

The COBRA project is supported by the 7th Framework Programme of the European Commission in the context of the Fuel Cells and Hydrogen Joint Undertaking (FCH-JU) public private partnership. It has a budget of €3.8 million over 3 years and the consortium comprises the following 6 organizations:

- Commissariat à l'énergie atomique et aux énergies alternatives (CEA), France
- Borit NV, Belgium
- Impact Coatings AB, Sweden
- SymbioFCCell SA (SFC), France
- IK4-CIDETEC, Spain
- Institut National des Sciences Appliquées de Lyon (INSA Lyon), Université de Lyon, France



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COBRA, consortium of European industrials and scientists, has been initiated to study **new manufacturing methods and coating concepts for metal bipolar plates** and demonstrate their interest for Fuel cell systems in real life conditions.

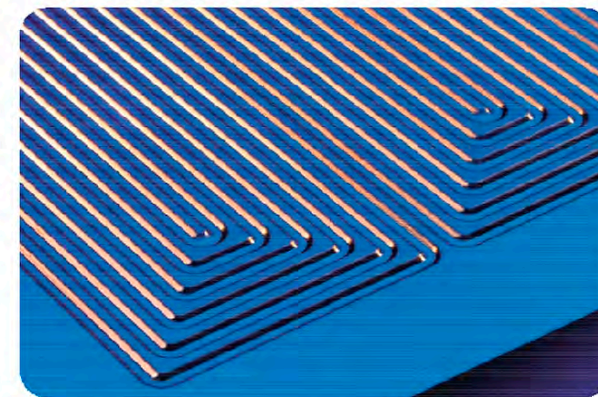
The COBRA project represents a mature approach towards reaching the technical and commercial targets of bipolar plates for automotive stack development based on the FCH-JU 2013 AIP targets.

The **COBRA project is providing the following specific benefits:**

- Bipolar plate specifications based on agreed **OEM system requirements;**
- Performance and durability compatible with the **stringent requirements** of the automotive industry;
- **Post-mortem studies**, phenomena modeling and ageing simulation will be conducted;
- **Development is tested in operating conditions** and verified in detail on component, cell, and stack level by highly skilled research institutes and industrial partners;
- **Marine and Automotive** conditions will be tested on-field with operating fuel cell systems.



Innovative COatings for Bipolar plates



- 2 years status of COBRA Project -

The research leading to these results has received funding from the European Union's Seventh Framework Programme (FP7/2007-2013) for the Fuel Cells and Hydrogen Joint Technology Initiative under grant agreement n° 621193



First year Results

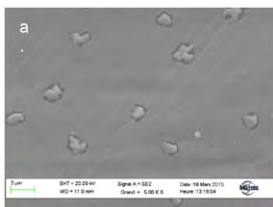
- Complete batch of gold coated **reference bipolar plates** was produced.



- Reference materials were analyzed and dedicated **characterization methods** were developed.
- Field tests were performed in **automotive and marine conditions**.



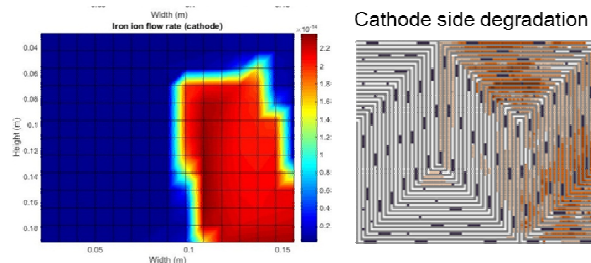
- Post-mortem analysis** were done on aged reference gold coatings.



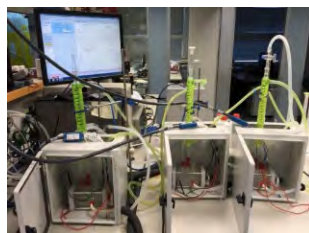
- Points of **improvement of the process** were proposed.
- The release of cationic pollutants from metallic bipolar plates during PEMFC operation were studied.
- In-situ & ex-situ tests** were performed and contamination model was proposed.

Second year Results

- The **development of model** for membrane degradation and correlations with post-mortem observations were done.



- An **ageing test protocol** was also proposed at stack level to evaluate coatings in representative conditions.
- New protective coatings, using 3 different approaches, were developed and studied:
 - ✓ **Application of sol-gel coatings** based on silanes doped with different additives for enhancing their conductivity.
 - ✓ **Gold, Silver and Nickel coatings** obtained by electrodeposition.
 - ✓ **Ceramic MaxPhase™, TiC-based and NbC-based coatings** obtained by PVD.



- 4 promising coatings** were selected to be evaluated in fuel cell conditions.
- Hydroforming** bipolar plates production process was improved

Next steps

- The production workflow that was already described in detail will be used to do **technico-economic evaluation** and **life cycle analysis** of newly developed coatings and production process.
- New Bipolar plates will be produced using **improved solutions** developed in the first 2 years of the COBRA project.
- The Bipolar plates will be tested in **new field tests in automotive and marine conditions** to compare COBRA solution with reference plates used at the beginning of the project.



In March 2017, a workshop will be organize in Grenoble (Fr) to share results and Surface Engineering good practices.

If you are interested by metallic bipolar plates coatings and COBRA innovative solutions, please contact us:

<http://www.cobra-fuelcell.eu/>