

16th IAA SYMPOSIUM ON BUILDING BLOCKS FOR FUTURE SPACE EXPLORATION AND  
DEVELOPMENT (D3)Novel Concepts and Technologies to Enable Future Building Blocks in Space Exploration and  
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TU Delft, The Netherlands, B.Lehner@tudelft.nlBIOREACTOR DESIGN TO PERFORM MICROBIAL MINING ACTIVITIES ON ANOTHER  
CELESTIAL BODY**Abstract**

Transporting materials from Earth to the Moon adds additional costs to a mission and limits other mission activities. Thus, a sustained settlement on any celestial body will be enhanced if it can perform elemental extraction and utilization in situ. In this study, all requirements to test a novel, biological approach for ISRU are validated. We present designs for a lander with a fully autonomous bioreactor, capable of taking in lunar regolith and extracting pure elements from it via biological processes. Simulations and 3D models of the bioreactor and complete lander will clarify its benefits as well as limitations in comparison to other mining approaches. Furthermore, the interconnection with additional biological systems (human astronauts, life support systems, etc.) is assessed in terms of nutrient recycling and self-sufficiency. The bioreactor design may be a new building-block for a variety of future missions and could pave the way towards a more sustainable future in space exploration.