

Selective uptake of alkaline earth metals by cyanobacteria forming intracellular carbonates

Nithavong Cam,^{†‡} Karim Benzerara^{*,†}, Thomas Georgelin,[‡] Maguy Jaber,[§] Jean-François Lambert,[‡] Mélanie Poinso,^{†‡}
Fériel Skouri-Panet[†], Laure Cordier[#]

10 pages ; 11 figures ; 1 table

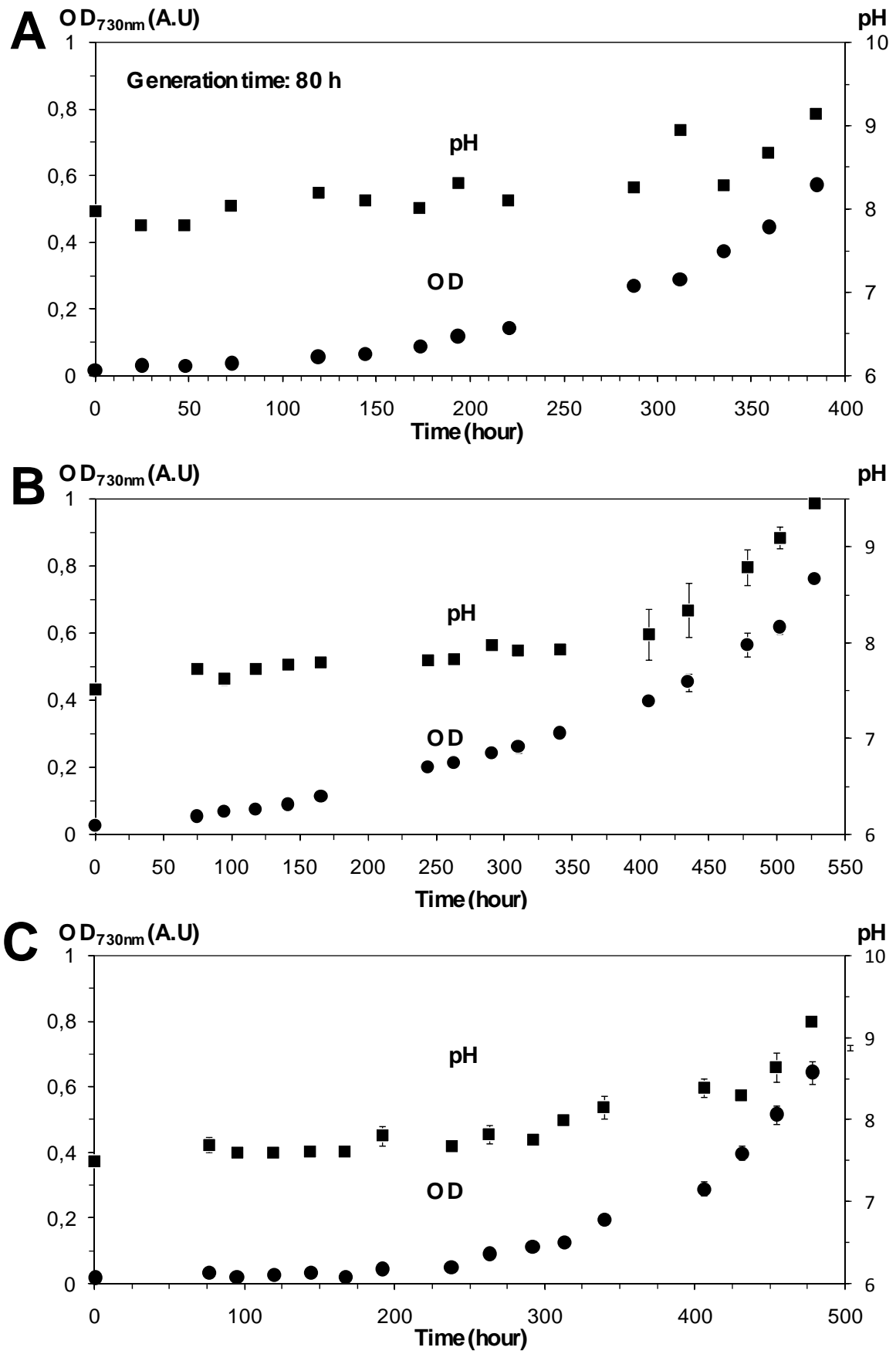


Figure S1. A) Time evolution of pH (squares) and OD (circles) in one replicate culture of

Gloeomargarita lithophora inoculated in BG-11 with 50 μM of Ba and Sr. B) Average of the time evolution of pH (squares) and OD (circles) obtained from two cultures of *Gloeomargarita lithophora* inoculated in BG-11 medium with 50 μM of Ba and Sr. Standard deviation bars are calculated from measurements made on two replicates. C) Average of the time evolution of pH (squares) and OD (circles) in triplicate cultures of *Gloeomargarita lithophora* inoculated in BG-11 medium (no Sr and Ba). Standard deviation bars are calculated from measurements made on three replicates.

