

CLSM/SEM correlative study of the dissolution of intracellular calcium carbonate in cyanobacteria under a heat stress

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Until recently, the biomineralization of CaCO₃ minerals has been considered as induced and exclusively extracellular mechanism of calcification [1]. The discovery of several species of cyanobacteria able to form amorphous intracellular CaCO₃ (AICC) [2-5], such as *Gloeomargarita lithophora*, *Cyanotheca* sp. PCC 7425, *Synechococcus* sp. PCC 6312, and *Thermosynechococcus elongatus* BP-1, shakes this paradigm. Two biomineralization patterns of AICC have been highlighted [3]: in the first one, AICC granules are scattered within the cyanobacterial cytoplasm (e.g. *G. lithophora*), while in the second AICC cluster at the cell poles (e.g. *T. elongatus* BP-1). As a potential inorganic carbon source, AICC could be immediately bioavailable for cyanobacteria under stress conditions. Moreover, their precipitation inside instead of outside the cell questions the viability of cyanobacteria. To validate these hypotheses, this study aims at affecting cell viability by heat stress treatments of mesophilic and thermophilic cyanobacteria presenting the two distinct distributions of AICC as described above. Calcium release in the extracellular medium was monitored in order to determine the temperature dependence of kinetics parameters of each cyanobacterial strains. Confocal laser scanning microscopy (CLSM) and scanning electron microscopy (SEM) were correlated to link the loss of cyanobacterial viability to the dissolution of AICC.

[1] Dupraz et al. (2009) *Earth Sci. Rev.* **96**, 141-162; [2] Couradeau et al. (2012) *Science* **336**, 459-462; [3] Benzerara et al. (2014) *PNAS* **111**, 10933-10938; [4] Ragon et al. (2014) *Front. Microbiol.* **5**, 331; [5] Cam et al. (2015) *Geochim. Cosmochim. Acta* **161**, 36-49.