2.7.42

Behaviour of diatom cells confined in a silica environment

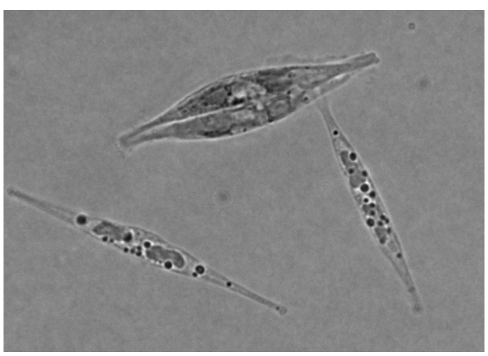
C. GAUTIER[1,2], T.CORADIN[1], J. LIVAGE[1] AND P.J. LOPEZ[2]

[1] Chimie de la Matière Condensée, CNRS-UMR 7574, Université Pierre et Marie Curie, Paris, France (coradin@ccr.jussieu.fr)

[2] Organismes Photosynthétiques et Environnement, ATIP-UMR 8543, Ecole Normale Supérieure, Paris, France (pjlopez@wotan.ens.fr)

Diatoms are unicellular photosynthetic algae that build-up a silica shell by condensation of mineral precursors taking up from the environnement, thus playing a key role in the geochemical cycle of silica. While recent progress have been made in the understanding of the biomineralization process at the molecular level [1], the interactions of the cells with their environment is still poorly understood.

In order to model the cell-mineral interface, diatoms were entrapped in silica gels. These mineral hosts are obtained by condensation of silicates in water, at room temperature and in pH conditions compatible with cell encapsulation [2]. The influence of gel strength and cell density on the behaviour of entrapped diatoms was studied by optical and electron microscopy, as well as fluorescence spectroscopy.



These studies show that entrapped diatoms can maintain photosynthesis activity over several days. Moreover, up to 3 cell division could be observed within the gels. The possibility for diatoms to use silica from the environment to synthesize new shells will be discussed.

References

[1] Coradin T. and Lopez P.J. (2003) *ChemBioChem* **4,** 251-259.

[2] Livage J., Coradin T. and Roux C. (2001) *J. Phys.: Condens. Matter* **13,** R673-R691.

2.7.43

Preliminary study of the organic matrix secretion pattern into biominerals: The scleractinian corals and fish otolith models

L. PEREIRA-MOURIÈS[1], S.TAMBUTTÉ[1], E. TAMBUTTÉ[1], S. PUVEREL[1,2], D. ZOCCOLA[1], P. PAYAN[2] AND D. ALLEMAND[1,2]

[1] Centre Scientifique de Monaco, avenue Saint-Martin, 98000 Monaco, Pincipality of Monaco (lmouries@centrescientifique.mc)

[2] Laboratoire "R.O.S.E." (Réponses des Organismes aux Stress Environnementaux), UMR 1112, INRA-UNSA, Faculté des Sciences, Université de Nice-Sophia Antipolis, B.P. 71, 06108 Nice Cédex, France (allemand@unice.fr, payan@unice.fr)

Biominerals are composite materials consisting of inorganic mineral intimately associated with an organic matrix. It is now recognized that this organic matrix plays a key role in the control of crystal nucleation and growth and is responsible for the physico-chemical properties of these biomaterials. However, the molecular mechanisms by which biominerals are formed are still unclear.

We use scleractinian corals and fish otolith as two complementary experimental models, since they provide unique opportunity to study simultaneously physiological aspects of organic matrix formation and its incorporation into the biomineral. The Centre Scientifique de Monaco has developped for more than ten years a system allowing to maintain and propagate coral microcolonies under controlled conditions. This enables us to study diurnal variation of organic matrix secretion into the skeleton. In order to characterize organic matrix, we set up a protocol to optimize its extraction and to analyze the molecular components by specific biochemical approaches, in particular for protein and polysaccharide detection. Such an approach will be useful to establish the relationship between periodic biomineral growth and organic matrix secretion.

In determining the pattern of matrix secretion, we aim to contribute to the comprehension of how organisms control the formation of a specific mineral polymorph and at long term, to find biological markers that can be used as environmental records in paleoclimatology (in the case of Scleractinian corals), or as indicators of fish growth in halieutic sciences (in the case of fish otolith).