

## Technical Data Sheet: TLH-0

TDS-TLH-0-v1.3

### 1. Overview:

- ❖ **Type:** Highlands
- ❖ **Series:** TerraLun™- Core
- ❖ **Composition:**
  - Anorthosite
  - Basalt
  - Altered Peridotite
- ❖ **Mean NASA FoM Score:** 88.6%
- ❖ **100 % European** Sourced & Manufactured.
- ❖ **Uses:** High-fidelity general simulant suitable for geotechnical and mobility testing, excavation and construction trials, large-scale testbeds, ISRU process development, dust and environmental studies, filtration and sealing validation, scientific research, and technology demonstration.



Figure 1: TLH-0 Close-up View

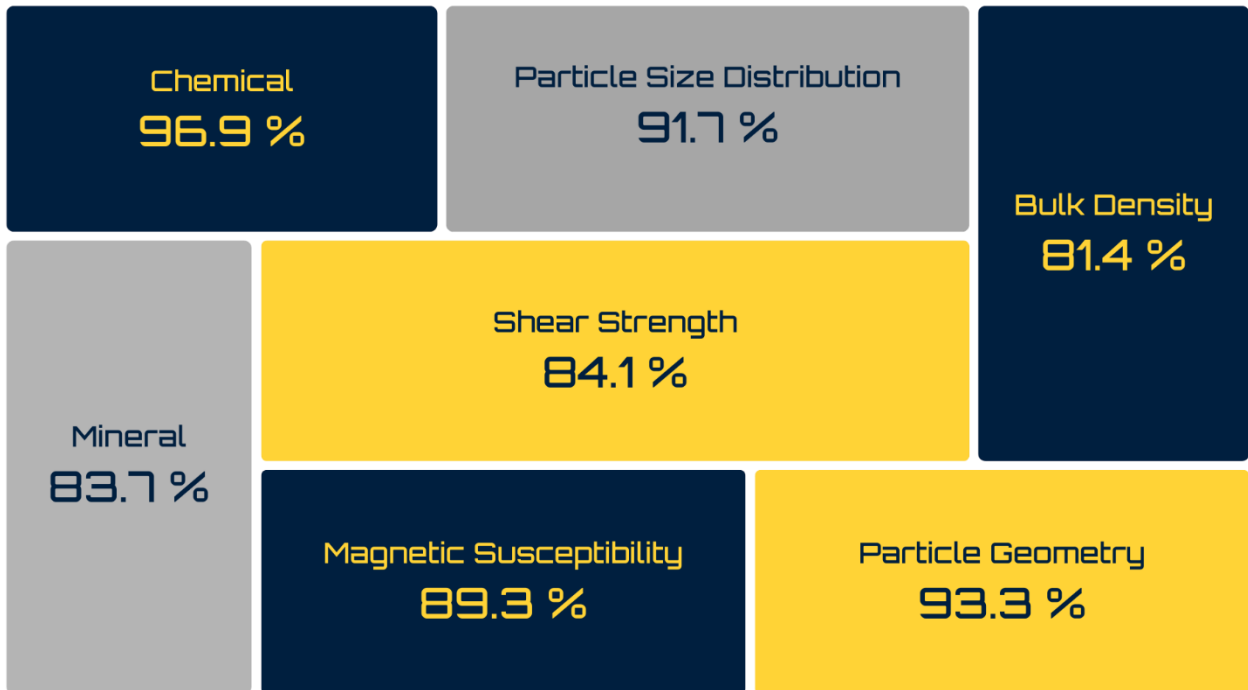


Figure 2: NASA Figures of Merit Results for TLH-0

## 2. Product Characterization

### 2.1 Chemical Composition

Chemical composition obtained through X-ray fluorescence analysis (XRF) performed by UPV/EHU with a Bruker M4 TORNADO.