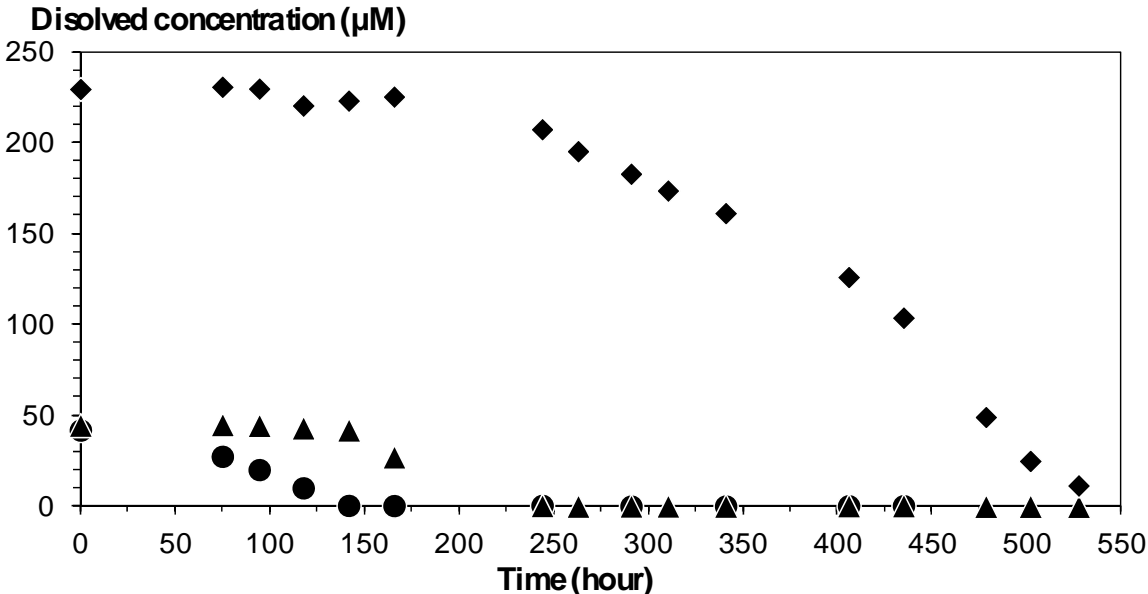
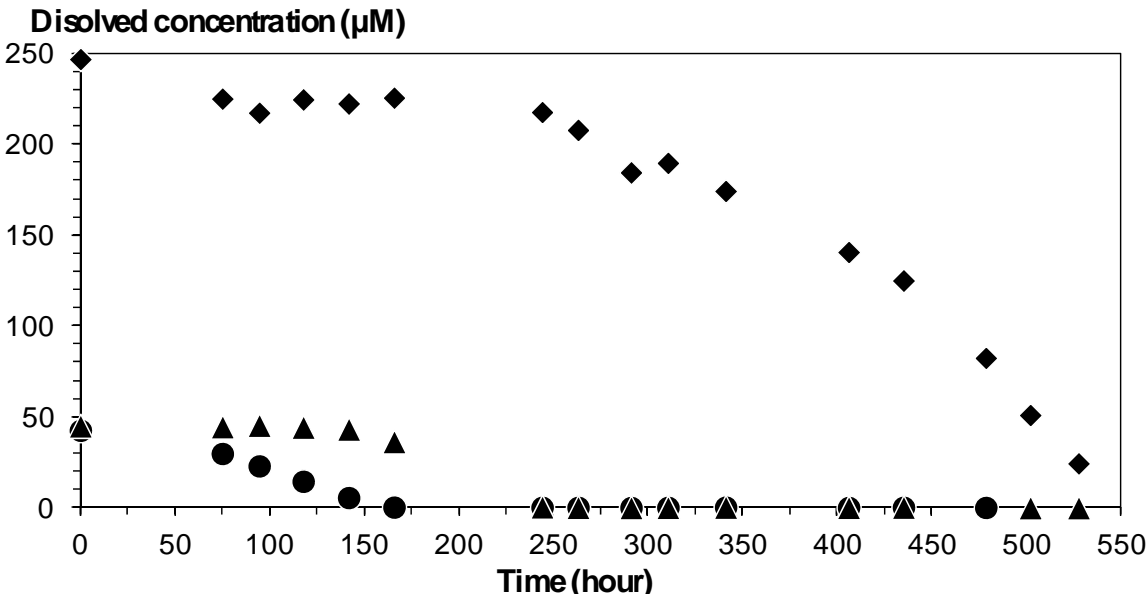


Figure S2. Time evolution of the concentrations of dissolved Ca (diamonds), Sr (triangles) and Ba (circles) concentrations in cultures of two replicates of *Gloeomargarita lithophora* inoculated in BG-11.

