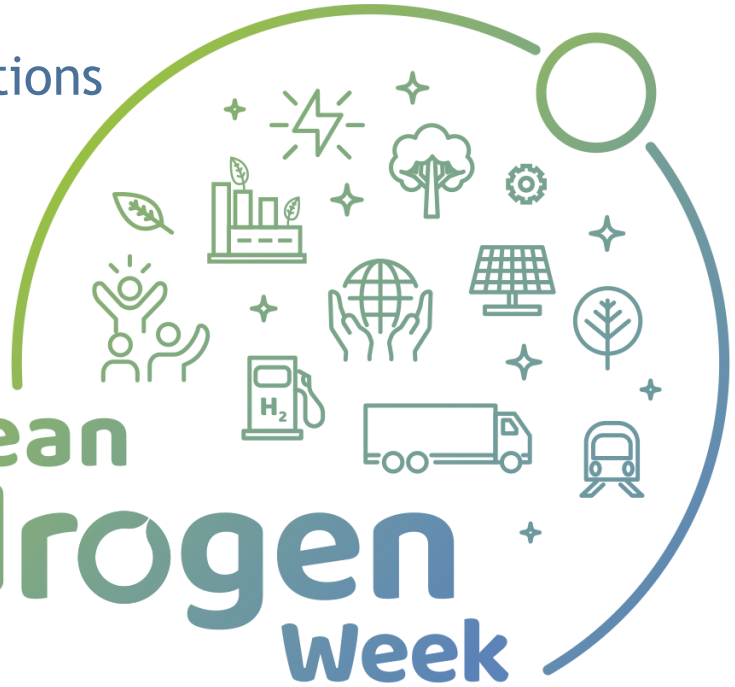
LOWCOST-IC

Low Cost Interconnects with highly improved Contact Strength for SOC Applications



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Project Overview

- Call year: 2018
- Call topic: H2020-JTI-FCH-2018-1 FCH-02-6-2018 - Cost-effective novel architectures of interconnects
- Project dates: 01/2019- 09/2022
- % stage of implementation 01/11/2019: 100 %
- Total project budget: 2,335,998 €]
- Clean Hydrogen Partnership max. contribution: 2,335,998 €
- Other financial contribution: 0 €
- Partners (10): DANMARKS TEKNISKE UNIVERSITET, APERAM STAINLESS FRANCE SA, AVL LIST GMBH, BORIT NV, CHALMERS TEKNISKA HOGSKOLA AB, FORSCHUNGSZENTRUM JULICH GMBH, AKTIEBOLAGET SANDVIK MATERIALSTECHONOLOGY, SOLIDPOWER SPA, SUNFIRE GMBH, TECNO ITALIA SRL

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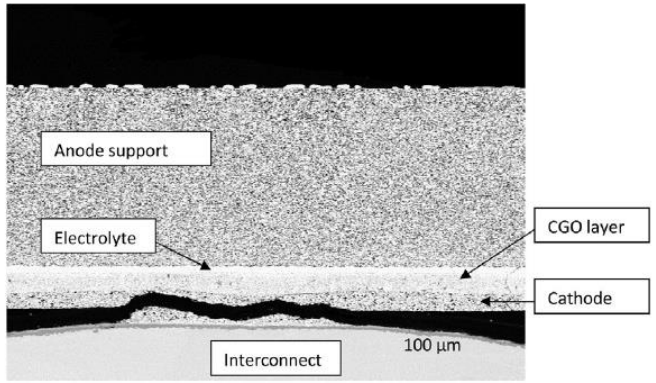
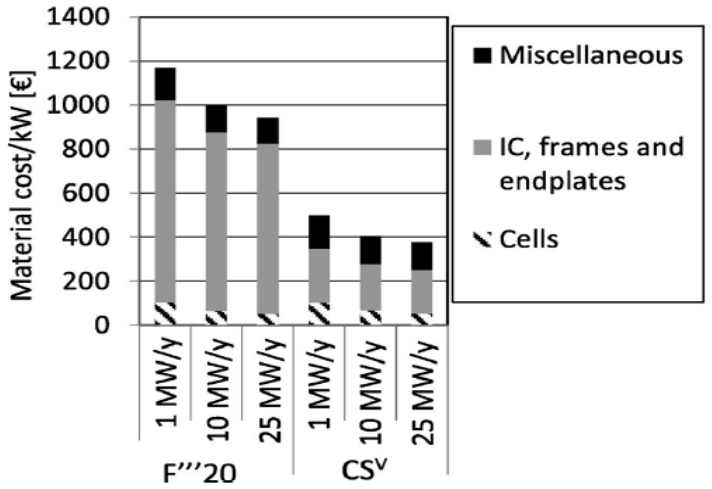
Project Summary