SiO <sub>2</sub>	TiO <sub>2</sub>	Al <sub>2</sub> O <sub>3</sub>	FeO	MgO	CaO	Na <sub>2</sub> O	K <sub>2</sub> O	NiO	MnO	Cr <sub>2</sub> O <sub>3</sub>
46.43	0.82	25.06	6.78	5.09	14.13	0.00*	0.67	0.07	0.11	0.08

Table 1: Chemical Composition of TLH-0

\*Na<sub>2</sub>O is expected to be present according to the mineral composition, but it might be below the identification and quantification limit of this machine.

### 2.2 Mineral Composition

Mineral composition and quantification of glass/amorphous fraction through X-Ray Diffraction analysis (XRD) performed at UCLM by Jacinto Alonso-Azcarate with a PANalytical Xpert PRO machine. Supplemented by a Raman Spectroscopy performed at UPV/EHU with a Raman Renishaw InVia micro spectrometer.

Anorthite	Augite	Fosterite	Lizardite	Analcime	Smectite	Illite	Quartz	Chlorite	Hornblende	Amorphous / Glass
57	5.7	1.8	6.5	2.6	0.5	1	1.2	2.4	2.1	19.2

Table 2: Mineral Composition of TLH-0

Pyroxene	Plagioclase Feldspar	Olivine	Ilmenite	Glass
5.7	57	1.8	0	19.2

Table 3: Mineral Group Classification of TLH-0

### 2.3 Density

Bulk minimum, maximum, mean density as well as particle density were measured by TÜV SÜD's Geotechnics Department. The tests were performed following norms; UNE-EN ISO 17892-3:2018 (Particle Density), UNE 103015:1993 (Minimum Density) and UNE 103106:1993 (Maximum). The norms applied for maximum and minimum density are not specifically designed for materials with high fine fractions and in the case of the maximum density it can result in values higher than reality.

**Minimum Density:** 1.45 g/cm<sup>3</sup>



**Maximum Density:** 2.14 g/cm<sup>3</sup>

**Mean Density:** 1.80 g/cm<sup>3</sup>

**Particle Density:** 2.78 g/cm<sup>3</sup>

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## 2.4 Particle Size Distribution

Particle size distribution (PSD) measured through Dynamic Image Analysis performed by a third-party entity with a CAMSIZER X2.