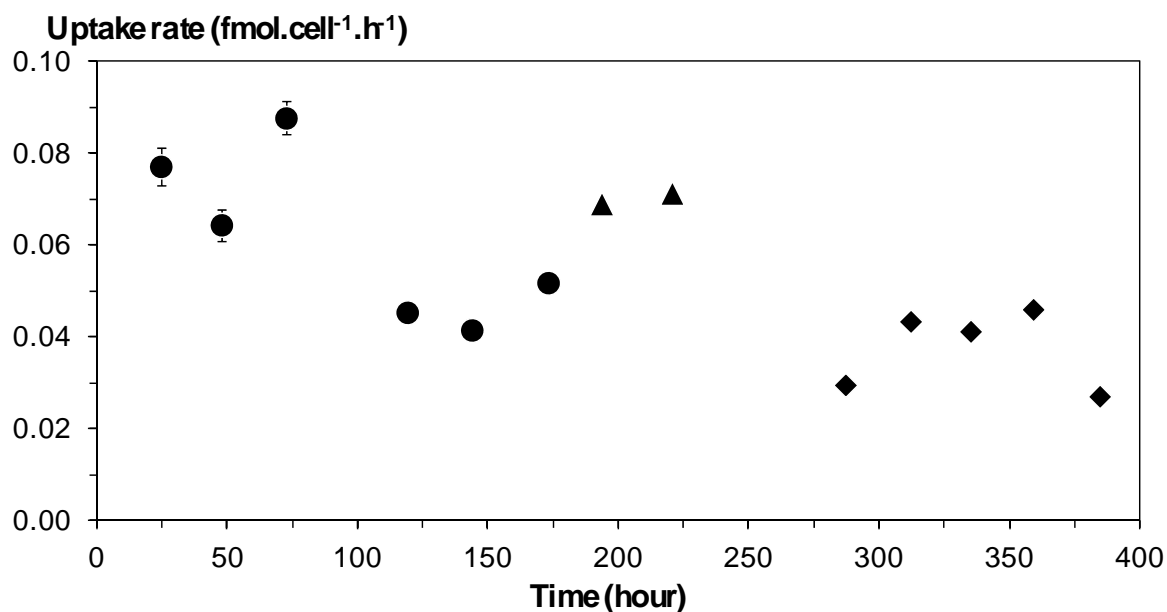


Figure S3. Uptake rates of Ba (circles), Sr (triangles) and Ca (diamonds) as a function of time in a culture of *Gloeomargarita lithophora*. Analytical standard deviations are smaller than symbols.