Main Objective : Decreasing cost of steel interconnects for SOFC and SOEC

- Increasing the robustness and thus lifetime of the stacks
  - Increasing strength of cell and interconnect interface by >200 %

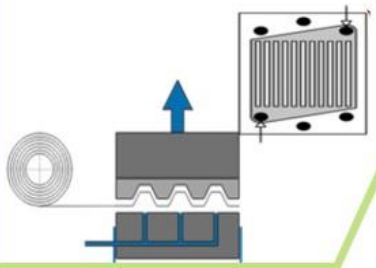
- Minimizing the interconnect development and production costs
  - 80 % cost reduction (target <5€ for IC coating and shaping)



https://doi.org/10.1016/j.ijhydene.2020.01.082

European Hydrogen Week

Concept + consortium

Raw materials	Coating	Design + Shaping	Contact layer application	Implementation + Testing
aperam	SANDVIK	borit®	TECNO ITALIA®	sunfire / SOLID POWER
				

Testing and evaluation

CHALMERS	JÜLICH FORSCHUNGSZENTRUM	DTU Technical University of Denmark	AVL
Coating research	Interconnect design	Contact layer	Cost analysis

High adhesion contact - Aspects (1/2)

Achievement to-date

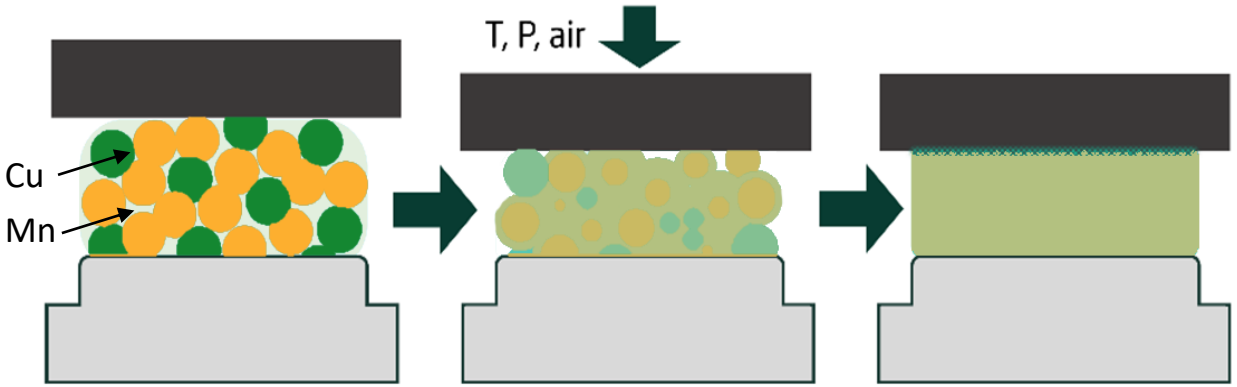
Fracture toughness (target + 300 %increase)

