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CONSTRUCTION OF MASONRY LUNAR HABITATS USING LASER-SINTERED BRICKS

Abstract

Construction of lunar civil structures using masonry units, laser-sintered from lunar regolith, can be achieved using accessible and abundant in-situ materials and energy resources. The process is robust, easily automated and minimises the need to import heavy equipment from earth. It is possible to construct launch pads, habitats, roads and retaining structures from masonry, using equipment which can be adapted to perform other mission-critical functions. Viable masonry unit shapes are identified and their suitability for constructing a range of lunar infrastructure is evaluated. Options for excavating, transporting and refining the regolith are explored. Suitable structural forms and methods of transporting, placing and fixing the masonry units are identified and evaluated. Preliminary experimental work into lunar masonry production by selective laser melting (SLM) of a basalt lunar regolith simulant is presented. This is the first trial of selective laser melting of a regolith simulant using a C02 laser, with consequent advantages for scalability. The effects of particle size distribution, pre-compaction, laser spot size, laser power, scanning speed, vector spacing and lift-height on unit mechanical properties, density and porosity are reported A new method of joining the bricks by laser-welding is proposed and future experimental work is described which will raise the technological readiness level of selective laser melting as a lunar materials processing technique.