

Master Thesis Proposal

Year 2020

Laboratory : Institut Fresnel
City, Country : Marseille FRANCE

Title: In vivo imaging of Oyster with Coherent Raman microscopy

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Summary of the subject (maximum 1 page) :

Biomineralization integrates biological, chemical and physical processes to control the formation of mineralized tissues in living organisms. Deciphering these mechanisms is of crucial importance for fundamental challenges and bio-inspired strategies for the synthesis of materials. Although classical crystallisation theory cannot be invoked for explaining the formation of biomineral crystals, to date, a detailed understanding of biomineralization is still lacking.

We propose to develop experiments to study, *in vivo*, the biomineralization process which consist for the oyster, *Pinctada Margaritifera*, to build its shell. Coherent Raman (CR) microscopy will image the amorphous carbonate and the crystalline carbonate during the mineralization of the shell. In recent years, Coherent Raman microscopy have evolved to become a powerful imaging and spectroscopy tool for investigating the biological world. The CR contrast is a resonant process with a molecular level, which allows specific chemical imaging without the use of fluorescent markers or dyes. In this process, the pump laser and the Stokes laser excite a vibrational level that generates a blue shifted photon.

During the thesis, alive animals will be receive from Tahiti (IFREMER institute) and will be grown in aquarium at the institute for imaging. Thus, the students will use and develop the experimental setup to investigate *in vivo* imaging. Strong skill in optics and experiments are expected.

Keywords: *in vivo*, biomineralization, nonlinear optics, imaging, coherent Raman

Additional information:

* Required skills: optics, nonlinear optics,

* Salary: 570€/month