STAMPEM

(GA #303449)

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SINTEF

General overview

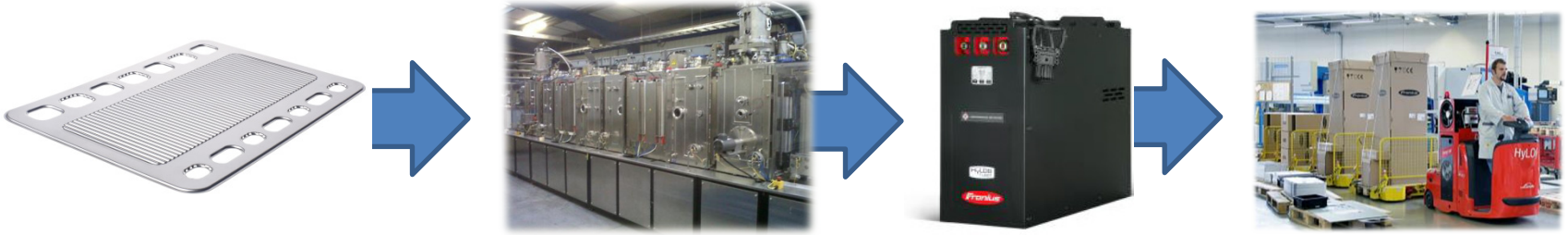
- STAble and low cost Manufactured bipolar plates for PEM Fuel Cells
- July 1st 2012 to June 30th 2015, 36 months
- Total Budget € 5 223 807, FCH JU contribution € 2 576 505
  Research Council of Norway ~€ 210 000 (to SINTEF)
- Partners:
  - SINTEF (Norway)
  - Teer Coatings Ltd, Miba Coatings Group (United Kingdom)
  - ElringKlinger AG (Germany)
  - Fraunhofer ISE (Germany)
  - University of Birmingham (United Kingdom)
  - Fronius International GmbH (Austria)

SINTEF Innovation in Motion Miba elringklinger Fraunhofer ISE UNIVERSITY OF BIRMINGHAM Fronius

Project objectives and targets - AIP/MAIP

The main objective of STAMPEM is to develop durable coating materials for metal based bipolar plates, that can be mass produced for less than 2.5 € /kW of rated stack power at mass production volumes of 500 000 pieces annually.

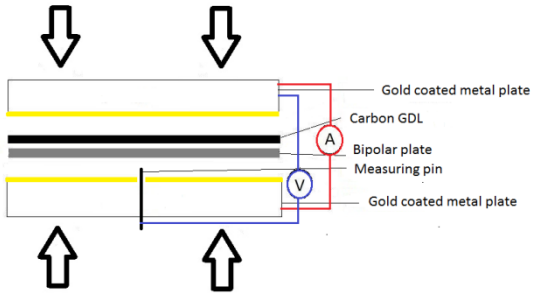
*Contributes to reaching the goals set within Application Area 1: Transportation & Refueling Infrastructure, by **reducing the cost** and **enhancing the stability** of the bipolar plates.*

