

Sulfur mineralogy and speciation in the shallow-sea hydrothermal sediments off Milos island (Greece)

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Shallow-sea hydrothermal vents of the volcanic island of Milos (Greece), discharge hot (up to 111°C), H₂S-rich and slightly acidic (pH 4-5) hydrothermal fluids to the marine environment. The system hosts chemolithotrophic sulfide oxidizing and sulfate reducing microbial communities that form white microbial patches and facilitate precipitation of various S-bearing mineral phases, including elemental S and Fe-sulfides.

This research aims to shed light on S-mineralogy and speciation in Milos hydrothermal sediments. Following in-situ measurements of the local physico-chemical parameters, surface cores (22 cm) were collected and sectioned into 2 cm intervals. Preliminary investigation included bulk XRD characterization and bulk ICP-MS analyses, along with SEM-EDS examination. Abundant Fe-S phases mainly occur in 18-20 cm depth, where distinct metalloid and chalcophile elements are also concentrated (As, Tl). Also, the radionuclide content was studied using γ -ray spectrometry.

Synchrotron-based μ -XRF elemental maps, μ -XRD and S *K*-edge μ -XANES spectroscopy, were utilized to examine S distribution and speciation in the samples. S is mainly correlated to Fe and As, corresponding to both crystalline and amorphous mineral phases. Except sulfidic sulfur, other oxidation states have been detected in the solids, corresponding to sulfates and a variety of mixed S-phases which are currently investigated by means of transmission electron microscopy (TEM).