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



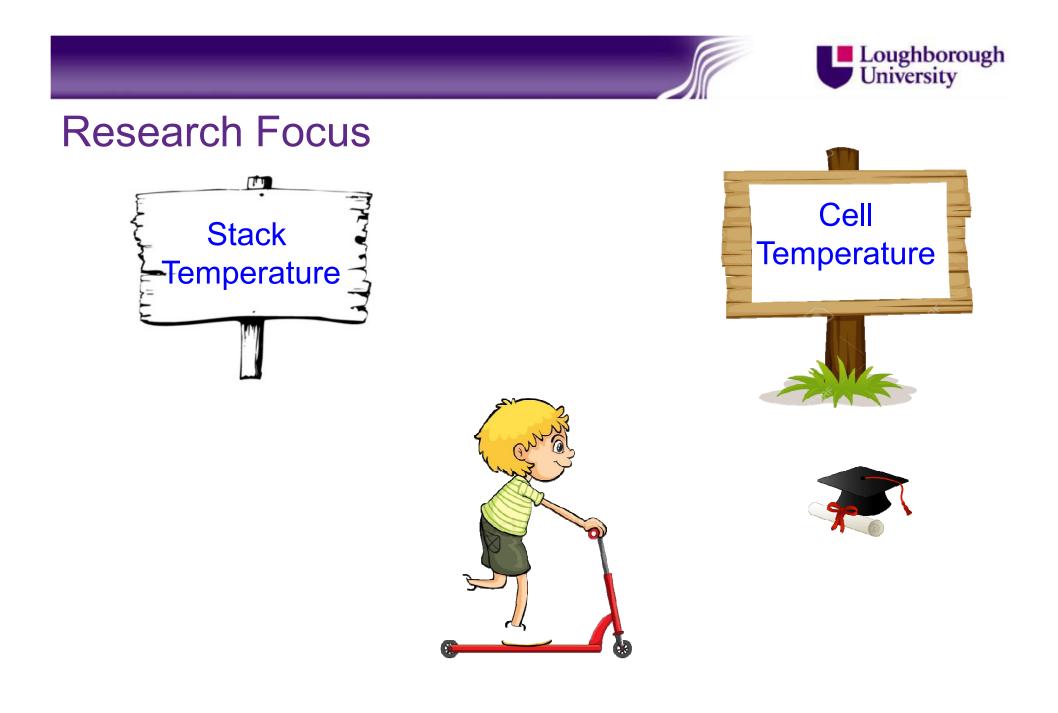


Research Focus

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