1 J/m²

3 J/m² +300 %

25% 50% 75%

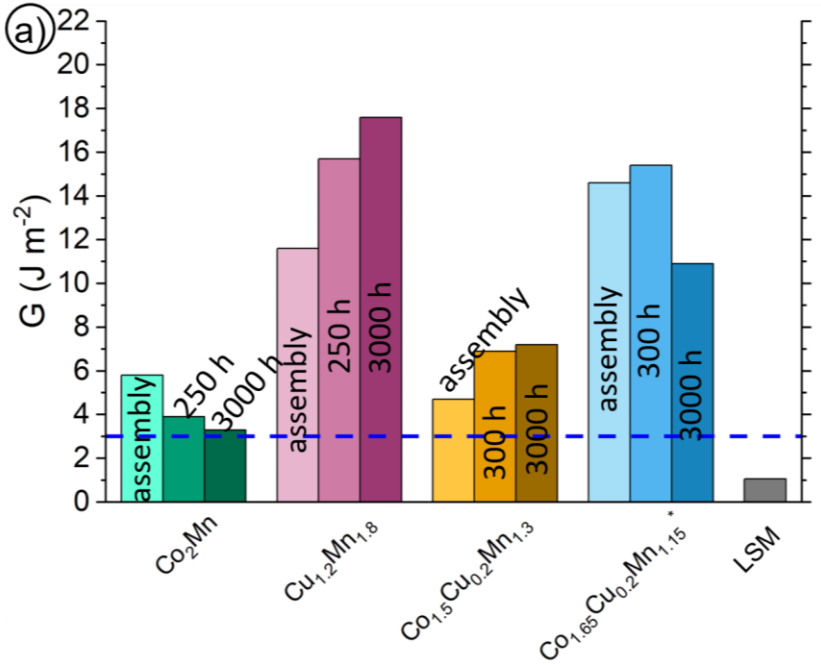
Reactive oxidative bonding



Metal particles + binder

Oxidation and reaction

Homogenization

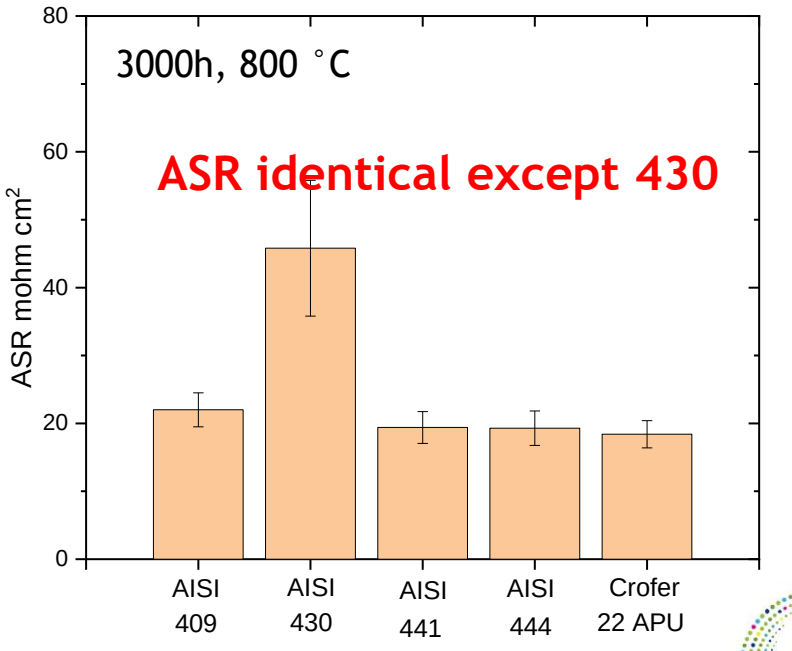


Low cost steels and coatings - Aspects (2/2)

Achievement to-date

-80 % cost (< 5€ per unit)

