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# THE CHARACTERISATION OF FIVE REGOLITH SIMULANTS TO ENABLE IN-SITU RESOURCE UTILISATION RESEARCH

**Abstract**

In-situ resource utilisation (ISRU) will play an important role in future space exploration and habitation missions, lessening the initial and continuing reliance on transporting essential materials from Earth. One of the most plentiful resources available on the lunar and Martian surfaces is regolith. On the Moon this layer of fine-grained material is up to 10 metres thick in the highland regions and five metres thick in the mare regions. One of the key avenues for ISRU is the extraction of oxygen from regolith for life support and fuel. Additionally, a number of other potential uses for regolith are being explored. For example, the extraction and purification of metals, the production of construction materials such as sintered bricks, and the production of glass substrate plates for solar conversion devices and solar concentrator mirrors.

Research into these potential ISRU applications requires regolith simulants that mimic the relevant properties of lunar and Martian soil. Properties such as heating and melting behaviour, reduction behaviour, and materials available for extraction are closely tied to the chemistry and mineralogy of the regolith material. For this reason, it is essential that the regolith simulants used in these studies are well characterised. Knowing the composition of each regolith simulant allows researchers to examine the relationship between results and different compositions, as well as predict the outcome of applying the process to real lunar and Martian regolith. Older simulants, for instance JSC-1(A), have been well characterised and discussed in literature, however they are no longer available to purchase. Presented is a detailed characterisation study of five regolith simulants currently available to researchers: JSC-2A, NU LHT-3M, FJS-1, EAC-1 and JSC Mars-1A. The chemistry and mineralogy of each simulant is examined using a wide range of techniques and compared to actual lunar and Martian soil.