Olivine dissolution and hydrous Mg carbonate and silicate precipitation in presence of a microbial consortium

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Olivine is an important mineral that controls the sequestration of atmospheric CO_2 in the form of carbonate minerals during chemical and biological weathering of (ultra)mafic rocks [1]. Despite significant efforts in the characterization of olivine reactivity and coupled secondary mineral precipitation both in abiotic [2, 3] and biotic systems [4, 5], little is known on olivine behavior in the presence of bacterial consortia, which are the dominant forms of life impacting mineral reactivity in natural settings. In this work, the interaction of olivine with a bacterial consortium composed of typical freshwater cyanobacterium *Synechococcus* sp. and heterotrophic aerobic *Pseudomonas reactans*, was studied. The precipitation of secondary mineral phases was characterized via i) monitoring various biological and physicochemical parameters and ii) microscopic observations and associated analyzes.

Our results show for the first time the effectiveness of such a consortium in the dissolution and precipitation processes. Indeed, heterotrophic bacteria and their organic exometabolites enhanced the release of Mg and Si and produced leaching features at the olivine surface whereas cyanobacterial photosynthesis raised the pH and favored precipitation of brucite and hydrous Mg carbonates (hydromagnesite, nesquehonite) and silicates (sepiolite).

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