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EXTRACTION OF IRON AND SILICON FROM REGOLITH SIMULANTS USING A MICROBIAL APPROACH IN COMBINATION WITH 3D PRINTING TECHNOLOGY

Abstract

Construction materials are essential to establish a colony on another celestial body. These construction elements are generally bulky and heavy, which makes re-supply from Earth difficult and tremendously expensive. One idea to solve this problem is in situ resource utilization. We demonstrate a novel way to utilize resources on any celestial body with a minimum of technical equipment by using microbes in a controlled environment. An inflatable bioreactor containing bacteria able to process regolith and extract elemental iron and silicon could be a low-cost solution for extraterrestrial biomining. The environment on any other planet within human reach is extremely hostile to organisms (high radiation, different gravitation and atmosphere). We are employing bacteria that were synthetically modified to work well under these extreme conditions, and we are currently testing the same approach in combination with 3D-printing technology to directly utilize any extracted material. This novel technique would enable an on-demand production of construction elements and, therefore, pave the way towards the construction of a moon village and Mars colony.