25% 50% 75%

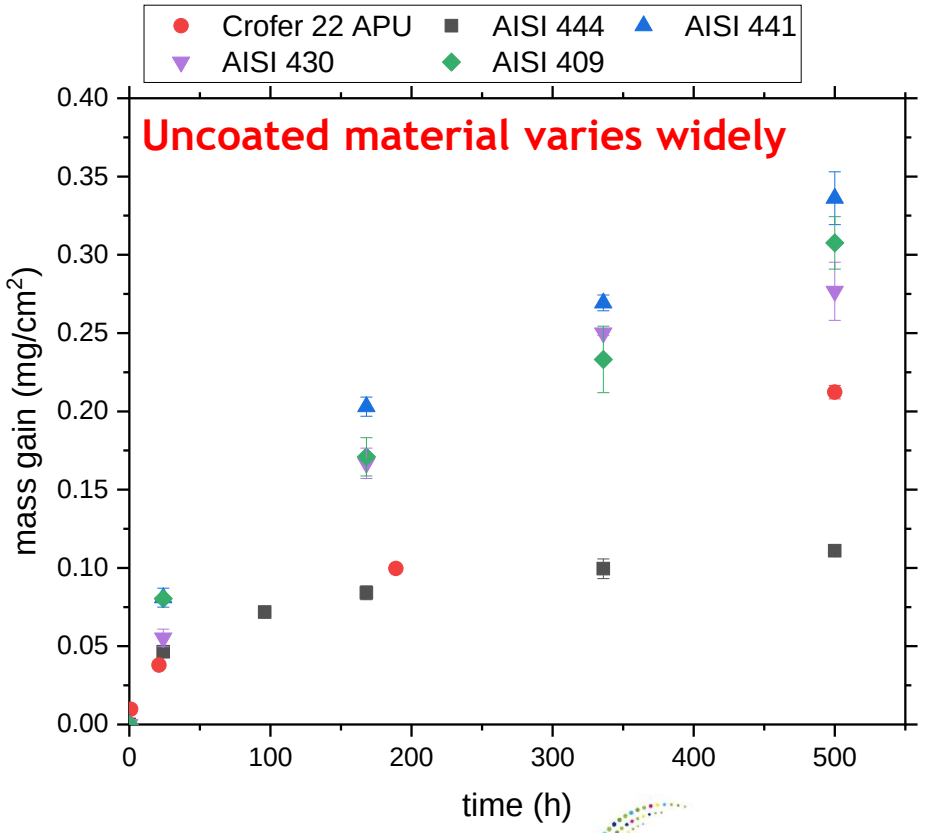


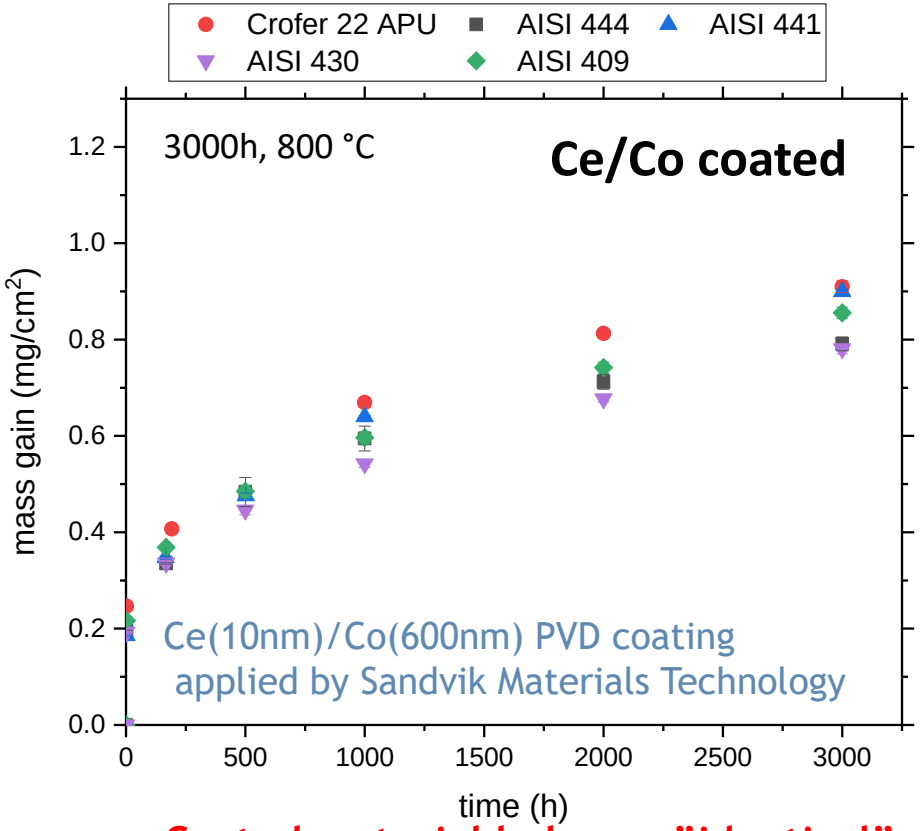
Ce(10nm)/Co(600nm) PVD coating applied by Sandvik Materials Technology

