ESRF	**Experiment title:** Ovalbumin foam stability	**Experiment number:** SC-1345
Beamline: ID-19	**Date of experiment:** from: 20/02/2004 8:00 to: 21/02/2004 8:00	**Date of report:** 27/02/2004
Shifts: 3	**Local contact(s):** Peter Cloetens, Rajmund Mokso	*Received at ESRF:*

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Report:

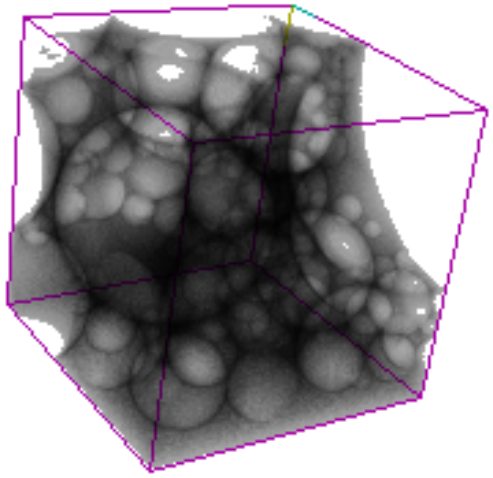
Note: We submit the present report early after the experiments in order to make it available for examination of a new beamtime application

These experiments aimed at following the aging of protein foams, prepared in various physico-chemical conditions, by X-ray tomography. They are related to similar experiments performed on model foams, which showed the feasability of the tomographic study of liquid foams and allowed scaling of the experimental parameters (see report of experiment SC-1111).

Foams were prepared from 300-μl solutions of purified ovalbumin (50–100 $g\,l^{-1}$), buffered at pH 5.0 or 7.0 to obtain low or high absolute values, respectively, of the protein net charge. Foams were generated directly in the sample cell, so as to avoid transfer artifacts and to minimize the delay between foam preparation and the beginning of acquisition, using a rotor-stator homogeneizer. 512×512-pixel^2 radiographs, corresponding approximately to a 15-μm resolution were acquired during the 400-step rotation of the sample foams. The kinetics of foam aging have been followed for up to 12 h, with a time resolution of down to 5 min in the initial phase of foam destabilization. Every experiment was duplicated in order to ensure its reproducibility.

The experiments were quite successful, in that excellent reconstructed images were obtained even in the very initial phase of fast foam aging, showing the high adequation of the tomography experiment on ID-19 for the study of protein foams.

Analysis of the data provided by these experiments (segmentation of three-dimensional images, individual identification and time-tracking of bubbles, statistical and structural characterization of foams...) is in progress. Preliminary observations already show unambiguously that the kinetics of foam structure changes are deeply altered by the net charge of the protein adsorbed at the air-solution interface and its ability, depending on its charge, to form a two-dimensional network exhibiting visco-elastic properties. These observations and further analysis of the data clearly have to be related with the data we previously obtained by other techniques (ellipsometry, interfacial rheology, infrared reflection-absorption spectroscopy) with ovalbumin adsorbed at model, planar air-solution interfaces.



Reconstituded 3D-image of ovalbumin foam at pH 7.0, 6 hours after foam formation.

We expect that in-depth analysis of the data will allow us to discriminate, in the different phases of foam aging and depending on the physico-chemical conditions, the contributions of the different mechanisms of foam destabilization (coalescence, Ostwald ripening). For example, the results should reveal whether and how the extent of protein conformational rearrangements at the air-solution interface can control the rate of gaz diffusion between bubbles and thus modify the contribution of Ostwald ripening.

X-ray tomography thus will help understanding how the properties that protein adsorption and molecular reorganization confer to the interfacial film can determine kinetics and mechanisms of foam stability.