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C isotope fractionation during heterotrophic activity driven carbonate precipitation

Nurgul Balci and Cansu Demirel
İstanbul Technical University, Department of Geological Engineering, Turkey (ncelik@itu.edu.tr)

Stable carbon isotopic fractionation during carbonate precipitation induced by environmentally enriched heterotrophic halophilic microorganims was experimentally investigated under various salinity (% 4.5, %8, %15) conditions at 30 °C. Halophilic heterotrophic microorganims were enriched from a hypersaline Lake Acigöl located in SW Turkey (Balci et al.,2015) and later used for the precipitation experiments (solid and liquid medium). The carbonate precipitates had relatively high δ13C values ($-$4.3 to $^{-1}$6.9 ‰ compared to the δ13C values of the organic compounds that ranged from $-$27.5 to $-$25.4 ‰Àt salinity of 4.5 % δ13C values of carbonate ranged from -4.9 ‰ to -10.9 ‰ with a 13C-enrichment factor of +20 to +16 ‰ higher than the δ13C values of the associated DOC (-27.5) . At salinity 8 % δ13C values of carbonate ranged from -16.3 ‰ to -11.7 ‰ with a 13C-enrichment factor of+11.3 to+15.9 ‰ higher than the δ13C values of the associated DOC. The respected values for 15 % salinity ranged from -12.3 ‰ to -9.7 ‰ with a 13C-enrichment factor of +15.2 to+16.8 ‰ higher than the δ13C values of the associated DOC. The carbonate precipitates produced in the solid medium are more enriched in 13C relative to liquid culture experiments. These results suggest that the carbon in the solid was derived from both the bacterial oxidation of organic compounds in the medium and from the atmospheric CO_2. A solid medium used in the experiments may have suppressed convective and advective mass transport favouring diffusion-controlled system. This determination suggests that the rate and equilibration of CO_2 exchange with the atmosphere is the major control on C isotope composition of carbonate minerals precipitated in the experiments.

Key words: Lake Acıgöl, halophilic bacteria, carbonate biomineralization, C isotopes

References

Nurgul Balci, Meryem Menekşe, Nevin Gül Karagüler, M. Şeref Sönmez,Patrick Meister 2015.Reproducing authigenic carbonate precipitation inthe hypersaline Lake Acıgöl (Turkey) with microbial cultures. Geomicrobiology Journal DOI: 10.1080/01490451.2015.1099763. TUBITAK (The Scientific and Technological Research Council of Turkey) Grant to N. BALCI (113Y464).