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Life and Microgravity Sciences on board ISS and beyond (Part II) (7)

Author: Mr. Trevor Kalkus
University of Fribourg, Switzerland, United States, tkalkus@alumni.stanford.edu

Dr. Nils Averagesch
Universities Space Research Association, United States, nils.j.averesch@nasa.gov

Mr. Benjamin Lehner
TU Delft, The Netherlands, B.Lehner@tudelft.nl

THE POWER OF LIFE - HOW BIOLOGY CAN HELP ADDRESS THE LONG TERM ENERGY
DEMANDS OF SPACE COLONIZATION

Abstract

New technologies to improve the sustainability of space exploration are essential to expand human activities on other celestial bodies. Current efforts to enhance our capability for in situ resource utilization (ISRU) are a promising way to increase sustainability and reduce costs. However, they are often constrained by the mass and energy requirements of transporting processing machinery and consumables. Self-reproducing biological systems could enable a variety of ISRU activities (regolith alteration, gas production, material extraction, recycling processes . . .) while at the same time minimizing the operational prerequisites. Synthetic biology approaches can improve the efficiency of the particular methods and the tolerance to the harsh space environment. We present an overview of the state-of-the-art of biological ISRU and consider future pathways. Finally, limitations due to planetary protection and nutrient-supply are analyzed to determine the applicability for future space missions.