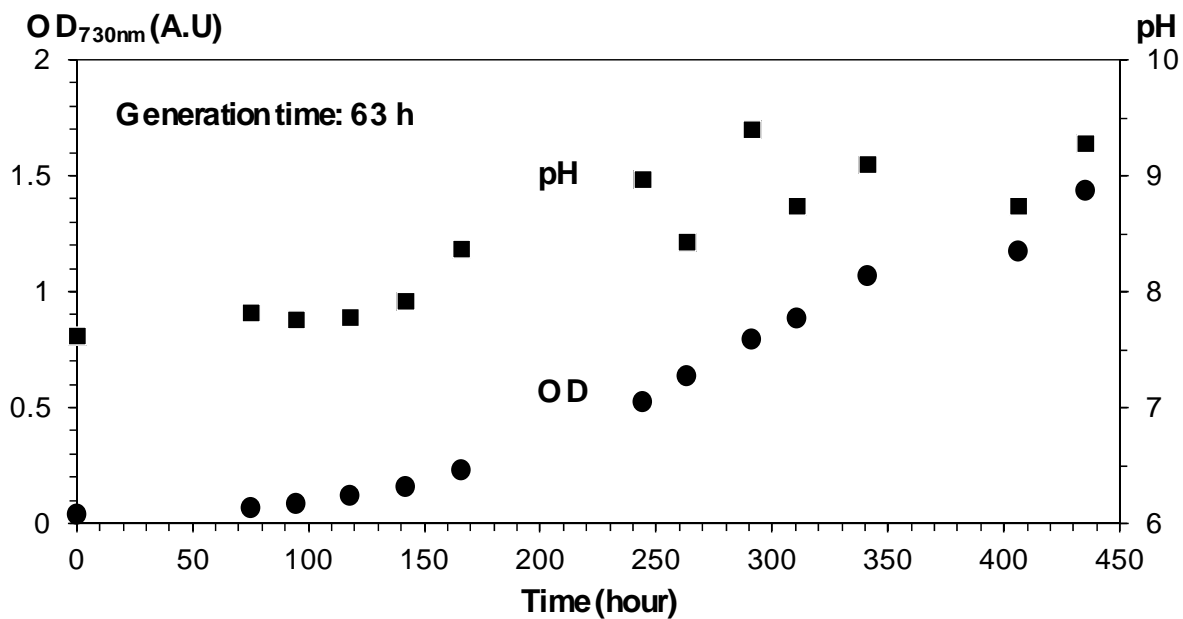


Figure S4. Time evolution of pH (squares) and OD (circles) in a culture of *Cyanothece* sp. inoculated in BG-11 medium with 50 μ M of Ba and Sr.

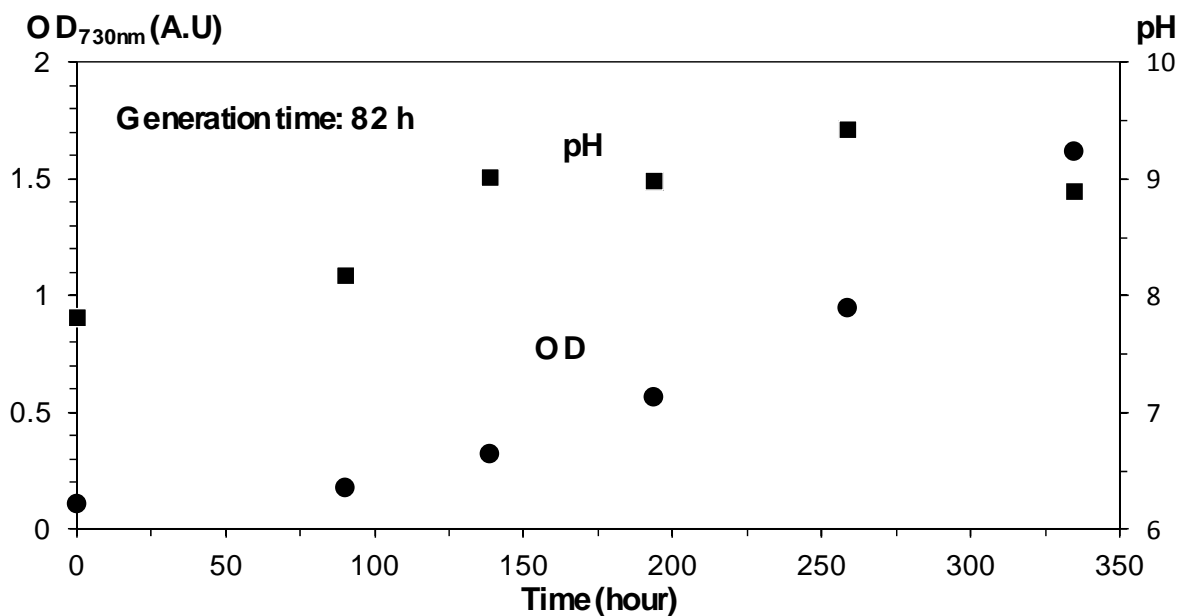


Figure S5. Time evolution of pH (squares) and OD (circles) in culture of *Cyanothece* sp. inoculated in BG-11 medium.

