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# Solar Sintering for Additive Manufacturing on the Moon

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## Abstract

Recently, various concepts have been investigated in the context of building Moon village using ISRU. Regarding this, laser sintering, microwave sintering, Contour Crafting (CC) and Powder Binder Bond Printing (D-shape 3DP) are among the most investigated Additive Manufacturing (AM) techniques so far [1-3]. However, unlimited solar energy source on the Moon combined with absence of the atmospheric fluctuations, make the solar sintering a competent candidate for the On-site manufacturing.

In this context, the project RegoLight investigates sintering of lunar regolith using solar light. RegoLight has been funded through the European program (Horizon 2020) under the lead of German aerospace center (DLR), Space Applications Services (SAS), COMEX and LIQUIFER Systems Group and Bollinger + Grohmann Ingenieure from Austria.

## Objectives:

In this project, AM concept capable of manufacturing building elements under ambient and vacuum conditions is developed and followed by manufacturing 3D printed test geometries. 3D printed test geometries such as bricks and interlocking elements are studied due to their geometrical accuracy as well as their mechanical properties. Subsequently, properties of additive manufactured parts are used in structural engineering to optimize both building elements and full constructions for a lunar environment. In this project, JSC2-A lunar simulant is used as the raw material while studying its sintering feasibility using actual and artificial sun light energy source. Moreover, layering concepts using a translation table and a mobile printing head are investigated. Additive manufactured building block structure out of JSC2-A is shown in Figure 1.

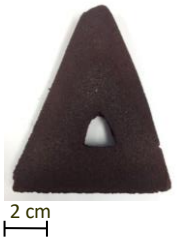


Figure 1: Additive Manufactured building element using solar sintering of lunar regolith simulant.

## Scenarios:

Scenario aims at building a stable structure assembled out of single interlocking elements. The structure targets shielding the pressurized and unpressurized modules from radiation, lunar thermal cycles and micro-meteorites impact. The dome-shape structure concept design is shown in Figure 2.

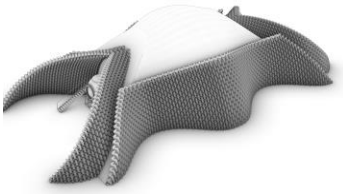

Figure 2: Dome-shape structure designed out of interlocking building elements with an internally integrated inflatable dome structure.

## References

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