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UTILIZATION OF STEREOLITHOGRAPHY-BASED ADDITIVE MANUFACTURING APPROACH FOR MANUFACTURING OF LUNAR REGOLITH CERAMICS

Abstract

Lunar regolith is a natural material found everywhere on the surface of the Moon, produced by billions years of space weathering of lunar surface. Considering its abundance on the lunar surface, lunar regolith has long been viewed as raw material for In-situ Fabrication and Repair strategy, which can be implemented for long-duration lunar exploration missions. Using in-situ resources is vital for lunar settlement construction and maintenance cost reduction. In this regard, lunar regolith can be used for in-situ additive manufacturing (AM), which can help future astronauts quickly produce on-demand items, spare parts, instruments, and infrastructure elements. The stereolithography-based techniques are amongst the most promising AM approaches for producing precise, high-dense, and tough ceramic parts from lunar regolith. In the present paper, we have described the fabrication of high-dense ceramic parts from LHS-1 lunar regolith simulant, utilizing laser stereolithography approach. We have demonstrated that employing the appropriate grinding and sintering parameters, lunar regolith can be 3d-printed into precise, dense ceramic parts of complex shape. Produced samples were analyzed using gravimetrical densimetry, micro-indentation, optical-microscopy, SEM, and XRD, showing that ceramic material with 97