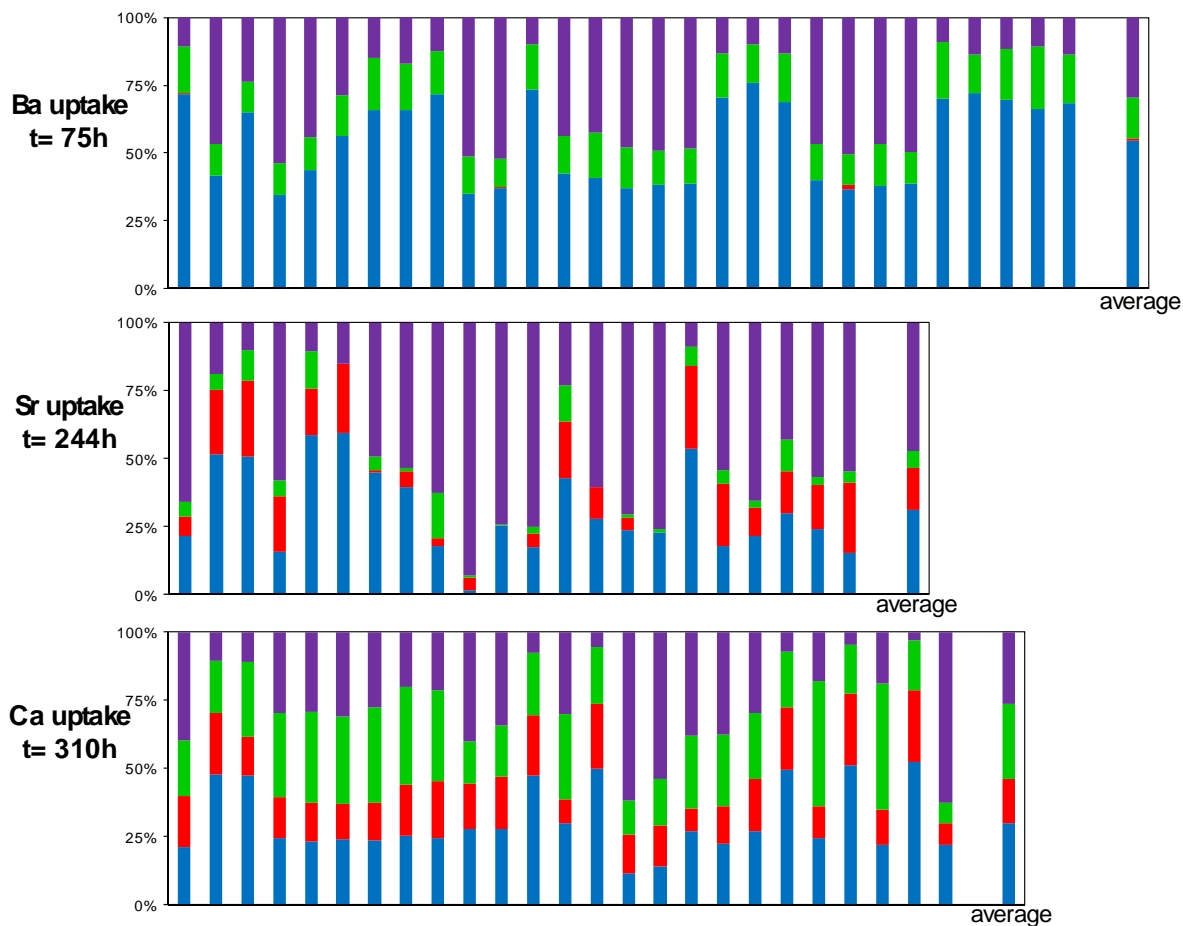


Figure S6. Chemical composition of single P-rich granules in *Gloeomargarita lithophora* cultured in BG-11 with Sr and Ba, at the different uptake stages. Each bar represents one PolyP granule on which relative proportions of Mg (purple), Ca (green), Sr (red) and Ba (blue) were quantified from EDXS analyses.