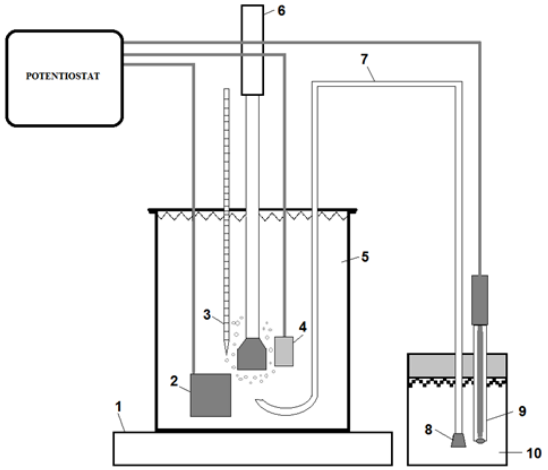


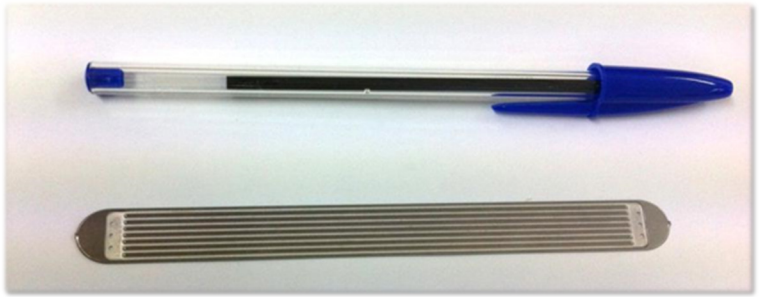
Project main technical targets

After extrapolated 10 000 hours from AST single cell testing:

- Contact resistance < 25 mohm cm^2
- Corrosion resistance < 10 µA/cm^2



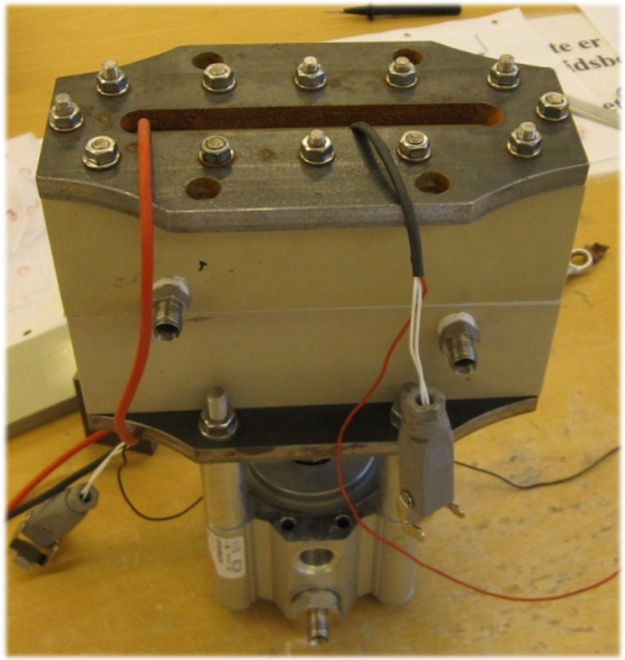




In-situ AST protocol

Accelerated BPP/coating degradation:

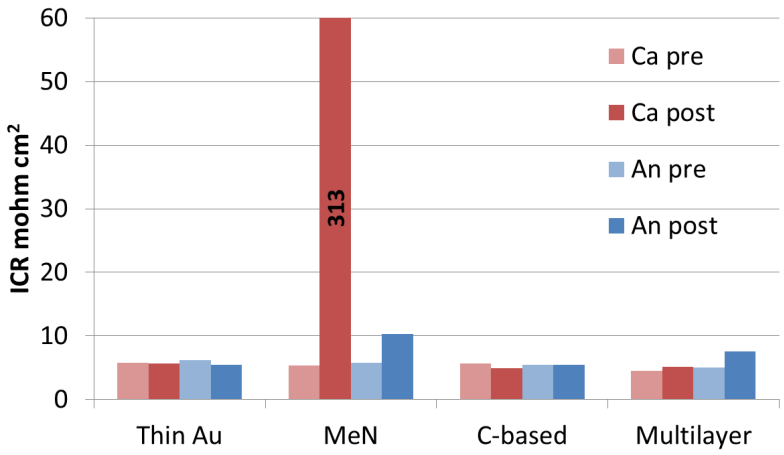
- 75˚C and 100%rH hum
- MEA conditioning: 0.4 – 0.7 V cycling
- Cycling 0.4V – OCV,
  20 min each for 100 hours
- Measure ICR before and after
- Ion analysis of water and MEA/GDL



