

# Standard Project

## Experimental Report template

<b>Proposal title: In-situ Pd K-edge XAS study of the H<sub>2</sub>-absorption impact on the HOR kinetics for in-operando proton- and anion-exchange membrane fuel cells</b>		<b>Proposal number:</b> 20131324
<b>Beamline:</b> FAME	<b>Date(s) of experiment:</b> from: 12.06.2014 to: 17.06.2014	<b>Date of report:</b> 13.09.2014
<b>Shifts:</b> 15	<b>Local contact(s):</b> Olivier Proux	<i>Date of submission:</i> 15.09.2014
<b>Objective &amp; expected results (less than 10 lines):</b> The objective of the measurement was to study the absorption of hydrogen in the lattice of Pd nanoparticles, supported on Vulcan carbon, with particle size and temperature. In these experiments, we used a new, custom-built in-situ fuel cell and a small test station to supply the humidified reactant gases to the cell (H <sub>2</sub> at the anode and N <sub>2</sub> at the cathode electrode) while the working electrode (Pd) was polarized at 0V vs. RHE. During these potential hold times, 2 consecutive EXAFS spectra were recorded, lasting 30min each, from which we determined the Pd-Pd nearest neighbour distance by fitting the EXAFS equation to the data. We expected to see a change the absorption behaviour by increasing potential and temperature, which could help us understand the poor activity of Pd in the hydrogen oxidation reaction.		
<b>Results and the conclusions of the study (main part):</b> Another very important outcome of the experiment was that our test setup performed extraordinarily well leading to a safe measurement throughout the entire time despite the use of pure hydrogen gas. Due to the excellent experimental support by the beamline scientist, Olivier Proux, we were able to record EXAFS data of very high quality which was important for the analysis.		
<b>Justification and comments about the use of beam time (5 lines max.):</b> This beam time was crucial for obtaining these results because EXAFS is the only technique allowing the observation of structural changes in-situ on an operating fuel cell. We are very grateful to have been awarded so many shifts, which were really necessary to conduct the experiments.		
<b>Publication(s):</b> - -		