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BIO POLYMERS FOR IN SITU SPACE SUIT TEXTILE PRODUCTION AND REPAIRMENT

Abstract

Bio Polymers for in situ Space Suit Textile production and repairment is a project within the framework of TWSS (Team Walk Space Suit) – educational program and an open platform for modular spacesuit design, which brings together international and multidisciplinary team of students from various universities and young professionals with different backgrounds and skillset to develop a new generation of experimental and functional MoonMars EVA suits. The program started as an interfaculty course at the Royal Academy of Art in collaboration with ILEWG. "Sustainable Space" module within the TWSS project is Bio polymers investigation, namely how they can offer smart and sustainable options for in situ textile production and repair works during a space mission. The research explores simple processes for production of bio-based, compostable types of plastics taking into account limited resources available during a space mission. Within the framework of this research, waste utilization scenarios are investigated to source ingredients for bio-plastics. On Earth, compostable plastics offer environmental benefits as sustainable, carbon-neutral and renewable materials compared to synthetic polymers. In space exploration uses of bio polymers can expand offering solutions to some specific challenges that astronauts experience. Bio polymers can be self-healing or used as a kind of "glue" to fix broken or torn materials. Protocols for the astronauts are developed to produce bio polymers and mold them into specific shapes in situ while on a mission. The variety of recipes allows creating a wide range of plastics from very solid hard plastics to latex like textiles. As a result, the number of materials required onboard will decrease. With the support of industrial partners, we are developing self-healing types of bio plastics. Production, use and performance of bio plastics in a Moon-like extreme environment will be tested during the Asclepios mission in Switzerland in collaboration with eSpace at EPFL. The research is disseminated in the form of a bio plastic cookbook that includes a variety of recipes including advantages, limitations and use suggestions. The research is carried out in collaboration with ESA/ESTEC, ILEWG, SupraPolix and is tested on the Asclepios platform. We believe that the amount of advantages bio plastics can offer to make them a practical addition to space exploration missions.