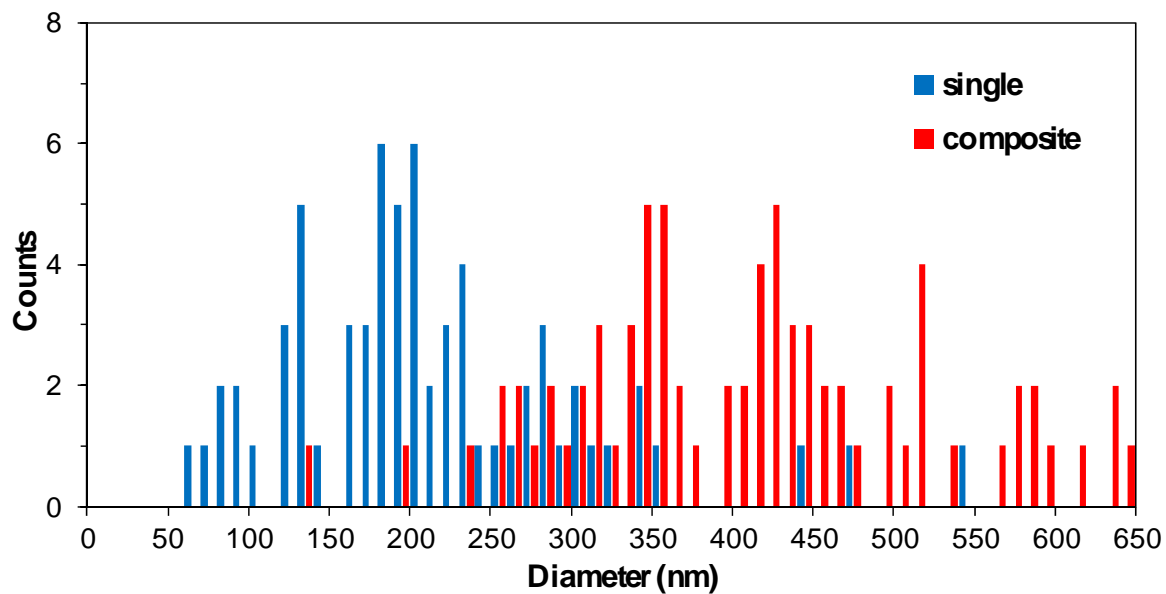


Figure S7. Size distribution of intracellular carbonates in *G. lithophora* cells grown in BG-11 with 50 μM of strontium and 50 μM of barium. The granules were observed at all uptake stages. “Single” granules containing one single alkaline earth element are shown in blue bars; “composite” particles containing several alkaline earth elements are shown in red bars.

