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IMPROVEMENT IN MECHANICAL PROPERTIES OF FUNGAL-BACTERIAL BIOCOMPOSITES AS SPACE CONSTRUCTION MATERIAL - TRANSGENIC MICROORGANISMS IN MWALLD

Abstract

Biocomposites have long stood as a promising alternative to current methods of structural development, and have proven by efforts of mWALLd to have even bigger potential for use in outer space. Aside from their advantageous factors in high radiation resistance, general shielding, the possibility of self-reparation and adaptable processing and build, as all materials, those too rise concerns, mainly relating to low mechanic rigidity. This paper serves as a study of modifications aiming at the reinforcement of the reliability of a fungal/bacterial composite as a structural material. On-site-produced polymers made from bacteria-produced hydrocarbons and their derivatives are likely to increase cohesion, while compression endurance could be achieved by the incorporation of native regolith as a scaffold for microbiological growth - included minerals allow microbial synthesis of complex compounds, serving further functions such as enabling biomineralization or decreasing fracture vulnerability in combination with the organic fraction. The use of the recombinant expression in fungi and bacteria of elongated and branched morphology may lead to higher elasticity, as titin, CLPs (collagen-like proteins) and other fibrous proteins could be produced. Other complex biominerals could in turn provide greater stiffness and an additional increase in cohesion. Furthermore, bacterial cellulose production and biofilm-forming qualities of used bacteria such as the presence of pili and flagella could yield better mechanic rigidity. Additional reinforcement might be provided by fungal hyphae aerogel made from elastic and cohesive species, and genetic modification of the fungus.