27th IAA SYMPOSIUM ON HUMAN EXPLORATION OF THE SOLAR SYSTEM (A5)
Interactive Presentations - 27th IAA SYMPOSIUM ON HUMAN EXPLORATION OF THE SOLAR SYSTEM (IP)

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TESTS WITH COSTA RICAN VOLCANIC ROCKS FOR THE CREATION OF A MARTIAN REGOLITH SIMULANT.

Abstract

Research on Mars underscores the importance of developing methods for bioremediation of Martian soil for sustained human missions, enabling self-sufficiency without relying on transporting Earth materials. This advancement paves the way for potential human settlements on the planet. Currently, costly artificial simulants are used, prompting exploration into natural alternatives like volcanic rocks with basaltic or picritic compositions, abundant in volcanic regions, for instance, Hawaii. Despite Costa Rica's predominantly andesitic nature due to its island arc origin, occasional basalts, akin to those from select Arenal volcano eruptions or specific geological formations, offer potential suitability for such purposes. The project aims to simulate the mostly basaltic composition of the Martian regolith using materials composed mainly of iron oxides, silicates and sulfates obtained from the igneous rock formations of the Costa Rican volcanic arc, such as the unit AR-20 on the Arenal volcano's stratigraphy and the alkaline basalt deposits present in the Garita deposit, in the province of Alajuela. The mentioned components are sifted and combined with other minerals in order to recreate a granulometry and chemical composition akin to the Martian regolith, maintaining an aseptic process that avoids cross-contamination of minerals.

Subsequently, the chemical composition of the sample is analyzed through X-ray diffractometry, and the physical characteristics such as grain size, porosity and structure are verified via microscope observation. Acquiring this data enables a statistical evaluation of commercial regolith samples against the simulated version, showcasing the representativeness of the Costa Rican regolith simulant for Martian soil. Therefore, creating a cost-effective simulant conducive to bioremediation research at both the national and Latin American scales is imperative. This endeavor aims to foster an environment conducive to space research processes across Latin America, thereby catalyzing substantial advancements that streamline the path towards future Martian settlements.