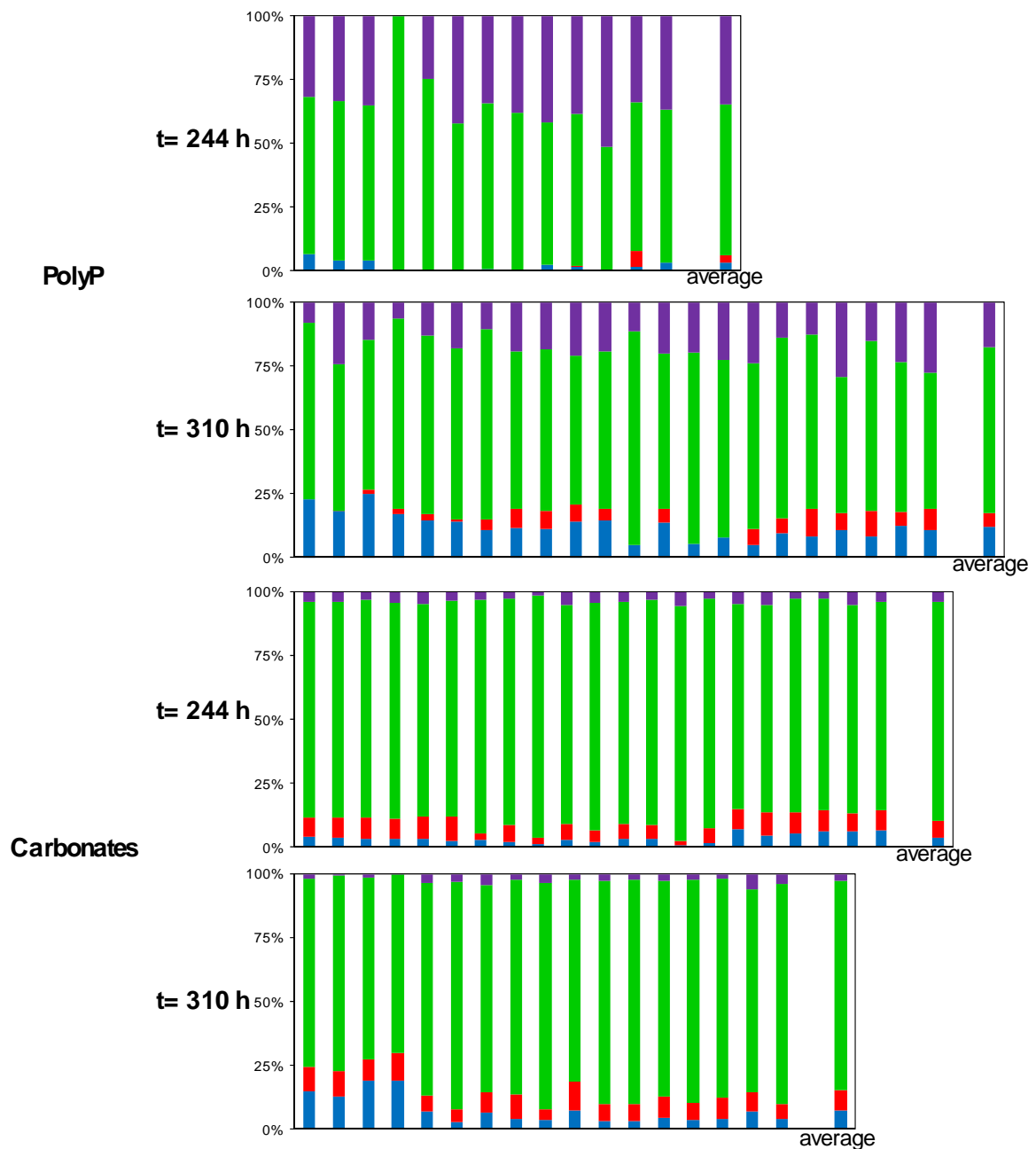


Figure S8. Chemical composition of single carbonate granules and PolyP granules in *Cyanothecce sp.* PCC 7425 cultured in BG-11 with Sr and Ba at 244 and 310 h. Each bar represents one granule on which relative proportions of Mg (purple), Ca (green), Sr (red) and Ba (blue) were quantified from EDXS analyses.

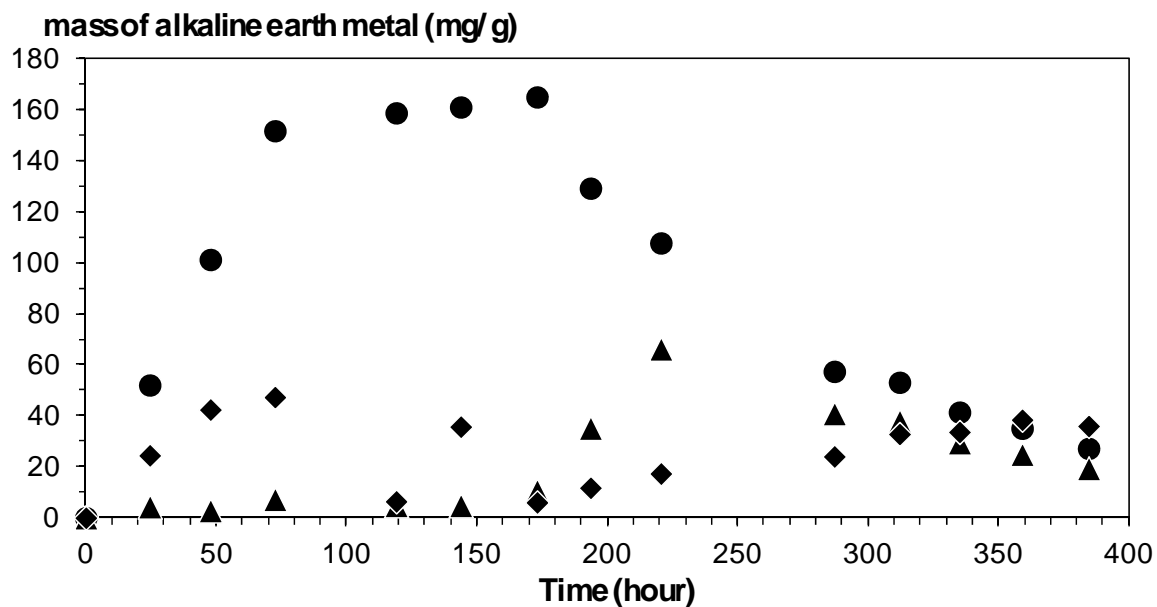


Figure S9. Time evolution of the mass of bioaccumulated Ba (circles), Sr (triangles) and Ca (diamonds) per total dry mass of the cells (mg/g) for a culture of *Gloeomargarita lithophora* in BG-11 medium with 50 μ M of strontium and 50 μ M of barium.

