

White smoker at 20 m water depth at Panarea's submarine volcano, Aeolian island, Italy

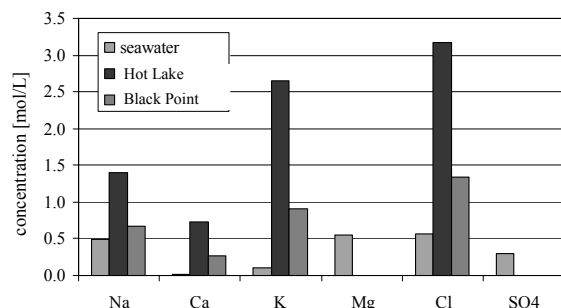
B. MERKEL¹, R. BECKE², T. POHL³, M. SCHIPEK¹
AND R. SIEHLAND¹

¹TU Bergakademie Freiberg, 09599 Freiberg, Germany
(merkel@geo.tu-freiberg.de)

³University Leipzig, 04009 Leipzig, Germany

²Geo Dive, Sachsenhoferstr. 10, 09599 Freiberg, Germany

Off Panarea Island, Sicily, between the active volcanos of Stromboli and Vulcano, hot water and gases with temperatures up to 130°C are emitting from the sea floor at depths between 8 and 30 m. Samples were taken by scuba diving from 2006 to 2008 and analyzed for stable isotopes (O, S, Sr) and 68 elements by ICP-MS. One major problem in submarine sampling is seawater dilution of the emitting fluids. By means of the ⁸⁷Sr/⁸⁶Sr ratio, dilution factors were determined and the probable composition of emitting fluids without the influence of seawater was calculated. Two distinct water types were found to exist, presented by the locations "Hot Lake" (HL) and "Black Point" (BP).



BP is the most prominent sites within the caldera as it emits grayish colloids and particles in times of increased activity, as e.g. during the 2002/2003 gas outburst or when actively disturbing the hydraulic conditions. These types of white smokers have previously only been known to exist at greater depths (> 2000 m). Even though REM-EDX, XRD, and XRF studies reveal that massive Zn and Pb sulphides (Galenite and Sphalerite) are precipitating from the emitting fluid, the solution is still supersaturated with regard to Chalcopyrite, Pyrite, Greigite, and Sulphur. At HL on the other hand no precipitations are observed and the emitting fluid is substantially enriched in major cations and anions as well as Li, Rb, Fe, Cs, I, Ba, Zn, Pb, Cu, Co, Se, As, Cr, and Mo (up to 10,000 times). Explaining provenance of the fluids and trigger mechanisms for formation of white smokers at shallow depths as observed at BP will be followed up by modeling.

Incorporation of U(VI) into biogenic carbonates: Molecular scale studies

M.L. MERROUN^{1,2*}, C. RODRIGUEZ-NAVARRO³,
J.M. ARIAS², G. BERNHARD¹
AND M.T. GONZALEZ-MUÑOZ²

¹Institute of Radiochemistry, FZD, Dresden, Germany
(merroun@ugr.es)

²present address: *Department of Microbiology, University of Granada, Granada, Spain

Concerns about the mobility of radionuclides in the environment have focused attention on their interactions with carbonate minerals, which are among the most common secondary phases forming in near-surface environments. Although that many of the carbonates found in the natural environment are considered to be of biogenic origin, very few studies on the importance of these minerals in the sequestration of radionuclides were performed. In this work, a combination of microscopic and spectroscopic techniques was performed in order to investigate, at molecular scale, the mechanism of incorporation of U(VI) into vaterite, a metastable calcium carbonate polymorph, precipitated by the cells of *Bacillus sphaericus* JG-7B. Several lines of evidence (XRD, SEM/EDX) show that U is incorporated into the biotic vaterite structure and not present in a second phase. Field emission scanning electron microscope (FESEM) reveals that U(VI)/co-precipitated vaterite has spherulite morphology. Infrared and HRTEM indicate that the organic matter of the bacterial cells (polysaccharides and amine acids) may help to the stabilization of the U(VI)/co-precipitated vaterite and it may participate in its long-term immobilization. EXAFS spectroscopy analysis demonstrate that the local environment of U incorporated into biotic vaterite is very similar to that of the mineral liebigite, Ca₂UO₂(CO₃).11H₂O, where the uranyl ion is coordinated to three carbonate ion groups in a bidentate fashion mode. These results showed that no change in uranyl coordination is required for its incorporation into biogenic vaterite.