Goldschmidt 2023 Abstract
https://doi.org/10.7185/gold2023.15493

Microbial Influences on the morphology and geochemistry of hydrated Mg carbonates in Lake Salda, Turkey

NURGUL BALCI[1], YAGMUR GUNES[1], MATTHEW J BALDES[2] AND TANJA BOSAK[2]

[1]Istanbul Technical University

[2]Massachusetts Institute of Technology

Presenting Author: ncelik@itu.edu.tr

Orbital measurements have detected hydrated Mg-carbonates in Jezero crater, Mars. Constraining the origin of carbonates on Mars and understanding their ability to record potential biosignatures relies on our understanding on analog sites. The microbialites in Lake Salda offer insights into the environmental and biological factors that enable the formation of these minerals and preservation of biological signals. Here, we aim to describe the morphology and petrographic features of microbialites along with their isotopic characteristics (C and O). These features of microbialites from Lake Salda are then compared to the features observed in authigenic magnesite and hydromagnesite deposits that occur predominantly as veinlets and nodules in the intensely altered and serpentinized ophiolitic rocks of Southwestern Turkey.

Modern microbialites range from a few cm in height along the shoreline of the lake to 1–2 m high at water depths of 5–20 m below the present lake level. Thrombolites are by far the most predominant form of microbialite in Lake Salda, with small stromatolites, defined by regular lamination, restricted to certain parts of the lake. The thrombolites exhibit a wide range of external morphologies including domical, mini columns, bulbous and tabular formations which vary considerably in size, as well as more irregular and columnar structures up to a few meters high. Hydromagnesite is mainly associated with a thick organic matrix composed of exopolymeric substances (EPS). The hydromagnesite meso and microclots, stromatolitic and dendritic structures contribute to the diverse macroscopic morphologies of thrombolites. Petrographic observations revealed the association of erect and non-erect filaments with clotted textures, and peloids that range in size from 50 to 100 µmIsopachouslaminae (ca. 200 µm) associated with peloids, and filament-like structures and fibrous aragonite fans also attest to abiotic precipitation in the lake. The Lake Salda microbialites are characterized by positive $\delta^{13}C_{PDB}$ values (up to + 6 ‰). Comparison with the preliminary $\delta^{13}C_{PDB}$ values of vein-stockwork magnesite (-10 to -15 ‰) and authigenic hydromagnesite (-8.2 to 3.2 ‰) suggests that these values in Lake Salda record evaporation and phototrophic fixation of CO_2. These morphological and geochemical analyses demonstrate the potential of hydromagnesite microbialites to record signals of biological processes.