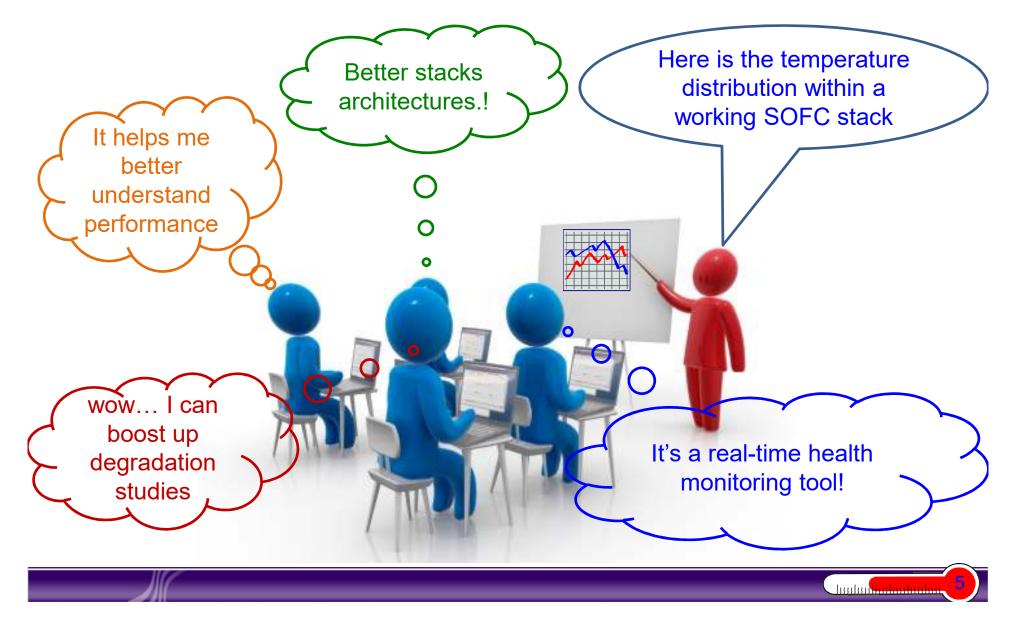








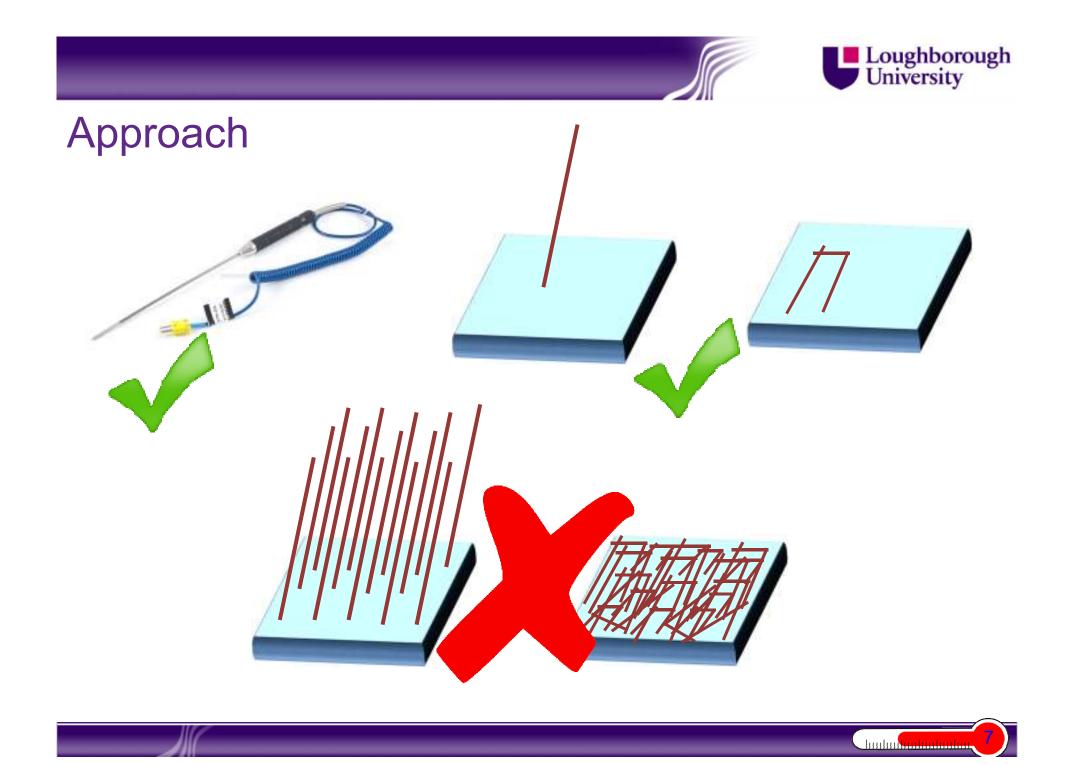
Introduction & research focus

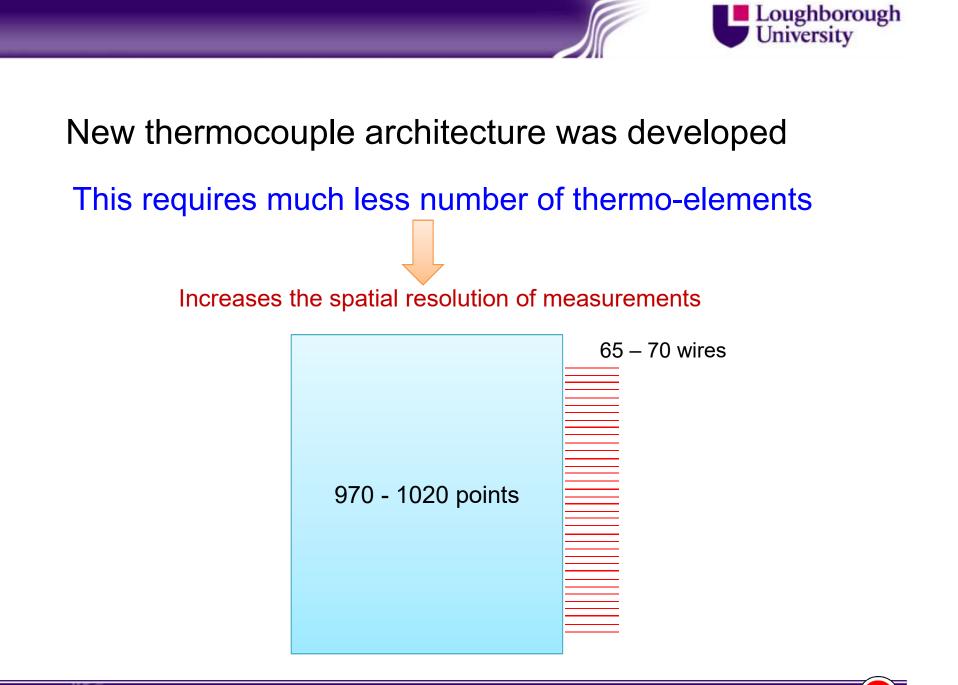




Research Approach

