



## Thermal stability of metalorganic compounds on volcanic olivine

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Previously unknown class of metalorganic compounds revealed in meteorites [1] also found on the surfaces of silicate phases such as olivine, may have been involved in the emergence of life. Here, the thermal stability of such organic compounds has been experimentally investigated under conditions which simulate those extant on the early Earth. We have studied olivines from the Hawaiian eruptions of 1959 and 2018. Individual mineral grains have been hand-picked to be free of secondary phases such as pyroxene or melt. We use a high temperature gas-tight tube furnace under CO-CO<sub>2</sub> gas mixture at temperatures ranging from 950°C to 1350°C and oxygen fugacity ranging from 10<sup>-12</sup> to 10<sup>-10</sup> bar, within the stability field of olivine. The samples were contained in Pt crucibles and held for dwell times of 1 to 64 h. Quenching was performed by lifting the samples vertically out of the tube furnace. Using EPMA (electron microprobe analyzer) and RAMAN spectroscopy, we have mapped the state of the olivine samples. We observe that the composition of the individual mineral grains remains stable and homogeneous with thermal treatment. We are also investigating the role of impurities and cracks in the natural olivine and synthetic forsterite that might influence our study. The metalorganic cargo of these olivines has been analyzed using FT-ICR-MS (Fourier Transform ion cyclotron mass spectrometry). Preliminary results reveal systematic changes or organic molecular composition depending on time and heat of thermal treatment whose origins will be discussed.

[1] A. Ruf, B. Kanawati, N. Hertkorn, Q. Yin, F. Moritz, M. Harir, M. Lucio, B. Michalke, J. Wimpenny, S. Shilobreeva, B. Bronsky, V. Saraykin, Z. Gabelica, R. D. Gougeon, E. Quirico, S. Ralew, T. Jakubowski, H. Haack, M. Gonsior, P. Jenniskens, N. W. Hinman, P. Schmitt-Kopplin. (2017) Previously unknown class of metalorganic compounds revealed in meteorites. PNAS 114 (2017) 2819-2824.