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

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 form 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.

ESRF	**Experiment title:** Crystallization of low-solid oleogels: characterization of lamellar thickness	**Experiment number**: A26-2-951
Beamline: BM26	**Date of experiment**: from: 22/11/2022 to: 25/11/2022	**Date of report**:
Shifts: 9	**Local contact(s)**: Martin Rosenthal	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

Filip Van Bockstaele – Ghent University, Food Structure and Function Research Group

Kato Rondou – Ghent University, Food Structure and Function Research Group

Report:

Persons who participated in the experiments

- Kato Rondou
- Fien De Witte
- Ivana Penagos

All participants are affiliated to Ghent University, Food Structure and Function Research Group.

The aim of the research

The results obtained with these experiments will contribute to getting a better fundamental understanding in the relation between processing and the microstructure of oleogels (based on monoglycerides and waxes). The strength of using synchtrotron data is that results could be obtained for the oleogels containing only 1% of solids and obtaining time-resolved measurements. Different X-ray techniques are used to characterize the oleogels from nano- to mesoscale. Within this research, the main aim is to further develop methodologies to obtain more information about the size and variability of crystal nanoplatelets and the impact of processing on this (Fig. 1). This can be done by using the BWA-method to produce the crystallite thickness distribution (Fig. 2) .

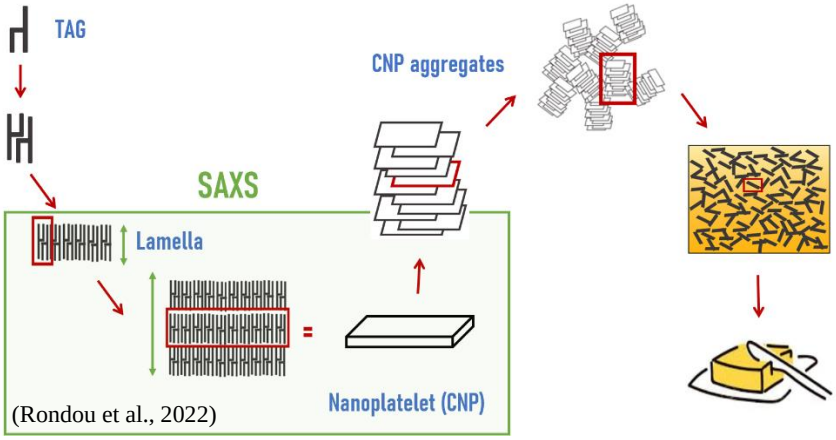

Fig. 1. Overview of traditional fat crystallization

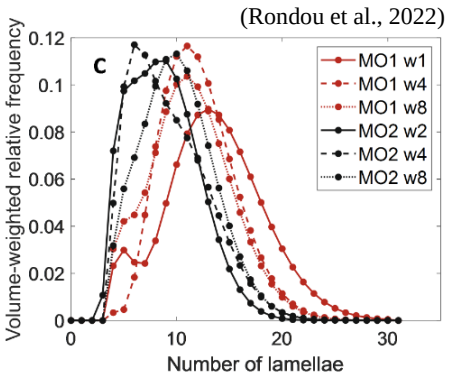

Fig. 2. Crystallite thickness distribution

Samples

The samples that were measured are oleogels with a varying concentration (1-10%) of 4 different hardstocks (C16 based monoglyceride, C16-C18 based monoglyceride, sunflower wax and beeswax).

Two different setups were used. The oleogels (varying concentration and hardstock) were dynamically produced at Ghent University by applying high cooling rates and high shear rates. To investigate the effect of processing, these oleogels were measured with kaptons without any additional heat treatments. Additionally, the samples were molten (80°C) and cooled by varying the cooling rate (1 - 5 - 10 - 20 °C/min) and final temperature (5 - 10 - 20 - 25°C) in capillaries to investigate the effect of cooling rate and crystallization temperature.

Results

With the experiments performed at BM26, the generated data contributes to elucidate the impact of high shearing rate and cooling rate on the final fat crystal network of low-solids systems. Despite having two problems related to the beam, we were able to perfom almost all our experiments. It was notable that even for some of the samples (not all) with only 1% hardstock a good result was obtained. Additionally, based on the results obtained with the time-resolved measurements, the impact of changing the cooling rate and final temperature can be observed. However, more detailed results are kept confidential to avoid conflicts on publications.

Publications

It is expected to submit at least one publication containing part of the results obtained with this project. Further research is being executed to obtain complementary data from PLM, DSC, rheology, etc.

Additional remarks

We want to thank our local contact Martin Rosenthal for all his help during our stay at the ESRF.

References

Rondou, K., De Witte, F., Rimaux, T., Dewinter, W., Verwaeren, J., Dewettinck, K., & Van Bockstaele, F. (2022). Microstructure development in semi-liquid shortenings upon storage. 2022 AOCS Annual Meeting & Expo, Abstracts. Presented at the 2022 AOCS Annual Meeting & Expo, Atlanta, Georgia, USA.

Rondou, K., De Witte, F., Rimaux, T., Dewinter, W., Dewettinck, K., Verwaeren, J., & Van Bockstaele, F. (2022). Multiscale analysis of monoglyceride oleogels during storage. JOURNAL OF THE AMERICAN OIL CHEMISTS SOCIETY, 99(11), 1019–1031. https://doi.org/10.1002/aocs.12645