

STable and low cost Manufactured bipolar plates for PEM Fuel Cells - STAMPEM (GA #303449)

Anders Ødegård
SINTEF

www.stampem.eu



PROJECT OVERVIEW

- Call topic: SP1-JTI-FCH.2011.1.7
- Application Area Transportation & Refuelling Infrastructure
- July 1st 2012 to June 30th 2015
- Total Budget € 5 223 807
FCH JU contribution € 2 576 505
Research Council of Norway ~€ 400 000 (SINTEF)
- Project objective:
"Develop durable coating materials for PEMFC metal based bipolar plates"
- Project ended June 30th 2015

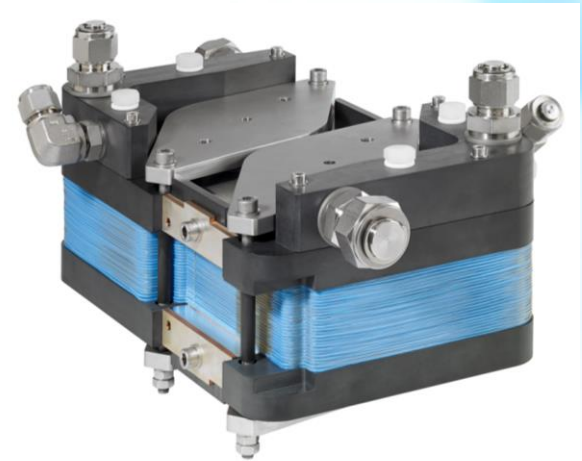
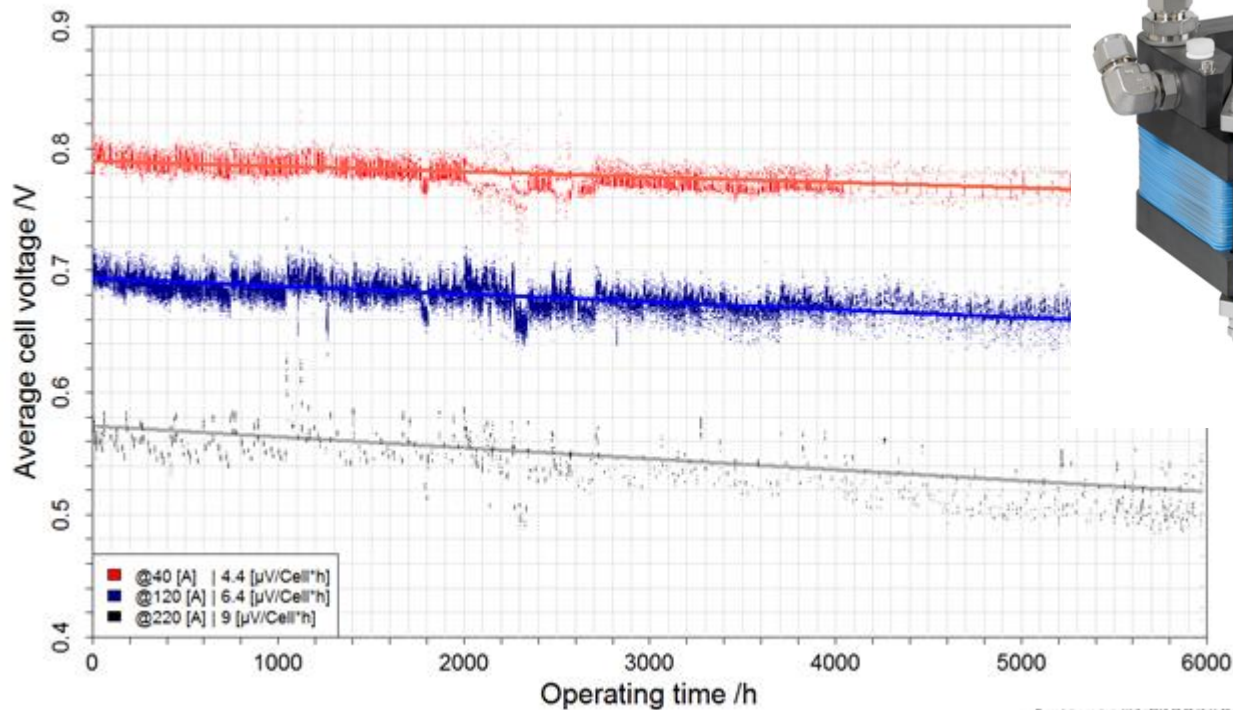