Steels	AISI 409	AISI 430	AISI 441	AISI 444	Crofer 22
Cr wt%	11.4	16.1	17.4	19.2	22.9

Low cost steels and coatings - Aspects (2/2)

Area Specific Resistance (coated vs. uncoated material)





Coated material behaves ”identical”

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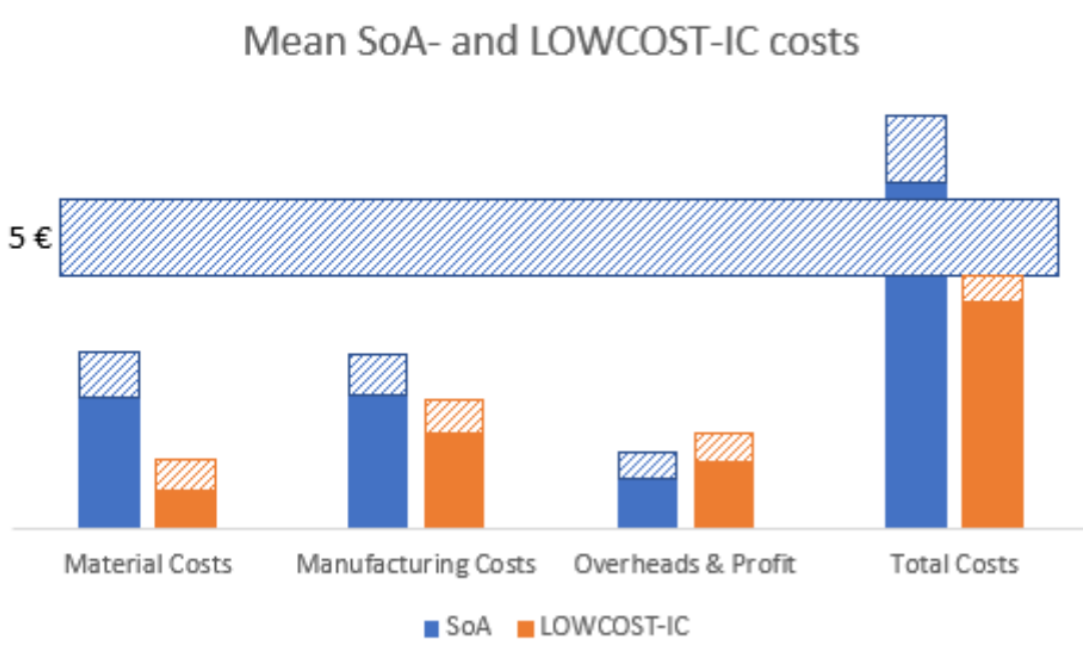
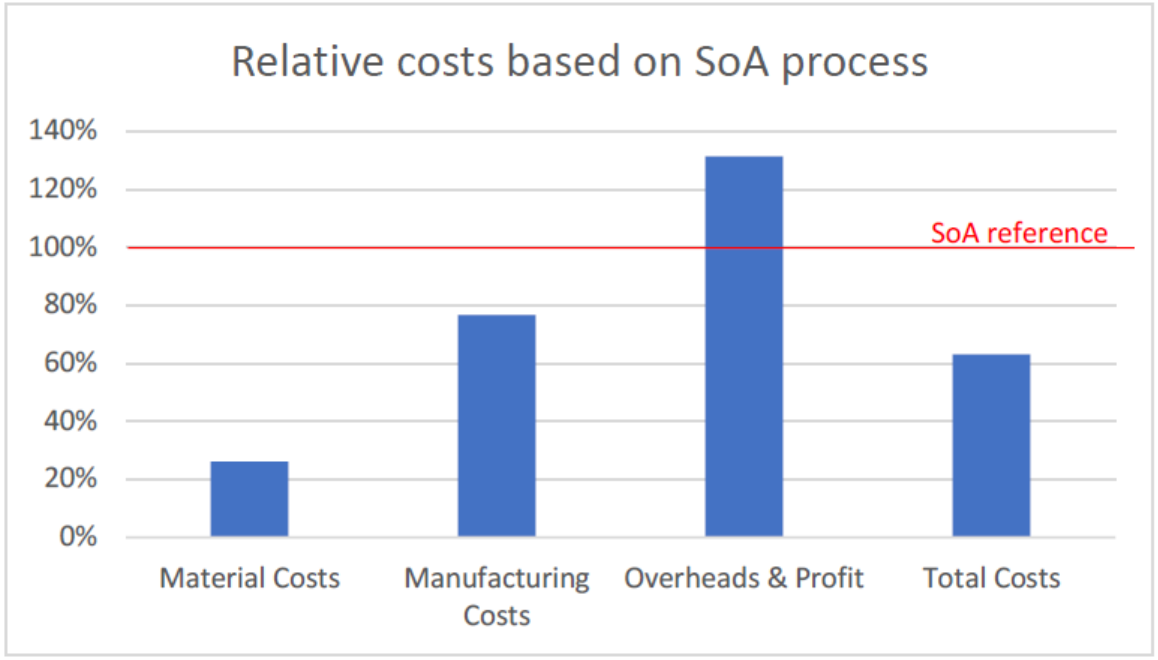
Low cost steels and coatings - Aspects (2/2)





