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Study of Mg-carbonate precipitation by laboratory cultivated microbialites

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Microbial populations can mediate the precipitation of Mg-rich carbonates as shown by the existence of hydromagnesite stromatolites in highly alkaline lakes. Although these microbially-formed carbonate rocks form under fairly different conditions and involve different mineral phases than those found in the subsurface, their study offer a good opportunity to progress on several issues of interest for the field of Geologic carbon capture and storage (CCS). Here, we will show results obtained from hydromagnesite microbialites initially collected from a Mg-rich alkaline lake then cultivated in the laboratory under known chemical conditions. To achieve the study of these samples, we used a combination of molecular biology approaches (construction of 16S rRNA gene libraries) and microscopy observations, including confocal laser scanning microscopy, electron microscopies (TEM and SEM) and scanning transmission x-ray microscopy. From these results, we will discuss several issues: first, what processes are involved in the biomineralization of carbonates in these systems and are there different mineral products associated with different microbial microenvironments? Second, is a large fraction of the high diversity of these microbial populations involved in biomineralization? Finally, what is the impact of carbonate precipitation on microbial cells (e.g., how much do they localize precipitation outside/inside of the cells)?