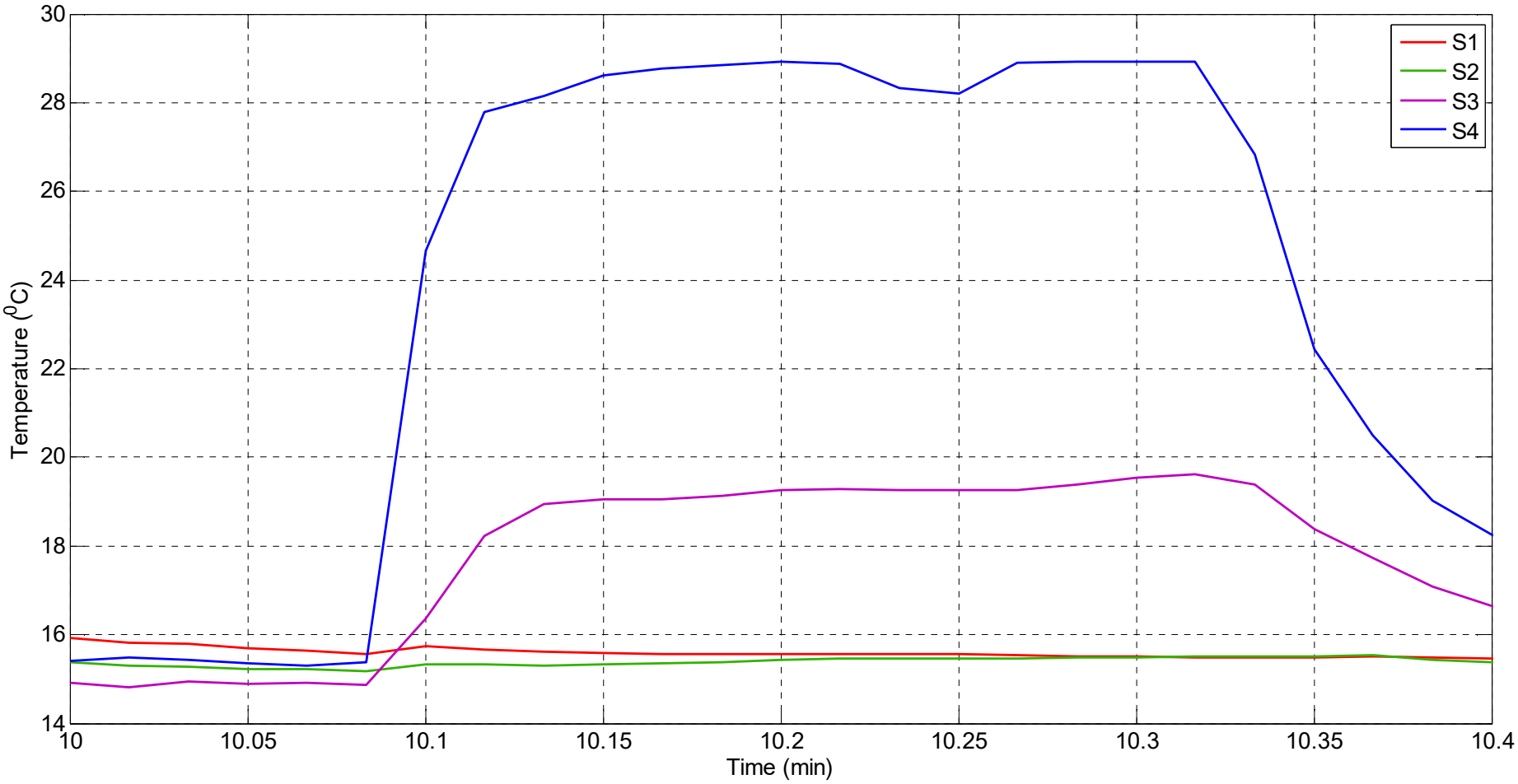
Resolution of measurements



Resolution: Large variations



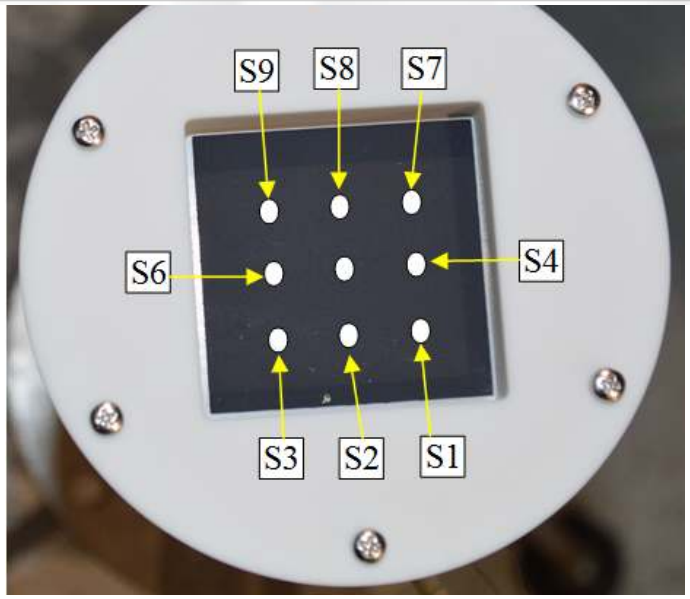
Resolution: Small variations