Mean relative material-, manufacturing-, overhead- and total costs compared to the SoA processing route. Scale: ICs for 50 MW/a electricity production.

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Risks, Challenges and Lessons Learned

Implementation of new findings in the production line takes time and patience (remember: the existing process may took years of development) → align expectations

Cheap steels + effective coating have huge potential to decrease SOC manufacturing costs! More PoC field test would be the next step

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Exploitation Plan/Expected Impact

Exploitation

- Cost effective alloy+ coatings for SOFC/SOEC interconnects. Will be advertised by two European steel manufactures
- “Contact solution” for reactive oxidative bonding - 3 potential European suppliers for distribution contacted

Impact

- Cheaper manufacturing costs
- Longer lifetime and increased robustness of SOC technology

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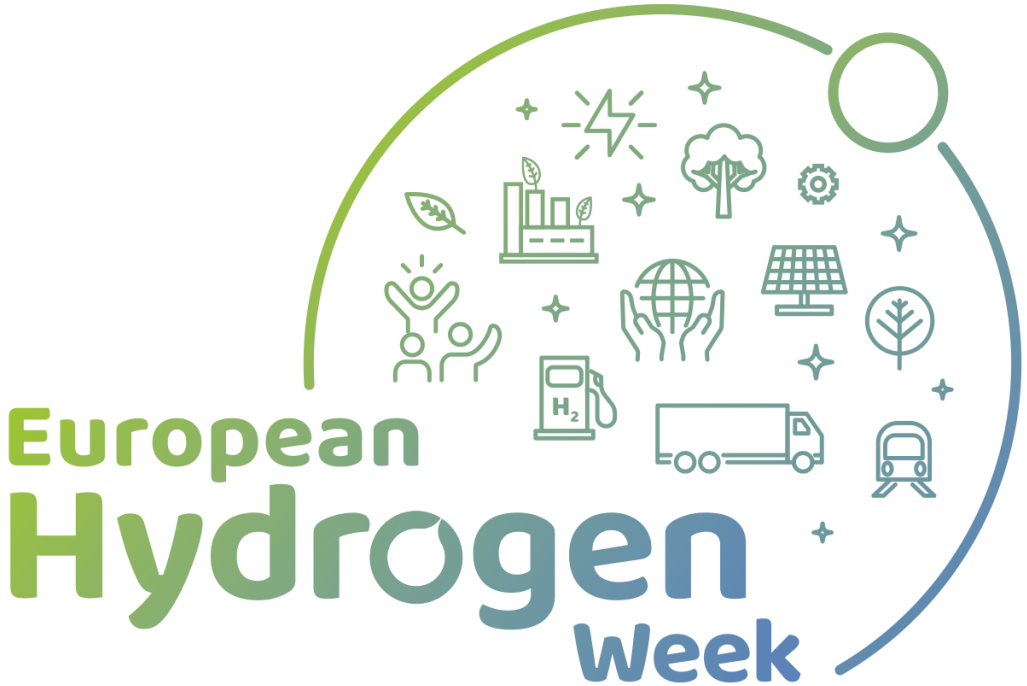

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