Dolomite in microbial mats from sabkha (Qatar): insights from combined Raman-Atomic Force Microscopy study.

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The formation of dolomites has been reported in the extreme environment of Arabian Gulf sabkhas (Illing, Wells *et al* 1965). Many of the sites are characterized by extensive growth of cyanobacterial mats. Carbonates precipitation at low-temperature appears to be impacted by microbial extracellular polymeric substances (EPS) (Dupraz *et al* 2005). Cyanobacteria are key producers of EPS, but so far no information has been gathered on their involvement in dolomite precipitation.

The first objective of this study was to gain insights into the spatial distribution of cyanobacterial EPS and dolomite in different sediment layers of Khor Al-Adaid sabkha (Qatar) Secondly, this project aims to characterize microbial mats in respect of organic and inorganic components on a molecular level. For this purpose, *in-situ* 2D Raman spectroscopy and Atomic Force Microscopy (AFM) were used. Additionally, samples have been anazysed with scanning electron microscopy (SEM) and X-ray difraction (XRD),.

Our results showed that Raman fingerprints of dolomite (~1098,~725 and 300cm^{-1}), cyanobacterial EPS (~1130-1148 cm^{-1}) and carotenoids (1507 and 1000cm^{-1}) are widely distributed in the top 2 cm of the sabkhas sediments. The mineralized EPS have been observed by SEM analysis, and dolomites have been identified by means of XRD.

2D chemical imaging of sediment layers, spectroscopically characterized minerals and organic matter of microbial origins at high spatial resolution. Raman mapping identified small dolomite clusters (<2um) embedded in a dense cyanobacterial EPS matrix. Therefore, our data provide evidence for an interaction between cyanobacterial molecules, especially EPS, and dolomite in the sabkhas top sediments. This study demonstrated that Raman mapping is a robust and sensitive technique for acquisition of *in situ* information from complex biofilm-minerals samples.

[1] Illing *et al* (1965). Dolomitization and Limestone Diagenesis. Ed. by Lloyd Pray and Raymond Murray.13:89-111. [2] Dupraz *et al* (2009).*Earth-Science Reviews* **96**:141-16.

High-pressure amphibolite facies metapelites of Carrancas *Klippe*, Southern Brasília Belt, Brazil

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The Carrancas *Klippe,* is composed from base to top by a pure to micaceous quartzite, grading vertically to a staurolite-garnet-chloritoid-chlorite phyllite or porphyroblastic kyanite-staurolite-garnet schist, depending on the conditions of metamorphism. The metamorphism recorded in these rocks increases to the southeast, from upper greenschist facies to transition of amphibolite to eclogite facies, as a result of the development of Brasilia Belt. Metamorphism was modeled using THERMOCALC, via pseudosections and optimal geothermobarometry. In Estancia Hill, rocks of top portion had peak metamorphic conditions calculated as 10.0 ± 1.7 kbar and 577 ± 8 °C and for Bicas Hill, lower rocks, metamorphic peak conditions were attained at 12.9 ± 1.0 kbar and 608.5 ± 19.5 °C, with retro-metamorphism taking place at 7.0 ± 2.2 kbar and 541.5 ± 25.5 °C. The mineral paragenesis of the studied samples are typical of the greenschist and upper amphibolites facies, respectively. However, the modeling indicates these rocks were exposed to higher-pressure conditions, reaching the transition to eclogite facies. The restricted bulk compositions of these true pelites allow the mineral associations to persist through conditions of higher pressure, as pointed in some theoretical studies.

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DOI:10.1180/minmag.2013.077.5.16