MASTER SYSTEMES BIOLOGIQUES ET CONCEPTS PHYSIQUES
Proposition de stage 2019-2020

Physicochemical processes in calcareous biocrystallization

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Période de stage / Internship period : 5 to 6 months
Gratification / Salary : 568,76 euros /mois

1. Project

Calcifying organisms (molluscs, corals, sponges) are able to produce crystallized mineral structures (shells, exoskeletons) with perfectly controlled morphology to target a particular biological function (protection, flotation, etc.). The physicochemical processes underlying this biocrystallization of calcium carbonate are still poorly known. One hypothesis is that the formation of crystalline calcium carbonate results from the transformation of an amorphous precipitate, the latter being formed out a liquid precursor that is salt-enriched with respect to the starting solution. The validity of this hypothesis will be assessed by carrying out model syntheses, for which the existence of a liquid precursor seems to be proven, and by comparing the structure, at the different spatial scales, of the minerals formed with that of the biocrystals produced by the biological organisms. This work is part of a European project (ERC 3D-BIOMAT) conducted in collaboration with the Fresnel Institute (Marseille) and the IFREMER station of French Polynesia.

2. Specific techniques or methods

Infrared and Raman spectroscopie, optical microscopy, chemical titration – X-ray scattering / diffraction.

3. References

[1] Gower L B, Odom D J, *Journal of Crystal Growth* **210**, 719-734 (2000).
[2] Mastropietro F, Godard P, Burghammer M, Chevallard C, Daillant J, Duboisset J, et al. Revealing crystalline domains in a mollusc shell single-crystalline prism. *Nature Materials*, **16**, 946–952 (2017).
[3] Tseng Y-H, Chevallard C, Dauphin Y and Guenoun P, *CrystEngComm*, **16**, 561-569 (2014).