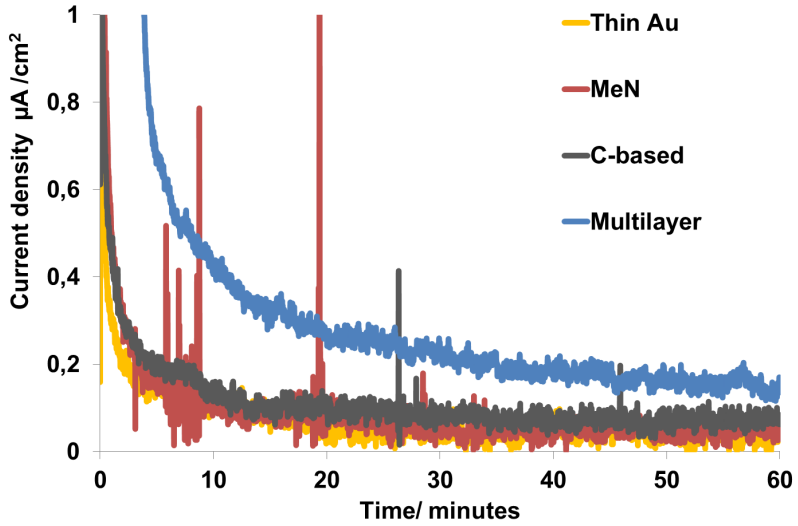
Project Achievements I: ICR and corrosion

ICR at 150 N/cm^2 before and after in-situ fuel cell AST.