PROJECT TARGETS AND ACHIEVEMENTS

Programme objective/target	Project objective/target	Project achievements to-date	Expected final achievement
MAIP			
Corrosion stability > 5,000 h	10 000 hours extrapolated from AST	> 6000 hours => no sign of corr. problems	Corrosion currently not an issue
Costs (excl. tax) < 2.5 € /kW at 500,000 p a	< 2.5 € /kW	~ 5 € /kW @ automotive conditions	~ 5 € /kW @ automotive conditions
AIP			
ICR < 25 mΩ cm ² at rel. clamping pressures	< 25 mΩ cm ² after 10 000 h extrapolated AST	~ 25 mΩ cm ² after 1000 h and 100 h AST	~ 25 mΩ cm ² after 1000 h and 100 h AST
Corrosion resistance < 10 μA/cm ²	< 10 μA/cm ² after 10 000 h extra- polated from AST	No visible corrosion after in- situ testing	No visible corrosion after in- situ testing

PROJECT TARGETS AND ACHIEVEMENTS

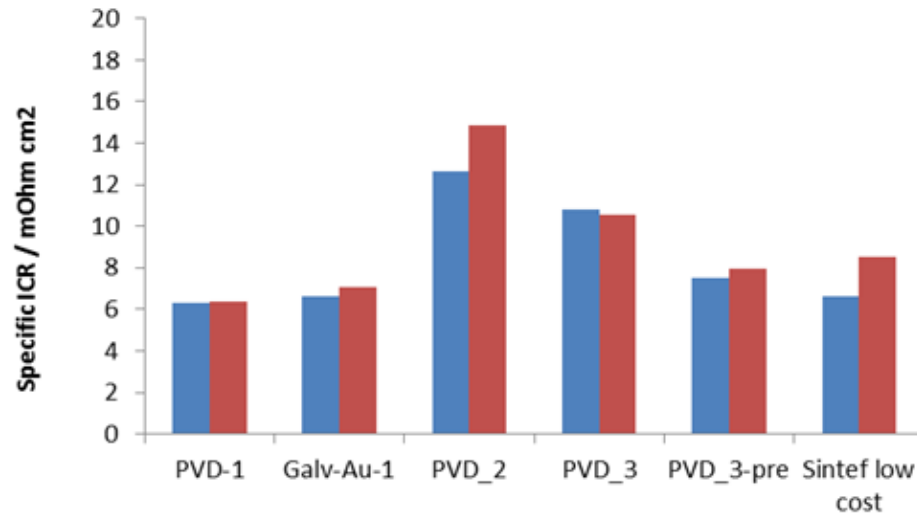
- Proven durability of PEMFC stack with metal BPPs
 - less than 10 $\mu\text{V}/\text{h}$ and no sign of impact of corrosion products