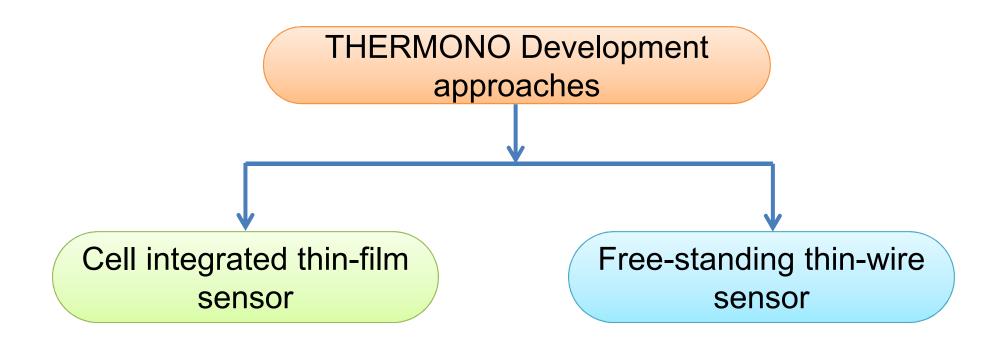








We named this sensor as THERMONO







Sensor development and testing

(tested with Alumel and Chromel wires of Φ 0.5mm and Φ 0.25mm)





