EUROPEAN SYNCHROTRON RADIATION FACILITY

INSTALLATION EUROPEENNE DE RAYONNEMENT SYNCHROTRON

ESRF

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://wwws.esrf.fr/misapps/SMISWebClient/protected/welcome.do

Reports supporting requests for additional beam time

Reports can be submitted independently of new proposals – it is necessary simply to indicate the number of the report(s) supporting a new proposal on the proposal form.

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.

Deadlines for submission of Experimental Reports

- 1st March for experiments carried out up until June of the previous year;
- 1st September for experiments carried out up until January of the same year.

Instructions for preparing your Report

- fill in a separate form for each project or series of measurements.
- type your report, in English.
- include the reference number of the proposal 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.

ESRF	**Experiment title:** X-ray tomography study of colloidal gelation for understanding structural color	**Experiment number**: SC -4594
Beamline:	**Date of experiment**: from: 02 October 2018 to: 04 October 2018	**Date of report**:
Shifts:	**Local contact(s)**: Pieter Cloetens	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

Zachary Ruff [a,b]***,** Thomas O'Neill[a]*, Erika Eiser[a], Mykolas Zupkaukas[a]

a) University of Cambridge, Cavendish Lab (Physics)
b) University of Cambridge, Chemistry department

Report:

Results from the beam-time can be found in the press contributing to:

Title: Thermally reversible nanoparticle gels with tuneable porosity showing structural colour

Citation:

Ruff, Z.; Cloetens, P.; O'Neill, T.; Grey, C. P.; Eiser, E., Thermally reversible nanoparticle gels with tuneable porosity showing structural colour. *Physical Chemistry Chemical Physics* **2018,** 20, (1), 467-477.

DOI: 10.1039/C7CP04835A

Abstract:

We present colloidal gels formed from dispersions of PEG- and PEG+DNA-coated silica nanoparticles showing structural colour. The PEG- and PEG+DNA-coated silica colloids are functionalized using exclusively covalent bonds in aqueous conditions. Both sets of colloids self-assemble into thermally-reversible colloidal gels with porosity that can be tuned by changing the colloid volume fraction, although the interaction potentials of the colloids in the two systems are different. Confocal microscopy and image analysis tools are used to characteraize the gels' microstructures. Optical reflection spectroscopy is employed to study the underlying gel nanostructure and to characterize the optical response of the gels. X-ray nanotomography is used to visualize the nanoscale phase separation between the colloid-rich gel branches and the colloid-free gel pores. These nanoparticle gels open new routes for creating structural colour where the gel structure is decoupled from the form factor of the individual colloids. This approach can be extended to create unexplored three dimensional macroscale materials with length scales spanning hundreds of nanometers, which has been difficult to achieve using other methods.