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20th IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND DEVELOPMENT (D3)
Systems and Infrastructures to Implement Sustainable Space Development and Settlement - Systems (2A)

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SUSTAINABLE MINING FOR CONSTRUCTION OF MARTIAN STRUCTURES

Abstract

The coming decade will see crewed missions to Mars and long-term human settlements. In situ resource utilisation is the key to a sustained human presence on Mars. Martian mining will enable the development of architecture, transport and life support systems and other technologies while also contributing to the economic growth.

Although mining is very crucial, it also needs to be eco-friendly and sustainable to avoid depletion and contamination of valuable resources. This paper looks into two study cases. The first is the recyclability and reusability of structures on Mars to reduce the strain of mining. A feasibility study is undertaken and the materials and processes that can be used to build different Martian structures are reviewed. They are then categorized based on efficiency, cost and the number of times recycling can occur, among other factors like by-products of the process, necessity of human intervention, etc. This would help in selecting sustainable materials and processes for different use cases such as habitation and transportation based on the requirements involved.

The second aspect of the paper involves the creation of a technical framework which outlines the best mining practices for various structures on different terrains. The two study cases complement each other and will help create a sustainable Space Habitat on Mars.