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: X-RAY MICROTOMOGRAPHIC STUDY OF TABLET SWELLING AND DISINTEGRATION.**	**Experiment number**: **MA - 201**
Beamline:	**Date of experiment**: from: 29 Nov 2006 to: 01 Dec 2006	**Date of report**:
Shifts:	**Local contact(s)**: Elodie Boller	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

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Report: Tablet swelling behaviour was investigated by following the movements of embedded glass microsphere tracers, using X-ray microtomography (XμT) with intense illumination from a synchrotron. Specimens were prepared using combinations of hydroxypropyl-methyl-cellulose (HPMC) and microcrystalline cellulose (MCC) or pre-gelatinised starch (PGS), three materials commonly used as excipients for compacted tablets. The results revealed significant differences in swelling behaviour due to excipient type and compaction conditions. In particular, a sudden change was observed from gel-forming behaviour of formulations containing PGS or high HPMC content, to more rapid expansion and disintegration for formulations above 70% MCC. Although some radial expansion was observable with the higher PGS formulations and during later stages of swelling, axial expansion (i.e. the reverse of the compaction process) appeared to dominate in most cases. This was most pronounced for the 10/90 HPMC/MCC specimens, which rapidly increased in thickness, while the diameter remained almost unchanged. The expansion appeared to be initiated by hydration and may be due to the relaxation of residual compaction stress. This occurred within 'expansion zones', which initially appeared as thin bands close to the compacted (upper and lower) faces, but gradually advanced towards the centre and spread around the sides of the tablets. These zones exhibited lower X-ray absorbance, probably because they contained significant amounts of bubbles, which were formed by air released from the swelling excipients. Although, in most cases, these bubbles were too small to be resolved (<60 μm), larger bubbles (diameter up to 1 mm) were clearly evident in the rapidly swelling 10/90 HPMC/MCC specimens. It is suggested that the presence of these bubbles may affect subsequent water ingress, by increasing the tortuosity and occluding part of the gel, which may affect the apparent diffusion kinetics (i.e. Fickian or Case II). These observations also suggested that axial expansion, initiated by water ingress, may be an important mechanism during tablet swelling.

P.R. LAITY AND R.E. CAMERON
"Synchrotron X-Ray Microtomographic Study of Tablet Swelling"
European Journal of Pharmaceutics and Biopharmaceutics, 2010, **75(2)**, 263 – 276