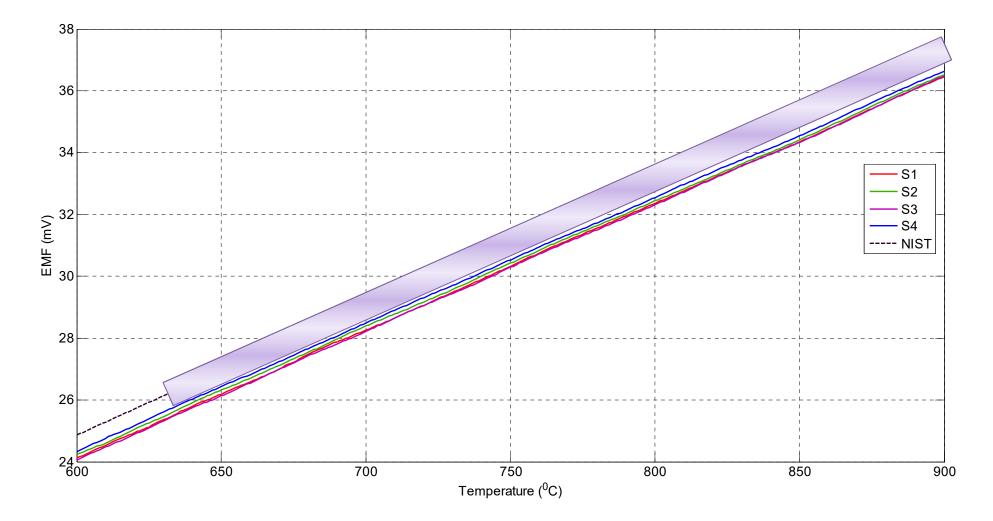


General Performance comparison 12 points with 7 wires 900 800 - TC 700 · S1 S2 S3 600 S4 Temperature (C) S5 - S6 500 - S7 - S8 S9 400 S10 S11 S12 300 200 100 0^L 12 22 2 10 14 16 18 20 4 6 8 Time (hours)