© ElringKlinger AG

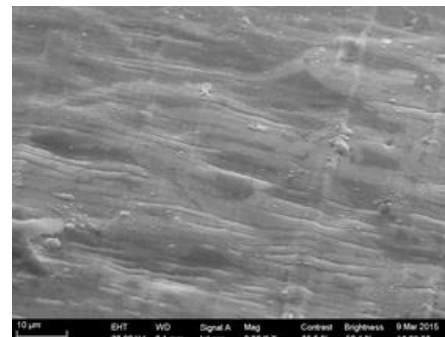
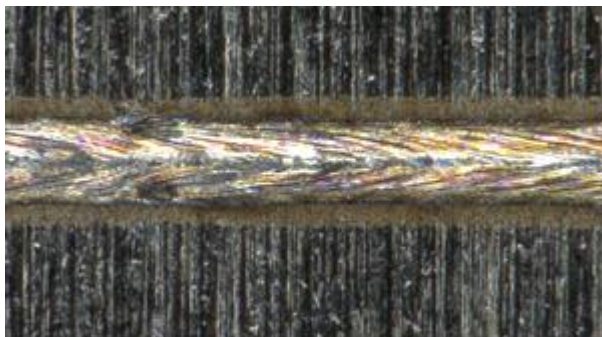
PROJECT TARGETS AND ACHIEVEMENTS

- Several potential good coating candidates



Specific ICR @ 166 N cm⁻², before and after AST.

- Improved understanding of test procedures and process parameters on coating and BPP properties



Photos from welding and stamping experiments
© ElringKlinger AG

RISKS AND MITIGATION

- Cost target: < € 2.5/kW at 500,000 pieces annually
- Cost projection of BPPs in a EK metal stack for automotive applications ~5 €/kW at high volumes
- Improvements on coating/material and BPP processing to reach the cost target are possible
- Next steps
 - Active area welding => requires less coating
 - Further develop low cost coating materials and processes



SYNERGIES WITH OTHER PROJECTS AND INITIATIVES

- The Research Council of Norway is funding SINTEF, so that its total funding is the same as in FP7 projects



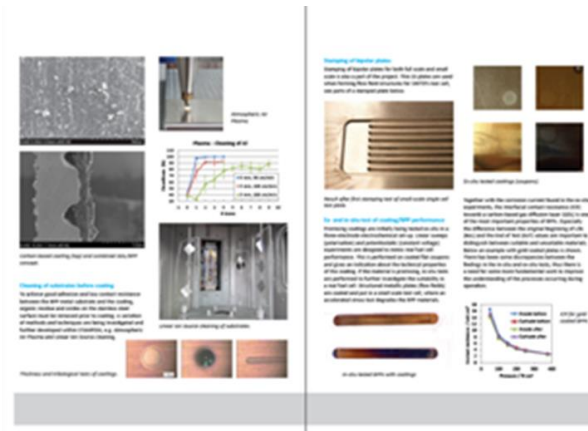
- STAMPEM builds on a range of previous EU/FCH JU projects the partners have been involved in
- Sharing experience and joint workshops with COBRA (other FCH JU PEM BPP project)
- Discussions with other relevant actors e.g. LANL (US) on metal BPPs in general and an open international BPP workshop was held in May 2015

HORIZONTAL ACTIVITIES

- Master-, PhD students and Post docs were involved in the project, both at R&D and industry partners
- Contributed to further development of test protocols by applying, investigating and improving existing test protocols for BPP (ex-situ and AST)
- Dissemination activities, see next slide

DISSEMINATION ACTIVITIES

- Conferences, workshops organised/attended by project
 - More than 20 presentations at conferences/workshops
 - Open, international PEM BPP workshop on May 20th 2015
- Publications, patents arising out of project and its results
 - Two articles published, three more in writing
 - Annual project flyers, public summary, workshop presentations and more available at the project web site



EXPLOITATION PLAN/EXPECTED IMPACT

- New knowledge gained within metal based BPP
 - Improved ex-situ/AST test conditions/more relevant test parameters
 - Possibilities and limitations of ex-situ and small-scale in-situ testing of coating materials
 - Reduced BBP cost with ~50% for current fork lift FC systems
 - For automotive applications still about twice the cost target
- Exploitation/further work
 - Optimization and cost reduction strategies of PVD-coatings and manufacturing
 - Investigation of automation (e.g. handling, cleaning, pre- and post inspection, etc.)
 - Implementation of process improvements/materials in fuel cell business by ElringKlinger, MIBA Teer Coatings Ltd and Fronius