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.

	Experiment title: Sulfated biomolecules in formation ofcentres of calcification and early crystallization process in biominerals.	**Experiment number**: CH 1162
Beamline: ID 21	**Date of experiment**: from: 14 Sept to: 18 Sept 2001	**Date of report**: 25 2 2002
Shifts: 12	**Local contact(s)**: SALOME Murielle	*Received at ESRF:*

Names and affiliations of applicants (* indicates experimentalists):

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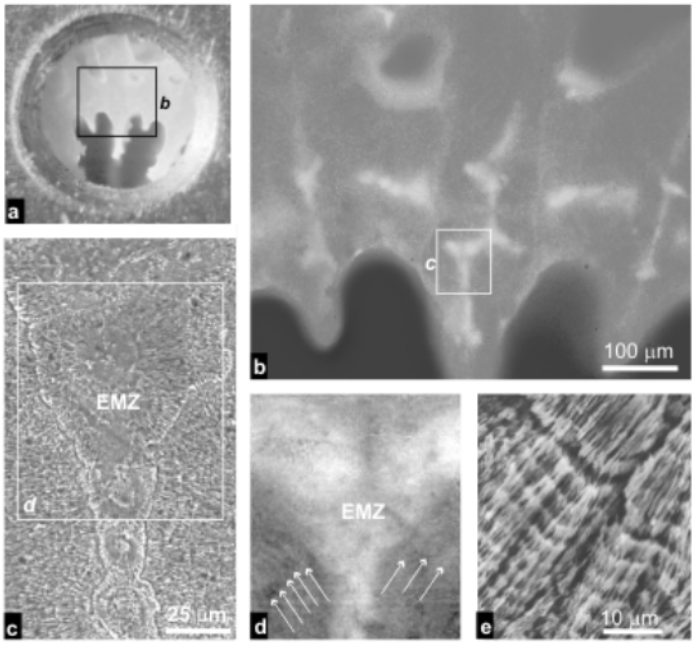
Report: Excerpt of a paper submitted to *Geochimica and Cosmochimica Acta*

The presence and localization of organic sulfate within coral skeletons are studied by using XANES fluorescence method. After checking by Raman spetrometry that no mineral sulfate is present, XANES spectra are recorded from four reference sulfur bearing organic molecules : two amino acids (H-S-C bonds in cystein; C-S-C bonds in methionin) , one disulfur bond (C-S-S-C bonds in cystine) and a sulfated glucidic compound (C-SO4 bonds in chondroitin sulfate). Spectral responses of three coral skeletons show that the sulfated form of sulfur is extremely dominant in coral aragonite, and practically exclusive within both centres of calcification and the surrounding fibrous tissues of coral septa.



The above picture is an example of results we got in the CH 1162 experiment.

a : polished section of coral fixed onto the holding-plate (hole diameter 1.2 mm

b : UV fluorescence picture showing the early mineralization zone (= centres of calcification)- picture made at Orsay during the preparative step

c : SEM picture of microctructural feature at the analyzed zone (picture made at Orsay, after the ESRF experiment)

d : Mapping of sulfur in the sulfated coordination made at the ID 21 line.

e: enlarged view of the growth steps in fibres : the S-sulfate banding pattern visible in fig.d precisely matches the mictrostructural growth steps
(i.e. the cyclic deposition of calcium carbonate that built the coral skeleton units).

Conclusion

XANES mapping allows the sulfated glucidic components of coral skeletons to be precisely localized a the micronic level.

1 -Centres of calcification and crystal-like fibres exhiibit two distinct patterns with respect to the S-sulfated glucidic compounds.
High concentrations are present in early mineralization zones (the “centres of calcification”).
In fibres, sulfated compound concentrations are weaker, but a banding pattem is visible, that corresponds to fibre growth steps that are evidenced by chemical etchings.

2 - Cyclic repartition of sulfated glucids exactly matches the calcareous fibre growth steps.
This correspondance strongly suggests that glucids are involved in the mineralization process.
This hypothesis founds additional support in the correlation between the biochemical diversity of these skeletal compounds and the taxonomy linked properties of skeletal fibres, from crystallinity to isotopic fractionation.