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Determining microstructural growth patterns on mollusk shells with synchrotron x-ray microdiffraction

Alvarez-Lloret, P. (1), Rodriguez-Navarro, A.B.(1), Checa, A.G (2)

(1) Dpto. de Mineralogía y Petrología, Universidad de Granada, Facultad de Ciencias, 18002 Granada (pedalv@ugr.es / Phone:+34958240059 / Fax:+34958243368) (2) Dpto. de Estratigrafía y Paleontología. Universidad de Granada, Facultad de Ciencias, 18002 Granada

Organisms form mineralized tissues with highly organized microstructures. Mollusks build very sophisticated shells (Mann, 2001). Shell forming calcium carbonate crystals layers may adopt different morphologies and organize in different spatial configurations in microstructurally distinct shell layers. Thin sections of mollusk shells species *(Nautilus belauensis, Psilunio littoralis* and *Ostrea edulis*) have been analyzed in transmission mode by synchrotron X-ray diffraction on BM 16 at the ESRF (Grenoble, France). We have studied the transition between shell layers to understand how they became organized. Bidimensional X-ray diffraction patterns acquired have been analyzed using XRD2DScan program. We have studied the variations of the intensities from the most intense aragonite and calcite reflections and calculated the FWHM from the integrated 2θ diffraction patterns. Degree of orientation of crystals was also calculated through the measurement of the angular width of the χ angle of arcs from the bidimensional diffraction patterns (Debye-Scherrer rings). Develop and evolution of crystals ordering between layers were then analyzed. Results obtained show abrupt variations in the parameters studied between layers that have different microstructures.

References:

Mann, S. (2001) Biomineralization: principles and concepts in bioinorganic materials chemistry. Oxford University Press, New York.