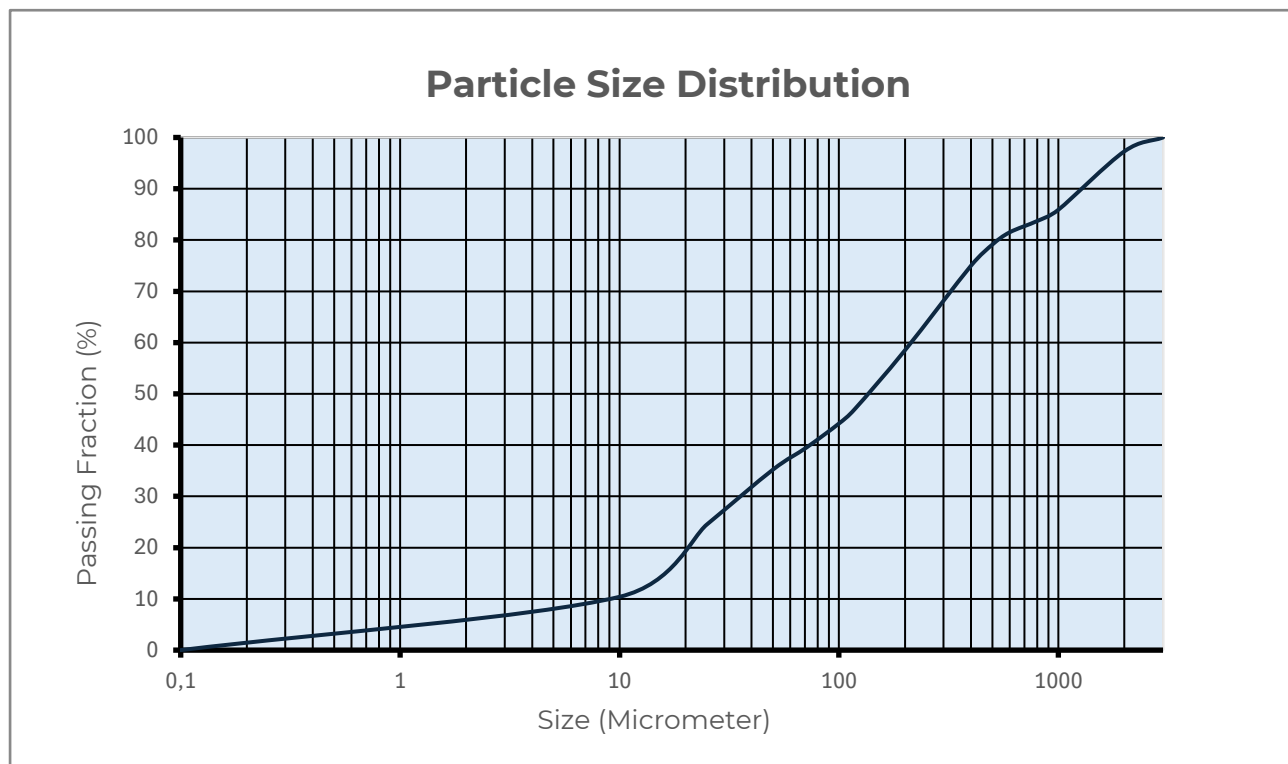
**Range:** 0.01-3000 µm

**D10:** 9.6 µm

**D90:** 1398.9 µm

**Median(D50):** 137.56 µm

**Mean:** 389.81 µm



## 2.5 Particle Geometry

Particle geometry measured through Dynamic Image Analysis performed by a third-party entity with a CAMSIZER X2.

**Aspect ratio:** 0.70287

**Root Form Factor/Circularity:** 0.88048

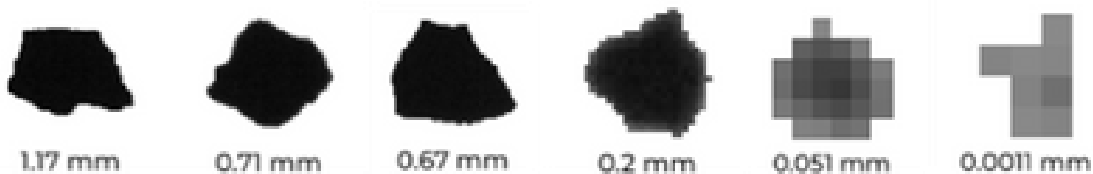


Figure 3: Particle Shape Example at Different Sizes

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## 2.6 Shear Stress - Cohesion (c) and Angle of Internal Friction ( $\varphi^\circ$ )

Cohesion and Internal Angle of Friction measured through Direct shear test Performed in combination at UPM-ETSIME by the Space Mining Group with a Mecánica Científica S.A. - Direct Shear Cut Machine and TÜV SÜD's Geotechnics Department with a CONTROLS-CODEIN Model 27-T2 160 Direct Shear Cut Machine following norm UNE-EN ISO 17892-10:2019. Measurements were performed at ~15 kPa, ~25 kPa, ~50 kPa, ~74 kPa and ~98 kPa, with a displacement rate of 0.5 mm/min up to a maximum displacement of 7 mm.

**Internal Angle of Friction ( $\varphi^\circ$ ):** 46.122 °

**Cohesion (c):** 2.896 kPa

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## 2.7 Magnetic Susceptibility

The massive magnetic susceptibility was obtained through a magnetic susceptibility analysis performed by UGR-CIC with a PPMS DynaCool Magnetometer with an ACMS II Module.

$$\chi_m = 4495.7 \times 10^{-9} \text{ m}^3/\text{kg}$$

### 3. Other Information

- Safety data sheet available on request.
- Available for purchase at <https://www.hispansion.io/shop> for low-volume orders.
- For high-volume orders, reach out at [info@hispansion.io](mailto:info@hispansion.io) to check availability and get a personalized quote.
- **Revision date:** March 16<sup>th</sup>, 2026.

