



Bachelor/Study/Master Thesis
(English)

Fabrication and Characterization of Lunar-Regolith Bricks with Reinforcements



Fig 1: Lunar construction concept, regolith casting and obtained brick

The race to the Moon has recently garnered significant momentum, with both NASA and ESA aiming to restore human presence on the Moon in the near future. Particularly, they aim to establish permanent lunar bases by around 2040 – a goal that will necessitate entirely new construction methods and in-situ resource utilisation (ISRU) strategies.

In this context, our team has conceptualised a novel method of casting bricks using melted regolith in a robotically-fabricated regolith formwork. These free-form bricks (built exclusively from in-situ material) could then be robotically assembled to form a protective vault-like shell hosting the habitat.

Within the scope of this thesis, the student will conduct a systematic parametric study of regolith casting. Beyond varying manufacturing processes and cast geometries, the research will explore the impact of micro-dopants and possible basalt fibre integration on mechanical performance. A central component of the work is the scientific characterisation of fabricated samples using standardised testing methods.

Tasks:

- Design and execute a parametric study varying cast geometry, composition, etc. using lunar regolith simulant
- Investigate the influence of micro-dopants
- Explore basalt fibre integration as a reinforcement strategy
- Perform scientific sample characterisation: mechanical testing, microscopy, etc.
- Document results, compare with literature benchmarks, and derive design guidelines for future brick geometries

Requirements:

- Interest in experimental work; basic materials testing experience
- CAD/parametric modelling; Optical microscopy/SEM/XRD experience is beneficial

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