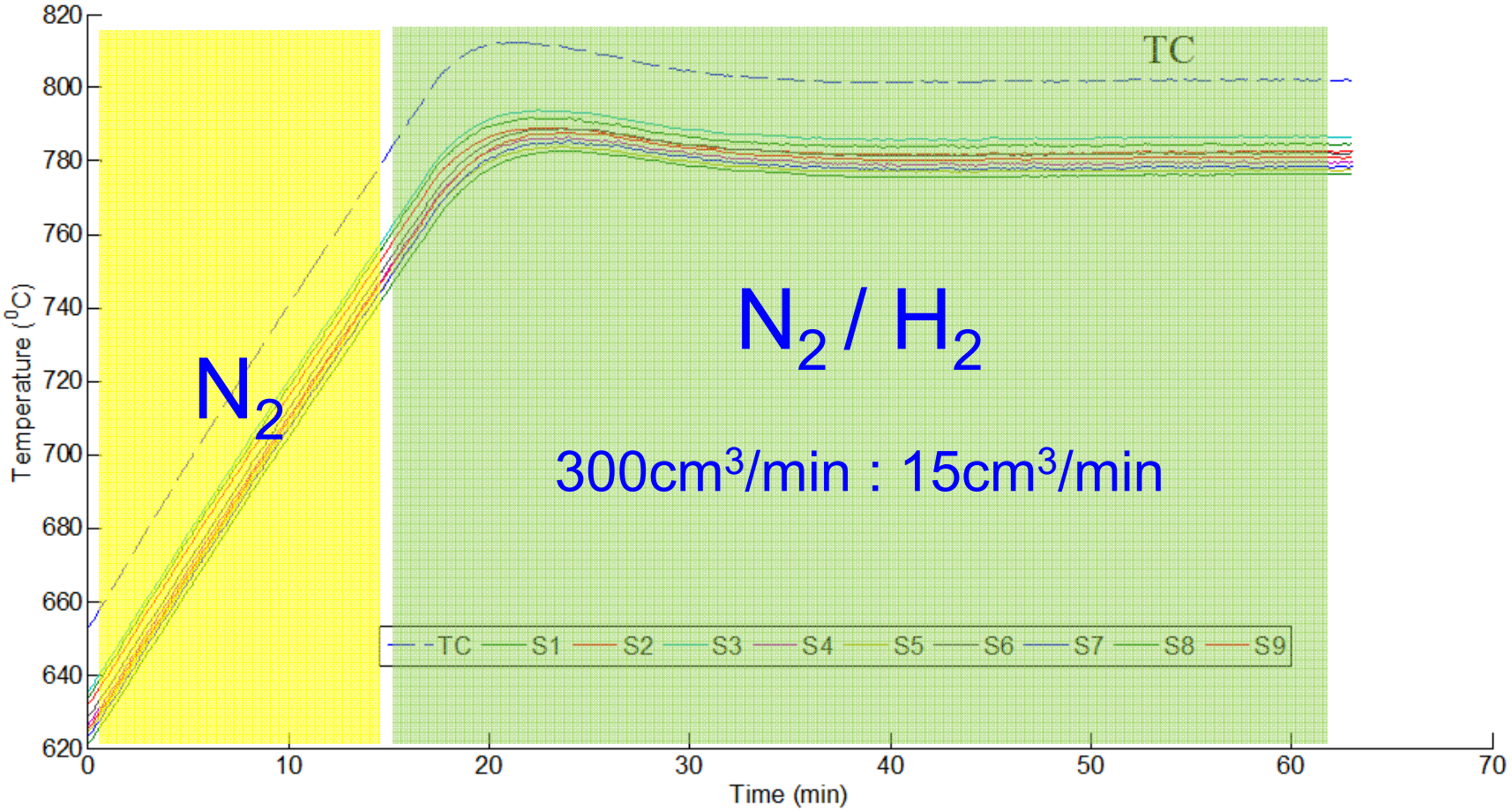
Application in SOFC

SOFC test rig

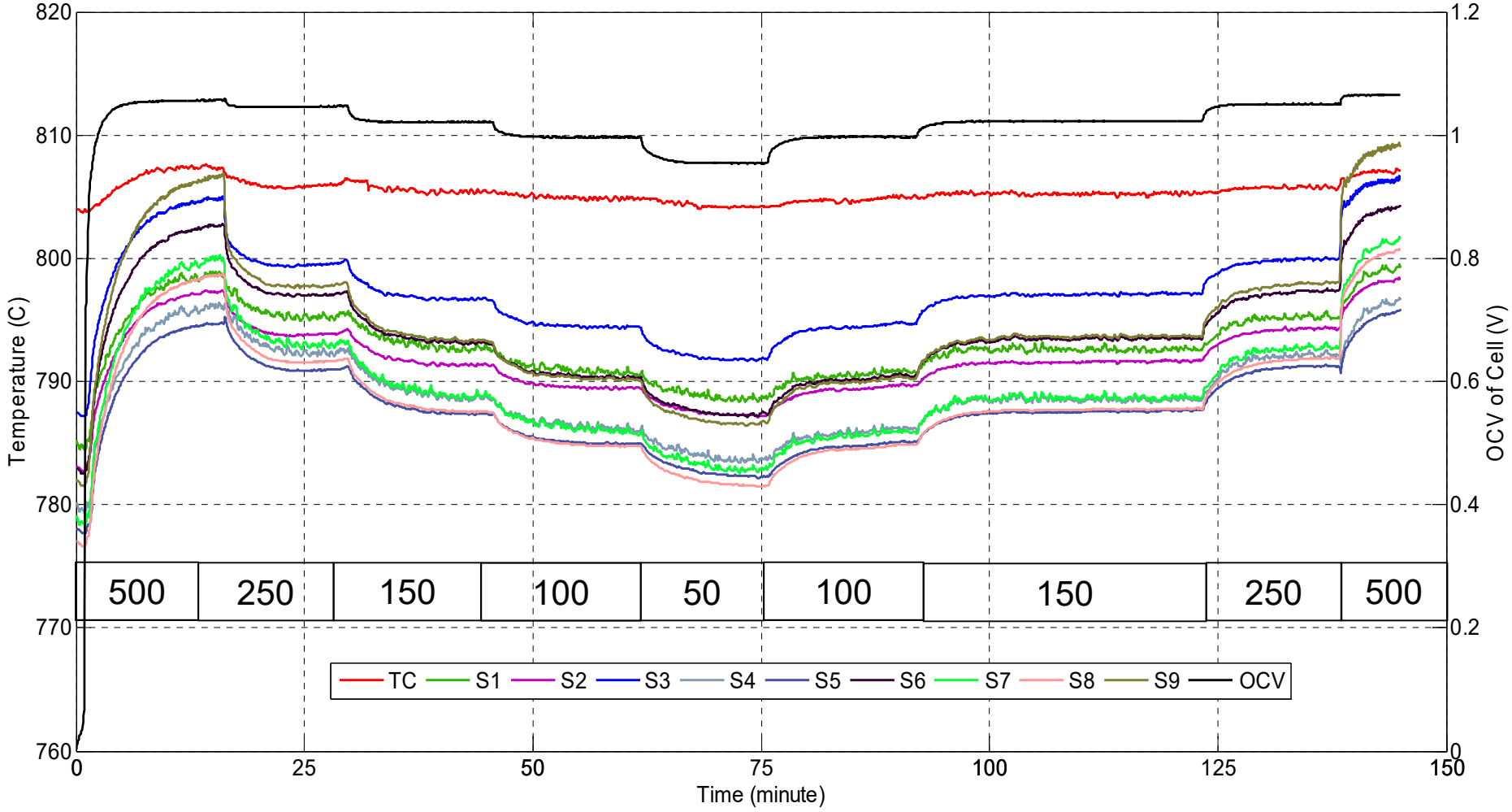
5cm x 5cm NextCell™



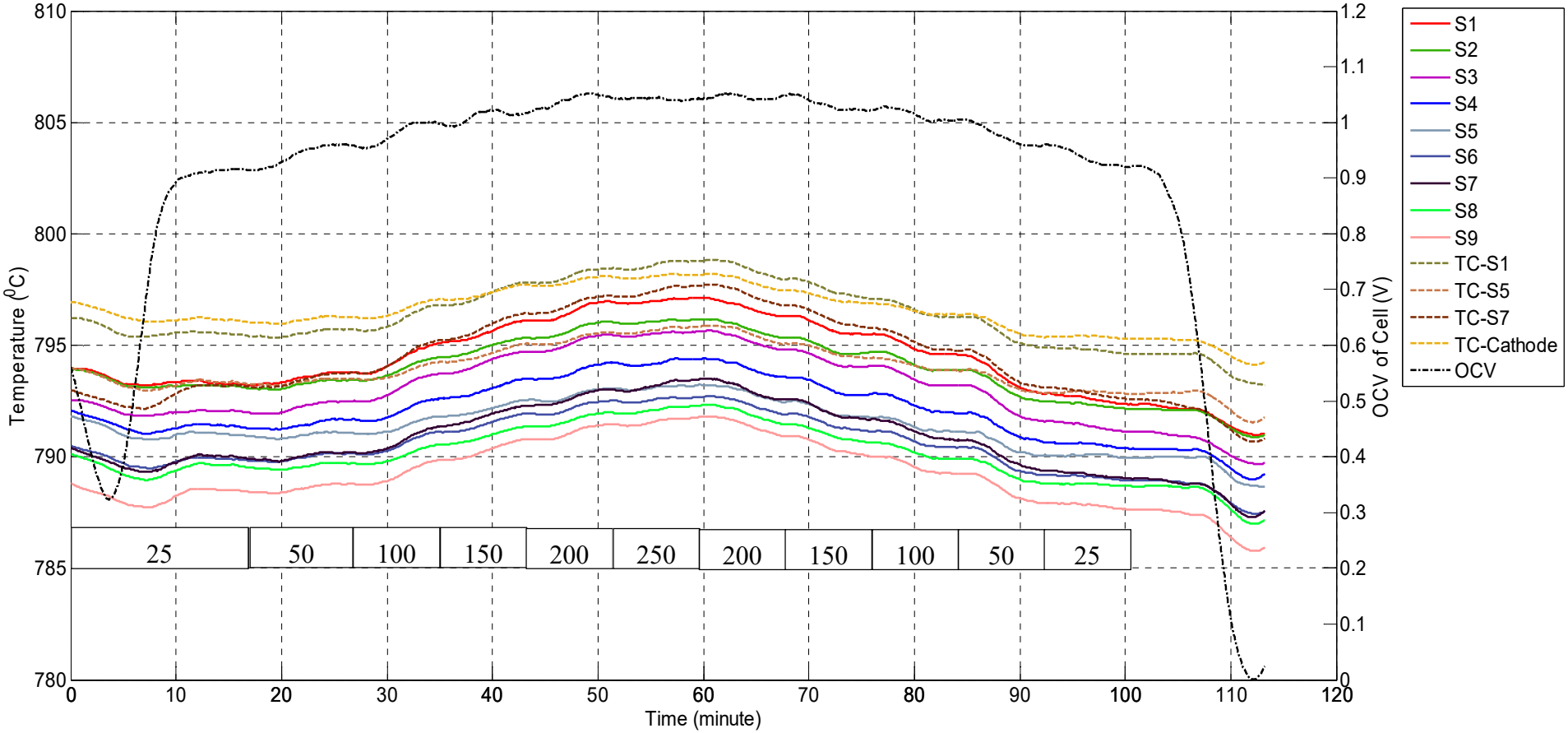
Anode Reduction



Cell operation: 1



Cell operation: 2



Conclusions

- The THERMONO concept works well
- Surface temperature measurements reveal better details on temperature evolution on cell surface

Future Works

- Apply THERMONO into short stacks and test under different operating conditions

Loughborough University

EPSRC

Pioneering research and skills

Q / A

Comparison with NIST standards