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 using the **Electronic Report Submission Application:**

http://193.49.43.2:8080/smis/servlet/UserUtils?start

Reports supporting requests for additional beam time

Reports can now 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:** **Search for a charge-density wave in uranium thin-films on tungsten**	**Experiment number**: 28-01879
Beamline: BM28	**Date of experiment**: from: 23/09/09 to: 29/09/09	**Date of report**: 10/02/2010
Shifts: 18	**Local contact(s)**: Peter Normile	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

Dr. SPRINGELL Ross*, U.C.L., London, UK

Prof. LANDER Gerard H. *, E.S.R.F. Grenoble, France

Mr. CHIVALL James*, U.C.L., London, UK

Dr. WARD Roger C. C., University of Oxford, Oxford, UK

Dr. ZOCHOWSKI Stanley W., U.C.L., London, UK

The light actinides exhibit some of the most intriguing properties of all the elements. Bulk alpha-uranium is rare in being a single-element system exhibiting a charge-density wave (CDW) ground-state. The rearrangement of charge at low temperature is accompanied by a periodic lattice displacement, and observed by the appearance of satellite-peaks in the diffraction patterns obtained from neutron or X-ray scattering.

The first part of this experiment was given to completing the picture of the effect of thickness on the intensities of the CDW satellites in samples of U grown on Nb substrates. The results of these investigations, including data from samples studied during the present experiment, are included in the experimental report form for experiment 28-01862.

The direction of the greatest component of the strain due to the CDW displacement is in the [100] direction. For thin-films of uranium grown on W (U:W), the [100] direction lies in the plane of the film-surface, and is therefore constrained in its movement by the rigid substrate. It is supposed that this constraint will suppress the CDW transition. For thin-film samples there is as yet no method available for the verification of the presence of a CDW other than X-ray diffraction of synchrotron radiation. The next part of this experiment was primarily devoted to searching for charge-density wave satellites in these samples. Surprisingly, after a comprehensive survey of the reciprocal lattice positions that the satellite-peaks are seen at in previous samples, no satellite-peaks were seen.

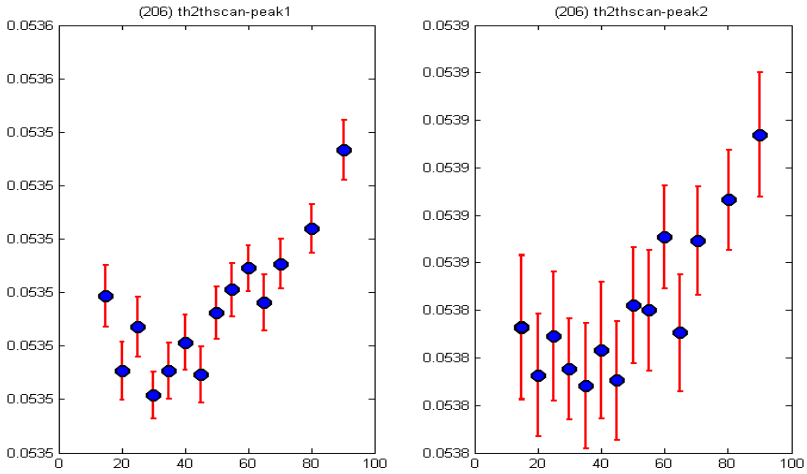

Figure 1: The temperature dependence of the d_{206} lattice-spacing in U:W samples of (left) 500 Å and (right) 50 Å. The x-axis scale is in Kelvin.

In samples displaying the CDW transition, a minimum is seen in the *a* and *b* lattice parameters near to the transition temperature. In both U:W samples studied, a minimum was seen in the d_{206} lattice-spacing [Figure 1], which suggests that the CDW is present in these samples, but with a different CDW wavevector. Further experiments are planned to exploit the CCD area detector at XMaS to search for CDW satellites at further positions of reciprocal space.