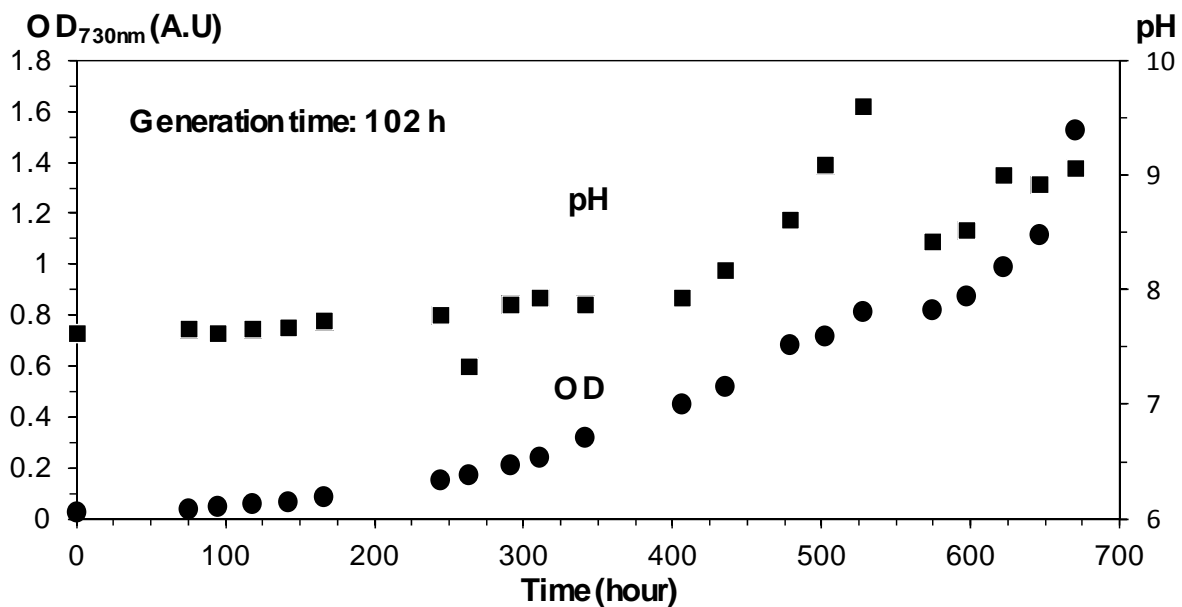


Figure S10. Time evolution of pH (squares) and OD (circles) in a culture of *Gloeomargarita lithophora* inoculated in BG-11 medium with 245 μM of Ba and Sr. Analytical precisions on measurements were 0.005 and 0.01 for OD and pH, respectively.

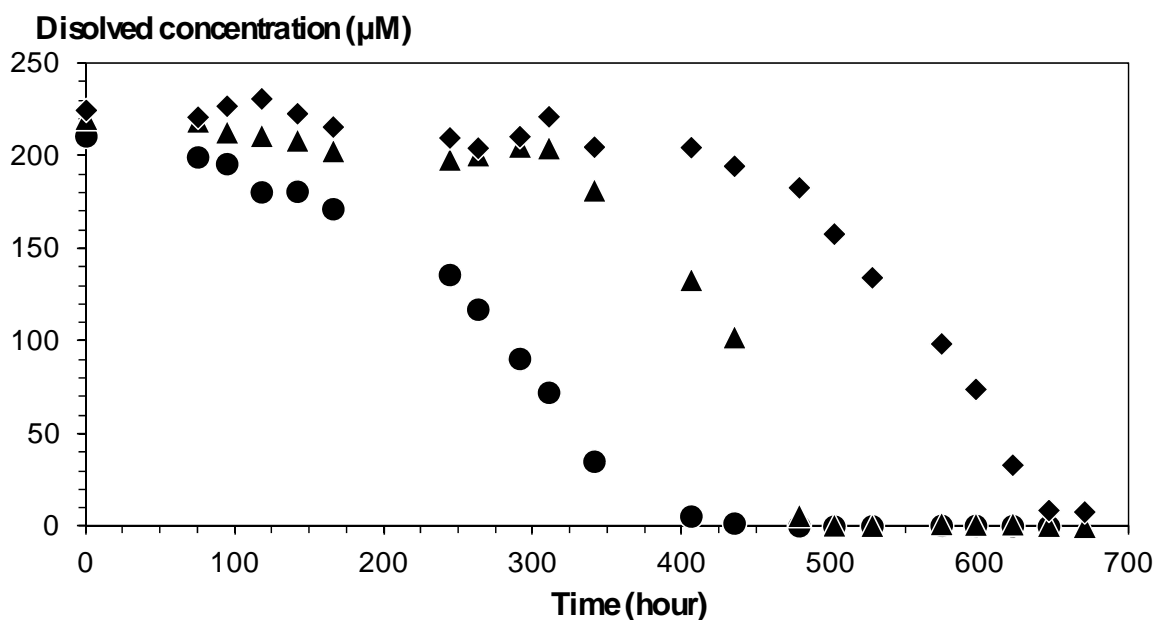


Figure S11. Time evolution of extracellular dissolved Ba (circles), Sr (triangles) and Ca (diamonds) concentrations in a culture of *Gloeomargarita lithophora* in BG-11 with 245 μM of strontium and barium. Analytical error bars are smaller than the size of the symbols.

Culture	BG-11 without Sr and Ba				BG-11 with 50 μM of Sr and Ba			
	1	2	3	Average \pm standard deviation	1	2	3	Average \pm standard deviation
Generation time (h)	110	109	105	108 \pm 2	80	96	99	92 \pm 8

Table S1. Generation time of cultures of *Gloeomargarita lithophora* in BG-11 with and without Sr and Ba.