Abiotic synthesis of volatile and condensed organic compounds in the deep oceanic lithosphere

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Primitive environments favorable for life emergence is a missing key to the search for life and its origin in our solar system. Here we show that a combo of magmatic degassing and olivine hydration can provide unexpected precursors for prebiotic reactions and life development in igneous rocks. We identified gases (N_2, H_2, CH_4, CH_4S) and various poly-aromatic carbonaceous compounds in olivine fluid inclusions forming the present-day oceanic lithosphere. They are associated with nanodiamonds, serpentine, magnetite, and carbonates at the micrometer scale. They result from drying while cooling of entrapped C-O-S-H magmatic fluids below 400°C, P<300MPa.
This considerably enlarges the range of abiotic organic compounds on the modern and primitive Earth, available for biotic and prebiotic chemistry. The occurrences of such complex carbonaceous material trapped with other primordial ingredients in micro-cavities, offers new pathways for abiotic organic synthesis in hydrothermal environments, on Earth and other planetary bodies, such as Mars where undisputable traces of life is actively sought.

Mots-Clés : carbonaceous material, serpentinization, oceanic lithosphere

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