Fe-rich stalactites from Libiola mine: Mineralogical and geochemical features

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The aim of this work is to characterize the mineralogy of different-shaped Fe-rich stalactites as well as to investigate the physico-chemical parameters of the associated mine and drip waters. The mineralogy has been investigated by means of reflected and transmitted light microscopy, XRPD, SEM-EDS, EPMA-WDS, and TEM-EDS analyses. Mine and drip waters have been sampled for chemical analyses. Water temperature, electrical conductivity, alkalinity by acidimetric titration, pH, and Eh were determined in the field during sampling. In the laboratory, waters have been analyzed for: Mg, and Ca by AAS, Na and K by AES Cl, SO_4^{2-}, and NO^{3-} by ion-chromatography, Si, Fe, minor and trace elements by ICP-OES. Three different types of stalactites were distinguished on the basis of their morphology: 1) "soda straw"-, 2) "deflected"-, and 3) "coned shaped"-stalactites. Mineralogical results showed that all the samples are characterized by poorly crystalline Fe-rich phases associated to goethite with different degree of crystallinity. Nevertheless, there are significant differences either in their texture and chemistry. The "soda straw" stalactites are enriched in Cu and Zn and evidenced botroydal to mammellonar textures; the "deflected" stalactites are enriched in Ni and showed concentric layering characterized by sheaves of radiating fibers; the "coned shaped" stalactites are enriched in Cu, Zn and Ni and evidenced a concentric layering maked by the alternance of botroydal/mammellonar and fibrous-radiating textures. Geochemical investigations evidenced that the composition and physico-chemical parameters of mine and drip waters are in any case different from the other AMD occurrences in the mining area [1, 2]. All water samples contain Cu, Ni, and Zn to appreciable levels, and the physico-chemical conditions are consistent with stability of ferrihydrite, which however tends to transform to goethite upon ageing. Few of the mine waters plot close to the metastability field of schwertmannite.

[1] Dinelli & Tateo F (2002) *Appl. Geochem,* **17**, 1081–1092.
[2] Marini *et al.* (2003) *Geochem J.* **37**, 199–216.

1998-2010 more than ten years of soil CO_2 flux measurement at Solfatara of Pozzuoli (Campi Flegrei, Italy)

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With a flux of deeply derived fluids of ~5000 t/d and an energetic release of ~100 MW Solfatara of Pozzuoli is one of the largest studied volcanic-hydrothermal system of the world. Since 1998, CO_2 flux surveys where performed using the accumulation chamber method: i) over a large area, including the volcanic apparatus and its surroundings, ii) at fixed points inside the crater and ii) by two automatic stations. The monitoring of CO_2 fluxes allowed to recognize both "long-term" and "short-term" variations in the degassing of the Solfatara system. The main "long-term" CO_2 flux variation consisted in the expansion of the area interested by anomalous soil CO_2 degassing which doubled since 2003. This variation mainly occurred external to the Solfatara cone in correspondence of a major fault system NE-SW oriented and was correlated with the occurrence in 2000 of relatively deep, LP seismic events, which were interpreted as the indicator of the opening of an easy-ascent pathway for the transfer of magmatic fluids towards the shallower domain hosting the hydrothermal system. The input of these magmatic fluids has been highlighted by the changes in the chemical and isotopic compositions of fumarolic fluids. "Short-term" variations of CO_2 flux were recorded by both automatic stations and at fixed measurement points. A marked peak of the mean CO_2 fluxes of fix points inside the crater occurred in 2000, probably connected with the 2000 seismic crises. In 2006 an evident anomaly was registered outside the crater. This anomaly was interpreted as due to shallow permeability changes along the NW–SE fault, induced by an earthquake swarm of October 2006. The physical feasibility of the interpretations of these variations was assessed by physical-numerical simulations of the gas along a "faulted" hydrothermal system. The relevant changes observed at Campi Flegrei since 2000 have to be taken in to consideration for the interpretation of the behaviour of this dangerous volcano.