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# MICROWAVE HEATING OF REGOLITH SIMULANTS FOR ISRU APPLICATIONS

**Abstract**

As increasing focus falls on the Moon as a location for post-ISS exploration, many technologies that promise a route to sustainable exploration of this locale are receiving increasing interest. In the context of in-situ resource utili-zation (ISRU), processing the lunar regolith material, whether for volatile extraction (e.g. H2O bound within icy regolith) or for fabricating building elements (e.g. radiation shielding, shield-wall building blocks), are being further developed. Microwave heating has existed as a materials processing technology in a variety of scientific and techno-logical fields, and is commonly deployed as a tool to realise dielectric heating within a material. When considering it for Lunar surface applications, it quickly becomes an attractive and versatile tool for many aspects of ISRU, which we will discuss. Owing to the composition and dielectric propertiers of lunar regolith (and many of its terres-trial analogue simulants), microwaves in the 2.45 GHz range can readily couple to the constituent materials of the regolith and drive rapid subsurface heating ( 13 mm depth). This process, which has significant advantages over conventional radiative heating, is versatile in its application for resource extraction and potentially fabricating build-ing elements quickly and with significant power efficiency.

Herein, we will present the ongoing work in the field of microwave processing of lunar regolith simulants that is carried out within the Spaceship EAC initiative at ESA and DLR, Cologne. This includes funda-mental insights into the interaction of 2.45 GHz microwave radiation with simulant material, approaches into melting simulants under differing compositions, the impact of 'welding' processed regolith together with microwaves and initial experiments with the extraction of H2O from simulant using microwaves. Issues around the further development of this technolo-gy are highlighted, and an outline of the future work within the initiative on this topic is presented.