

Simulant Name: MGS-1C Clay ISRU
Simulant Type: Water extraction applications
Reference Material: M-WIP Reference Case C
Publication: Cannon et al. 2019. Icarus 317, 470-478



Mineralogy

As mixed.

| Component | Wt.% |
|-------------------|------|
| Smectite | 40.0 |
| Anorthosite | 16.4 |
| Glass-rich basalt | 13.7 |
| Pyroxene | 12.2 |
| Olivine | 8.2 |
| Mg-sulfate | 2.4 |
| Ferrihydrite | 2.1 |
| Hydrated silica | 1.8 |
| Magnetite | 1.1 |
| Anhydrite | 1.0 |
| Fe-carbonate | 0.8 |
| Hematite | 0.3 |

Safety

See SDS for details. Primary hazard is dust inhalation; wear a respirator in dusty conditions.

Photo credit Matthew Villegas.

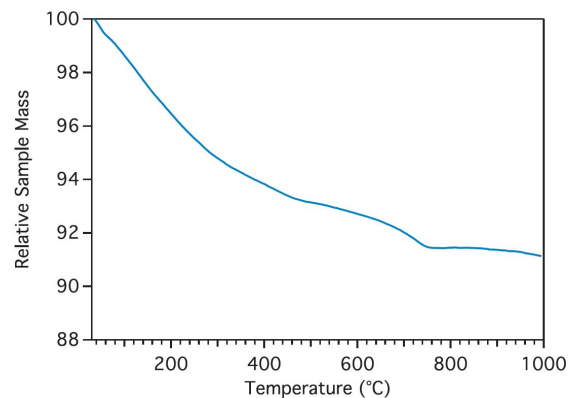
Bulk Chemistry

Measured by XRF.

| Oxide | Wt.% |
|--------------------------------|--------------|
| SiO ₂ | 44.8 |
| Al ₂ O ₃ | 9.8 |
| CaO | 15.3 |
| Fe ₂ O ₃ | 12 |
| K ₂ O | 3.4 |
| MgO | 9.9 |
| MnO | 0.1 |
| P ₂ O ₅ | 1.0 |
| TiO ₂ | 0.4 |
| SO ₃ | 2.3 |
| Cl | 0.5 |
| Cr ₂ O ₃ | 0.1 |
| NiO | 0.1 |
| SrO | 0.2 |
| Total | 100.0 |

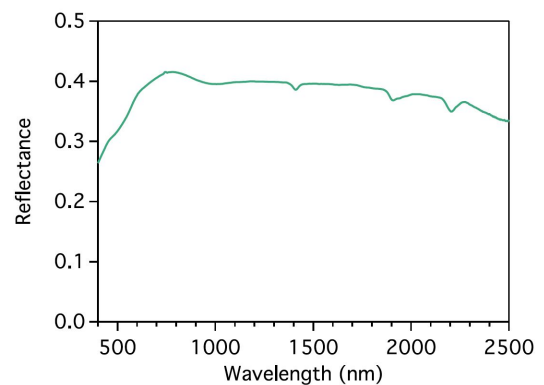
Volatile Release Pattern

As measured on a SAM-analog TG/EGA instrument at JSC. Total evolved water at 200° C is 3.5 wt.%.



Reflectance Spectrum

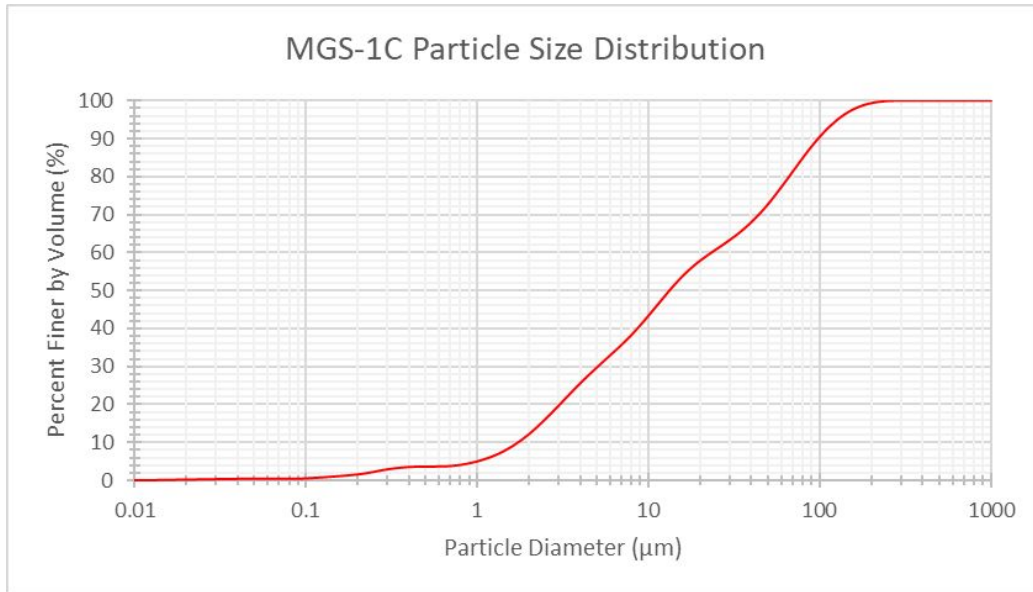
As measured on an ASD Fieldspec at 30° incidence and 0° emergence angles.





Volumetric Particle Size Distribution

From CILAS 1190 laser diffraction particle size analyzer



Sieve Analysis

Following ASTM Standard E11 using RO-TAP RX-30 sieve shaker

| Sieve Number | Diameter (µm) | Mass of Soil Retained on Each Sieve (g) | Percent Retained by Mass (%) | Cumulative Retained by Mass(%) | Percent Finer by Mass(%) |
|--------------|---------------|---|------------------------------|--------------------------------|--------------------------|
| 18 | 1000.000 | 0.0000 | 0.0% | 0.0% | 100.0% |
| 25 | 710.000 | 59.3333 | 6.0% | 6.0% | 94.0% |
| 35 | 500.000 | 44.3333 | 4.4% | 10.4% | 89.6% |
| 45 | 355.000 | 44.6667 | 4.5% | 14.9% | 85.1% |
| 70 | 212.000 | 65.6667 | 6.6% | 21.5% | 78.5% |
| 140 | 106.000 | 422.6667 | 42.4% | 63.9% | 36.1% |
| 200 | 75.000 | 250.6667 | 25.2% | 89.1% | 10.9% |
| 270 | 53.000 | 83.3333 | 8.4% | 97.4% | 2.6% |
| PAN | | 25.6667 | 2.6% | 100.0% | 0.0% |

*Sieve analysis skews particle size larger, as many of the fines cling to the larger pieces of regolith. This is measured by mass percent rather than volume

