In-vitro synthesis of amorphous Mg-, Ca-, Sr- and Ba-carbonates: What do we learn about intracellular calcification by cyanobacteria?

NITHAVONG CAM[12], THOMAS GEORGELIN[1], MAGUY JABER[3], JEAN-FRANÇOIS LAMBERT[1] AND KARIM BENZERARA[2]

[1]LRS, UPMC & CNRS, Ivry-sur-Seine, France, nithavong.cam@upmc.fr
[2]IMPMC-ERC Calcyan, UPMC, CNRS, IRD & Muséum National d'Histoire Naturelle, Paris, France, karim.benzerara@impmc.upmc.fr
[3]LAMS, UPMC & CNRS, Paris, France

Cyanobacteria are relatively diverse phylogenetically, abundant and widespread at the surface of the Earth. By their photosynthetic activity they modify significantly their environment and in particular impact the carbon geochemical cycle by formation of organic carbon and precipitation of calcium carbonate. Recently some cyanobacteria able to form intracellular carbonates have been discoved [1] [2]. It has been suggested moreover that calcification might be controlled by these cyanobacterial species. The intracellular carbonates they form have several peculiar characteristics: they are poorly crystalline, relatively small (between 60 and 500 nm) and at least in some cases have much higher Sr/Ca and Ba/Ca ratios than the solution in which the cells grow. Therefore, understanding the formation of these carbonates may open new perspectives on remediation of heavy alkaline earth metals. Here, we performed *in vitro* abiotic syntheses of Mg-, Ca-, Sr- and Ba-containing carbonates with compositions, crystallinities and sizes close to those observed in cyanobacteria. Precipitates were characterized by scanning and transmission electron microscopies coupled with energy dispersive x-ray spectroscopy and x-ray diffraction. We will discuss how these *in vitro* syntheses can be compared to the processes occuring within cells and what we learn about them.

[1] Couradeau, Benzerara, Gerard, Moreira, Bernard, Brown, and Lopez-Garcia, *Science* 336, 459–462. [2] Benzerara, Skouri-Panet, Li, Férard, Gugger, Laurent, Couradeau, Ragon, Cosmidis, Menguy, Margaret-Oliver, Tavera, López-García, and Moreira, *Proc. Natl. Acad. Sci.* 111, 10933–10938.