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Mineralogy, aqueous history and biosignature preservation potential of bedrock deposits at Oxia Planum, ExoMars 2022 landing site - Spectral characterization of terrestrial analogues.

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In 2022, ESA/ROSCOSMOS will launch the ExoMars2022 rover mission to Mars. The selected landing site for the mission is Oxia Planum, a wide, Noachian-age, phyllosilicate-bearing plain located on the SE border of Chryse Planitia. The Fe,Mg-rich clay mineral deposits at Oxia Planum are one of the largest exposures of this type on Mars, with a thickness of more than 10 m. They clearly record complex water-rock interactions and as such are a promising target to answer scientific questions posed by the ExoMars 2022 mission pertaining to the history of water and the geochemical environment in the shallow Martian subsurface, and the ancient and present habitability of the planet.

From the spectral analysis by CRISM and OMEGA, bedrock deposits at Oxia appear to contain vermiculite, a hydrous 2:1 phyllosilicate. But the exact mineralogy of the deposits and their origin is not yet fully understood. To fill this gap, and to better prepare for in-situ analyses by the ExoMars2022 rover, we performed a survey of potential terrestrial analog rocks by determining their mineralogy and NIR spectra for comparison with CRISM and OMEGA spectra of bedrock deposits at Oxia. The study focused on Fe-rich, trioctahedral vermiculite.

Two terrestrial sites were identified and studied: Otago, New Zealand with vermiculitized chlorite-schists that underwent alteration without significant oxidation; and Granby, Massachusetts with basaltic tuffs containing Fe-rich clays of apparent hydrothermal origin filling amygdales. Both analogues have been added to a newly built Planetary Terrestrial Analogue Library (PTAL) collection. The PTAL collection aims to provide the scientific community with analogue rocks to help characterize and define the mineralogy and geochemistry of landing sites on Mars chosen for in-situ analyses (www.ptal.eu).

The analogue comparisons reveal that Oxia bedrock deposits consist of Fe-rich, trioctahedral vermiculite, which is well crystallized and probably mixed with minor saponite. Additionally, NIR data analysis suggests that the deposits were not oxidized, nor illitized after formation. Based on

this study, Oxia's bedrock deposits may have formed from: (1) hydrothermal or magma fractionation-related origin of phyllosilicates and formation as an ash-fall deposits or (2) chlorite-rich sediment transported to a basin where chlorite was subsequently altered to vermiculite under anoxic, reducing conditions. The detailed characterization of the analogues and discussion of processes inferred for the evolution of Oxia Planum will be presented during the meeting.

Vermiculite, with its high surface area and exchange capacity, has great potential to store organic compounds. The mineralogy of the bedrock deposits at Oxia, along with the anoxic, reducing conditions that might have been prevalent during Noachian time would be advantageous for retaining and preserving organic matter and make it a promising site for future analysis.