

# Development of rubber materials for Lunar and Martian applications with use of local fillers

Utilization of local materials (In Situ Resource Utilization – ISRU) plays a major role in future Lunar and Martian settlements design. Very high cargo transportation costs necessitate involvement of local materials in developing of new materials for future Lunar and Martian habitants [1].

Elastic sealing systems made of rubber will play an important role in the designed extraterrestrial buildings (Fig.1) preventing losing the breathable atmosphere.



Fig. 1. Concept of Lunar-base infrastructure [2].

Significant amount of fibers and fine powder fillers is incorporated into elastic rubber to reduce its cost and improve properties. Regolith is a powder-form mix of minerals abundant both on Lunar and Martian surface that could be used as received or be a resource to produce mineral fibers (Fig. 2) [3, 4].

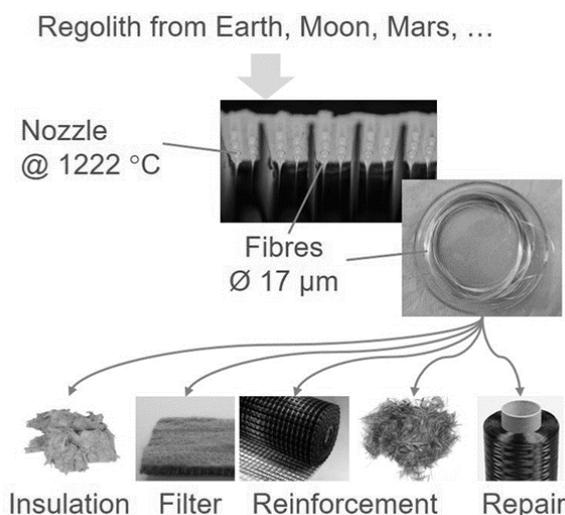


Fig. 2. Scheme of the technique of fiber producing from regolith [3].

This project aims to investigate the reinforcing potential of Martian and Lunar regolith simulants (Fig. 3) and the fibers produced from them in rubber materials for sealing applications. The regolith simulants and fibers will be incorporated into rubber along with coupling agents and curatives. The rubber will be vulcanized and tested to study its mechanical, dynamic and abrasion properties. The composition, morphology and properties relationship will be discussed and evaluated.

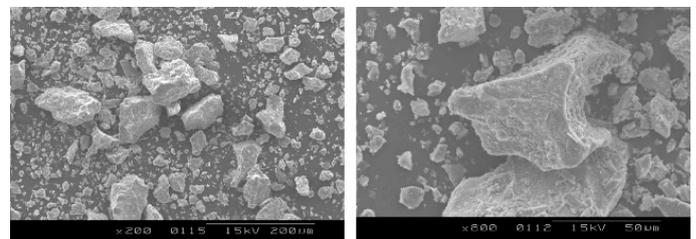


Fig. 3. SEM micrographs of TJ-1 Lunar regolith simulant [5].

## References:

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- [2] "Colonies on the moon soon? ESA may well make it happen", <https://innovationorigins.com/colonies-on-the-moon-soon-esa-may-well-make-it-happen/>
- [3] "Launch of the MoonFibre Project Initiative", <https://aachen-fibres.com/news/2018/11/23/launch-of-the-moonfibre-project-initiative>
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## Partners:

**RWTH Aachen University** – Production of Lunar regolith-based fibers

**Technical University of Braunschweig** – Production of Lunar regolith simulant

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