

Experiment Report Form

The double page inside this form is to be filled in by all users or groups of users who have had access to beam time for measurements at the ESRF.

Once completed, the report should be submitted electronically to the User Office via the User Portal:
<https://www.esrf.fr/misapps/SMISWebClient/protected/welcome.do>

Deadlines for submission of Experimental Reports

Experimental reports must be submitted within the period of 3 months after the end of the experiment.

Experiment Report supporting a new proposal (“relevant report”)

If you are submitting a proposal for a new project, or to continue a project for which you have previously been allocated beam time, you must submit a report on each of your previous measurement(s):

- even on those carried out close to the proposal submission deadline (it can be a “*preliminary report*”),
- even for experiments whose scientific area is different from the scientific area of the new proposal,
- carried out on CRG beamlines.

You must then register the report(s) as “relevant report(s)” in the new application form for beam time.

Deadlines for submitting a report supporting a new proposal

- 1st March Proposal Round - **5th March**
- 10th September Proposal Round - **13th September**

The Review Committees reserve the right to reject new proposals from groups who have not reported on the use of beam time allocated previously.

Reports on experiments relating to long term projects

Proposers awarded beam time for a long term project are required to submit an interim report at the end of each year, irrespective of the number of shifts of beam time they have used.

Published papers

All users must give proper credit to ESRF staff members and proper mention to ESRF facilities which were essential for the results described in any ensuing publication. Further, they are obliged to send to the Joint ESRF/ ILL library the complete reference and the abstract of all papers appearing in print, and resulting from the use of the ESRF.

Should you wish to make more general comments on the experiment, please note them on the User Evaluation Form, and send both the Report and the Evaluation Form to the User Office.

Instructions for preparing your Report

- fill in a separate form for each project or series of measurements.
- type your report in English.
- include the experiment number to which the report refers.
- make sure that the text, tables and figures fit into the space available.
- if your work is published or is in press, you may prefer to paste in the abstract, and add full reference details. If the abstract is in a language other than English, please include an English translation.



	Experiment title:	Experiment number:
Beamline:	Date of experiment: from: 27 Sept 2017 to: 3 Oct 2017	Date of report:
Shifts:	Local contact(s): Jakub Drnec	<i>Received at ESRF:</i>
Names and affiliations of applicants (* indicates experimentalists): Jakub Drnec* Isaac Martens* Dan Bizzotto*		

Report:

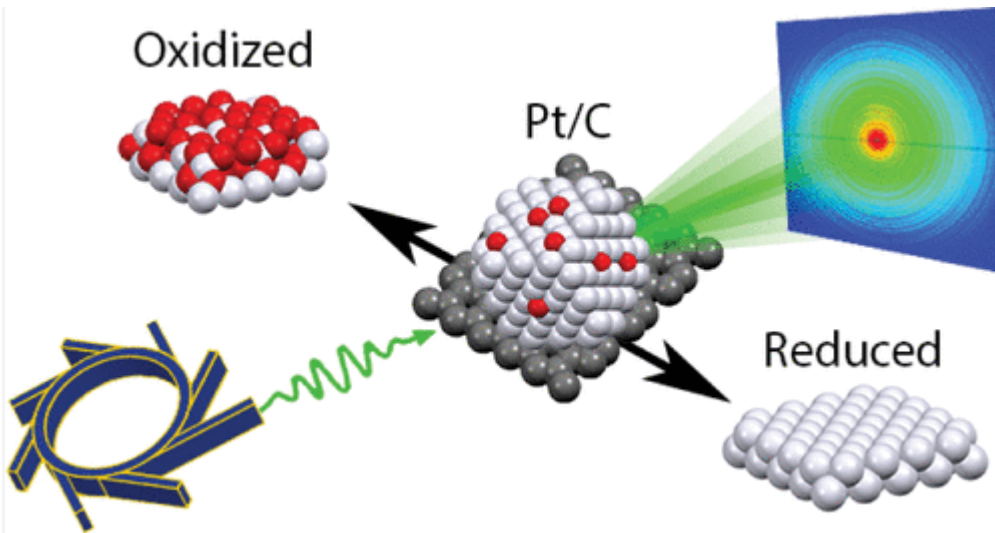
This work was published as

“Probing the Dynamics of Platinum Surface Oxides in Fuel Cell Catalyst Layers Using in Situ X-ray Diffraction”

Isaac Martens, Raphael Chattot, Miika Rasola, Maria Valeria Blanco, Veijo Honkimäki, Dan Bizzotto, David P. Wilkinson, Jakub Drnec*

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<https://doi.org/10.1021/acsaem.9b00982>

Abstract



The processes leading to degradation of Pt nanoparticles inside commercial hydrogen fuel cell catalyst layers are studied in situ, using time-resolved high-energy powder X-ray diffraction. Advances in electrochemical cell design significantly increase the quality of diffraction patterns obtained at practical catalyst loadings at high temporal resolution and allow the use of advanced techniques including differential pair distribution function analysis. Rietveld refinement of the lattice parameter and peak intensities during cyclic voltammetry or potential steps allow the separate steps of oxygen electroadsorption and place exchange in the Pt oxide growth mechanism to be clearly differentiated. The slow kinetics of the place-exchange process limit the oxide growth under standard laboratory conditions, decoupling the surface chemistry of the nanoparticles from the applied potential and directly affecting the outcome of accelerated stress tests measured with different cycling schemes. High-speed diffraction measurements are also used to follow the oxide reduction reaction, which is much faster. Refined structural parameters from these data show direct evidence for a transient, disordered platinum intermediate created during reduction of the oxide, which is likely responsible for catalyst dissolution when cycling to high potentials.

