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Author: Mr. Flavio Gioia
Italy

Dr. Claudia Esposito
ASI - Italian Space Agency, Italy

Prof. Luca Valentini
University of Padua, Italy

Dr. Eva Santini
Italy

Mr. Carlo Bettanini
CISAS – “G. Colombo” Center of Studies and Activities for Space, University of Padova, Italy

Dr. Giorgia Franchin
Università degli Studi di Padova, Italy

Dr. Marco D’Agostini
University of Padova - DII/CISAS, Italy

THE GLAMS PROJECT: BUILDING A LUNAR BASE WITH 3D PRINTING AND “LOCAL”
MATERIALS

Abstract

Funded by ASI – the Italian Space Agency, the two-year GLAMS Project aims to develop structural elements for lunar bases using a 3D printing approach that utilizes cement binders extracted from lunar soils (regolith). By utilizing locally available raw materials, the project’s concept is to implement the IRSU (In Situ Resource Utilization) approach to minimize costs and environmental impact associated with transporting raw materials from Earth to the Moon.

The ultimate objective of the project is to develop a production process based on additive manufacturing of structural units (panels) made of regolith-based geopolymers, designed for thermal insulation while also possessing exceptional stability and porosity.

A key aspect of the project involves the production of porous materials, obtained through the generation of foams from geopolymeric slurries. Optimizing such materials necessitates considering various factors, including environmental conditions, wide temperature ranges, reduced gravity, atmospheric pressure, and the potential impact of micrometeorites.

Subsequently, the resulting material will be utilized to fabricate a prototype of the structural element featuring a medium-scale macro-porous structure, created through Liquid Deposition Modelling (LDM) additive manufacturing. These structures will be equipped with a suitable sensor network aimed at continuously monitoring micro-meteoritic impacts.

The aspiration driving the GLAMS Project is to contribute to fulfilling the space agencies’ objectives by establishing semi-permanent human settlements on the Moon within the coming decade.