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USING SOLAR SINTERING TO BUILD INFRASTRUCTURE ON THE MOON – LATEST ADVANCEMENTS IN THE REGOLIGHT PROJECT

Abstract

In-Situ-Resource Utilisation (ISRU) will be needed if humans want to sustain their presence on extra-terrestrial bodies for extended periods of time. In the past years, a renewed focus has been put on ISRU concepts, specifically in the context of Additive Layer Manufacturing or 3D printing to be able to create necessary radiation shielding for habitats. Different approaches to use the regolith of the Mars or the moon for building radiation shielded pressurized habitats, unpressurized shelters or for modelling the terrain have been investigated. Project RegoLight progresses solar sintering from a Technology Readiness Level (TRL) 3 to 5 as an alternative Additive Manufacturing (AM) to microwave sintering, contour crafting and others. Solar sintering has the advantage that no binders are needed, building elements

such as interlocking bricks can be sintered with only using the sun and the sand thus reducing the material which needs to be brought from earth. The project RegoLight has been funded through the European Commission and comprises five partners: DLR in Cologne (coordinator), Space Applications Services (Belgium), COMEX (France), LIQUIFER Systems Group (Austria) and Bollinger + Grohmann Ingenieure (Austria). The project started in November 2016 and will end in June 2018. This paper provides a preliminary conclusion of project RegoLight with regard to the projects' main objectives: (a) AM approach for automated fabrication of building elements under ambient conditions. (b) Automated fabrication of larger structures through a mobile printing head in ambient conditions (c) Demonstration of producing a 'building element' block from lunar regolith simulant by applying the solar sintering AM approach, using a solar furnace automated setup, under vacuum conditions. (d) Production of a 'building element' with a fine structure (resolution 1.4 cm) from lunar regolith simulant under ambient conditions. (e) Design and validation of interlocking building elements for a variety of space architecture and mission requirements (f) Characterization of the building elements produced (materials metrology) (g) Study the application of solar sintering element manufacturing in the larger frame of a lunar base architecture (e.g. Moon Village) Latest RegoLight developments also include the description of the next steps to further the technology and mature the outcomes. The RegoLight project demonstrates the viability of solar sintering for establishing a lunar base and other necessary infrastructure made from local resources.