Corrosion currents at 0.8 V $_{SHE}$ 1 mM H_2SO_4 80^{o}C



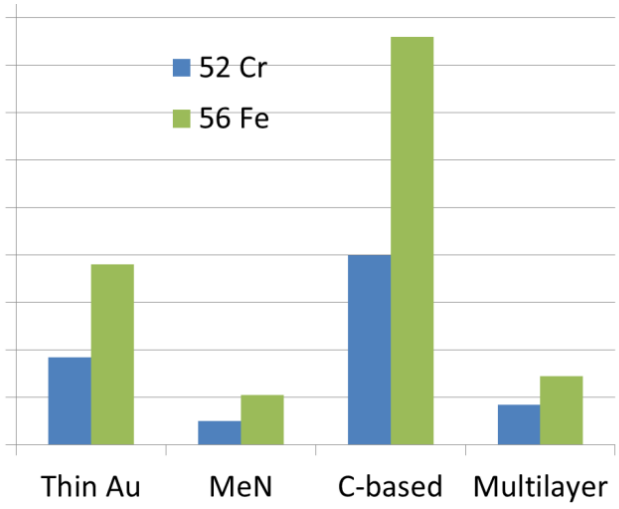
< 25 mohm cm^2



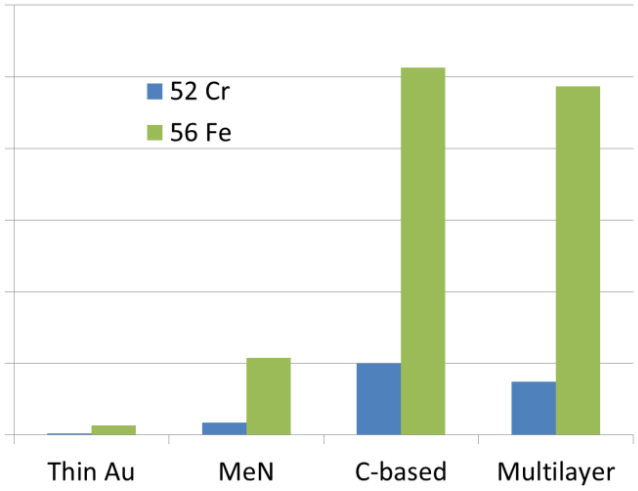
<10 µA/cm^2

Project Achievements II: Ion release

MEA/GDL



Anode effluent water



Evaluation of the progress towards the overall project objectives

AIP Specific Objectives/Expected Output per Topic/Call addressed by the project	Project Objectives & Targets	Timing (% of project duration passed)	Project Achievements - Current Status	Project Achievements - Expectation at the end of the project
Contact resistance < 25 mohm cm^2 at relevant clamping pressures	< 25 mohm cm^2 after 10 000 hours extrapolated from AST	45%	< 10 mohm cm^2 at BoL and after 100 hours in-situ AST	< 25 mohm cm^2 after 10 000 hours extrapolated from AST
Corrosion resistance < 10 µA/cm^2	< 10 µA/cm^2 after 10 000 hours extrapolated from AST	45%	< 1 µA/cm^2 in 1 mM H2SO4 at 0.8 VSHE and 80 °C at BoL	< 10 µA/cm^2 after 10 000 hours extrapolated from AST
Corrosion stability > 5,000 h	10 000 hours extrapolated from AST	45%	N/A (test not finalized)	10 000 hours extrapolated from AST
Costs (excluding taxes and levies) < 2.5 € /kW at 500,000 pieces annually	< 2.5 € /kW at 500,000 pieces annually	45%	N/A (test not finalized)	< 2.5 € /kW at 500,000 pieces annually

Bottlenecks and risks

1. Development of a coating (alternative to gold) which withstands the stamping process

   => Major cost reduction compared to the post-coating process

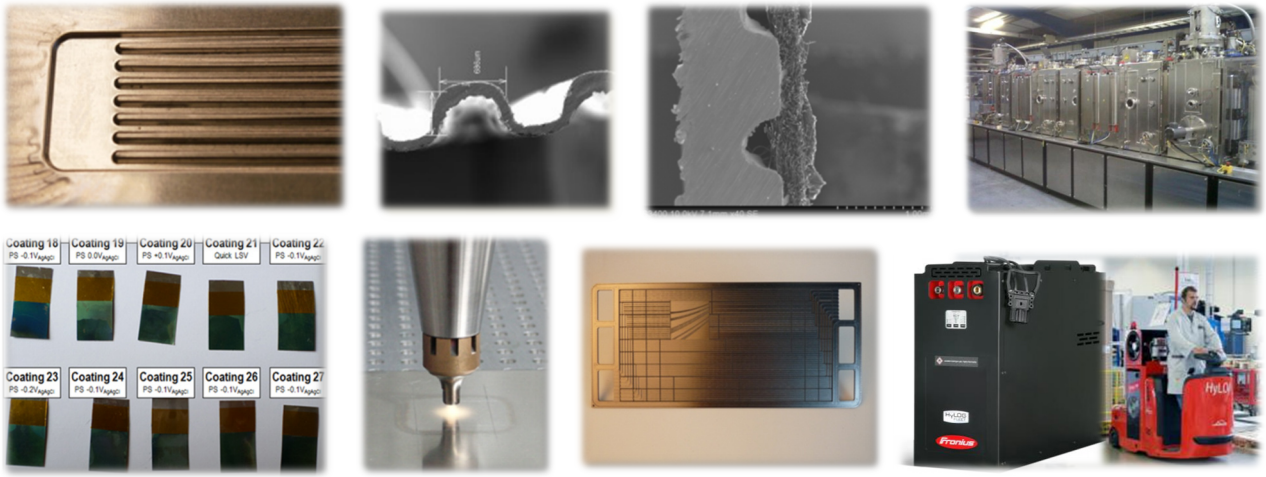
2. Long term testing and verification

   => Cannot be sure about durability without in-situ operation

   => Real life operation vs. AST

Activities beyond coating development

- Stamping - pre-coated vs pre-formed, …
- Processing - cleaning, coating, quality control, …
- Testing - ex-situ, in-situ, segmented, AST, …
- Verifying - full size cells, stacks and systems



Further information

- Cross-cutting and Dissemination Activities
  - Contributing to further development of test protocols by applying, investigating and improving existing (AST) protocols for BPP
  - 4 presentations at conferences/workshops so far, one publication to be submitted
  - Open workshop to be organized at the end of the project
- Exploitation and Post-Project Activities
  - Techno-economical assessment
  - Validation/operation of BPPs in systems continues post project life
- Recommendations towards the FCH JU Programme
  - Verification and understanding of degradation in existing materials

Thank you,
and

- Project partners
- SINTEF colleagues
- FCH JU
- RCN

Questions?