Landson Sundan Internations



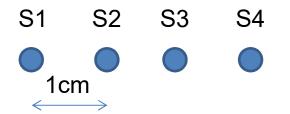
Comparison with international standards







Resolution of measurements

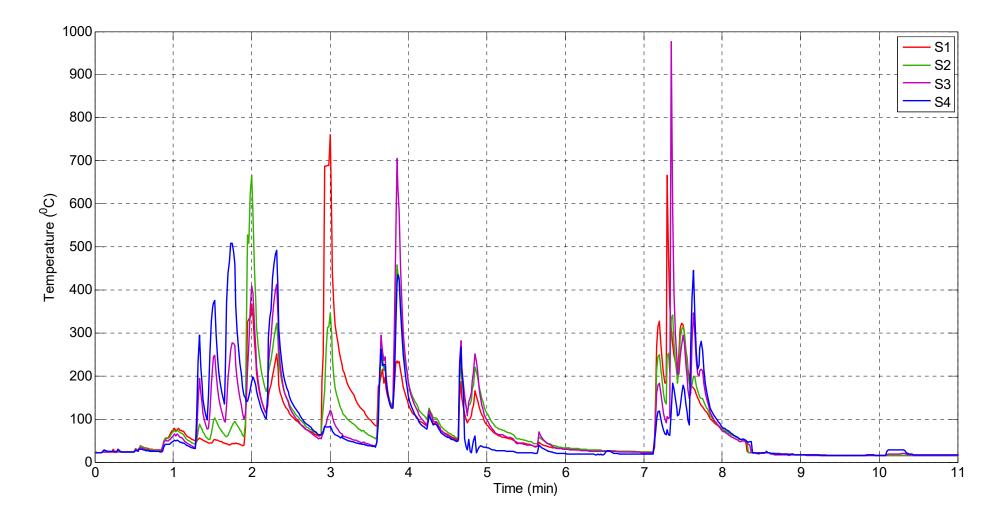








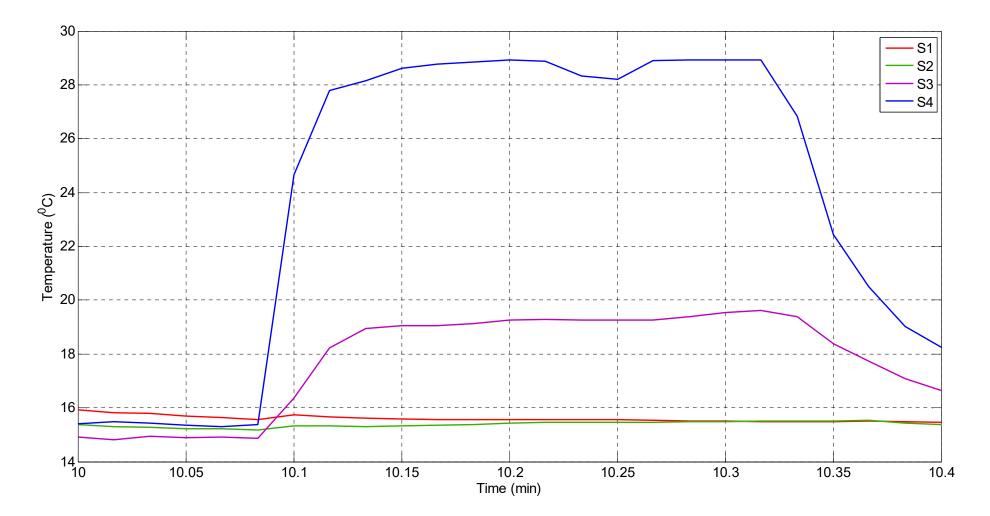
Resolution: Large variations







Resolution: Small variations







Application in SOFC



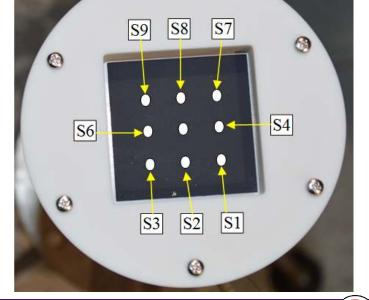
SOFC test rig

Cell Performance Tes



5cm x 5cm NextCell[™]

Data recording settings	Management a	And shares a	1493	
Data file to store results (als)	Recording interval	Temperature Correct Voltage	1-V	1 - MAR - 232 - A AM
Create Data File		700-		Plot0
Configure DAQ parameters Configure DAQ Configure DAQ Current Violage Resistance	05 Seconds Minutes	601- 307- 302- 432- 302- 302-		
Display settings		202-		
Max. Temp Max. Current (mA) Max. Vo 400 500 600 400 500 600 1.5	tage (V)	100-		
i) i) ii		0+, 4246	Time	52/09
CMSersitimen/Desktop/EXP- 128-13 unction VOtrageda	1000 - 900 - 800 - 700 - 500 -	Current (mA)	Voltage (V) 8.35 0.5 0.75 1 1.25 1.5 8	1.75 2
Message(s) Data is being recorded	400 - 300 -	-0.630050 Temperature Sensor outpu	-0.00147191	
rogram Execution	200 - 100 -	0 682.16 681.452 686.230		
	-1-			

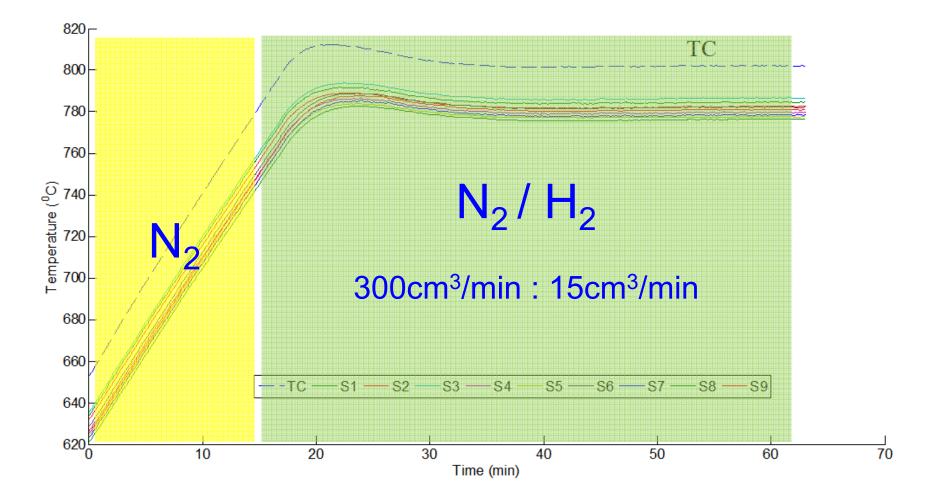


(Janadasa)

