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Evaluation of tri-metalic catalysts in metallic bipolar plate stack

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The cost of fuel cell system and particularly of stack remains an important issue before their massive deployment in automotive applications. To decrease cost, two key drivers must be optimized. On the one hand, it will be necessary to increase the stack power density in order to decrease the number of components to reach the targeted power. On the other hand, it will be mandatory to decrease the overall cost of catalyst by decreasing the platinum loading (in g/kW).
In the frame of SMART-CAT project, tri-metallic catalysts have been developed based on gold, platinum and nickel alloys showing interesting electro-catalytic activities regarding oxygen reaction reduction. According to initial results obtained using rotating disc electrode and 25 cm² single cells, it was decided in the project to manufacture 220 cm² MEA to be tested in a stack based on metallic bipolar plate technology. First, catalyst layers were manufactured using classical screen printing techniques. Catalyst prepared by IC2MP was used to prepared ink at CEA facilities. The ink was then used to prepare Gas Diffusion Electrode (GDE). Secondly, PVD technique was used to prepare GDE with low platinum loadings. GDE were used to manufacture high surface MEA (220 cm²) using an automatic device located at CEA.
Both stacks were characterized using electrochemical techniques (polarization curves, impedance spectroscopy, cyclic voltammetry,…).Performances and robustness obtained in representative conditions of automotive applications using a new catalyst prepared by classical route or by PVD) were compared to performances obtained with classical MEA manufactured with pure platinum.

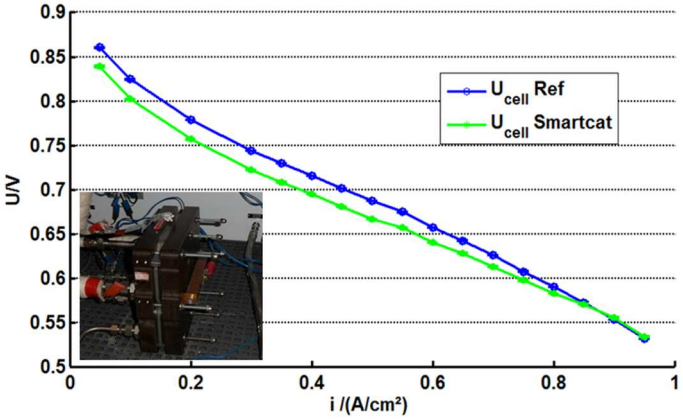

Figure 1: Polarization curves obtained with 10 cells stacks containing SMART-CAT MEA in automotive European conditions.

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REFERENCES