265



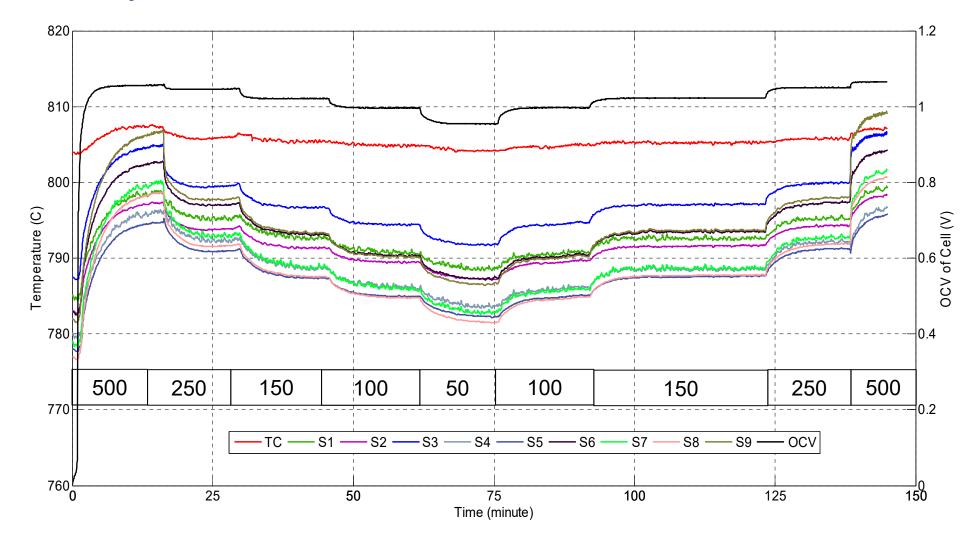
Anode Reduction







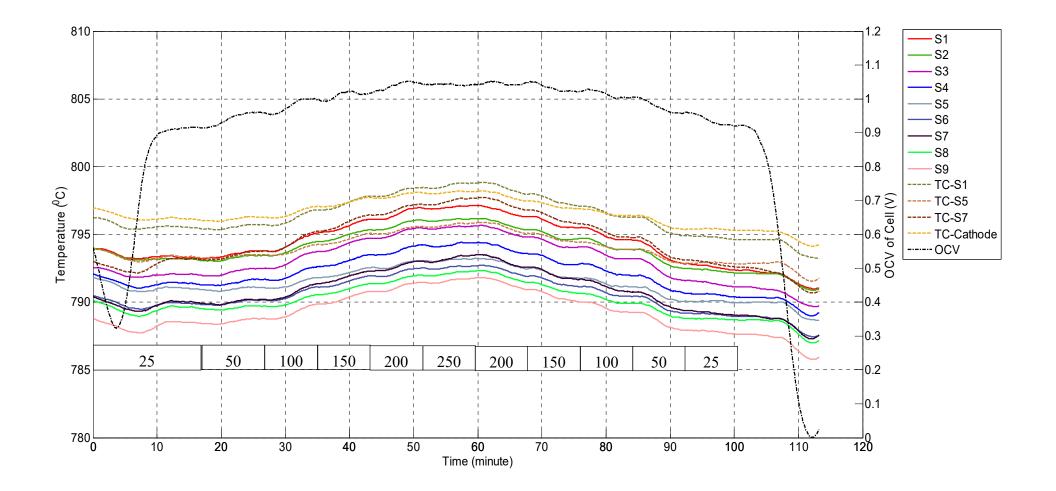
Cell operation: 1







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







Q/A







Comparison with NIST standards

