

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



## Mineralogy

As mixed.

Component	Wt.%
Gypsum	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.

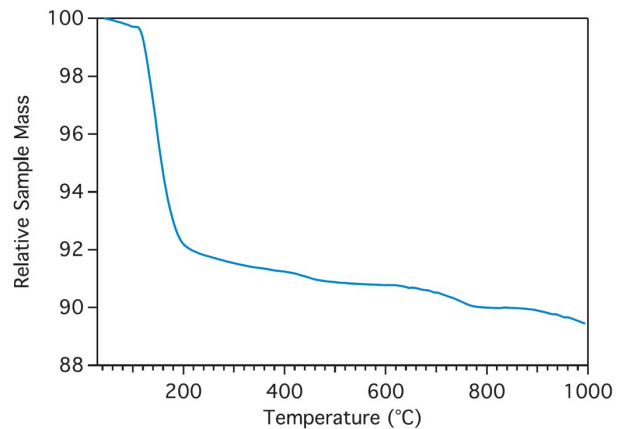
## Bulk Chemistry

Measured by XRF.

Oxide	Wt.%
SiO <sub>2</sub>	31.9
Al <sub>2</sub> O <sub>3</sub>	10.6
CaO	20.0
Fe <sub>2</sub> O <sub>3</sub>	11.9
K <sub>2</sub> O	0.6
MgO	6.4
MnO	0.1
P <sub>2</sub> O <sub>5</sub>	0.9
TiO <sub>2</sub>	0.3
SO <sub>3</sub>	16.6
Cl	0.3
Cr <sub>2</sub> O <sub>3</sub>	0.1
NiO	0.1
SrO	0.1
<b>Total</b>	<b>100.0</b>

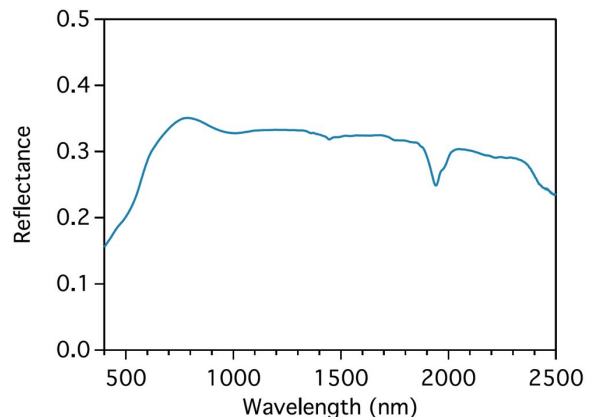
## Volatile Release Pattern

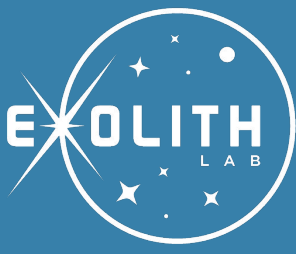
As measured on a SAM-analog TG/EGA instrument at JSC. Total evolved water at 200° C is 7.8 wt. %.



## Reflectance Spectrum

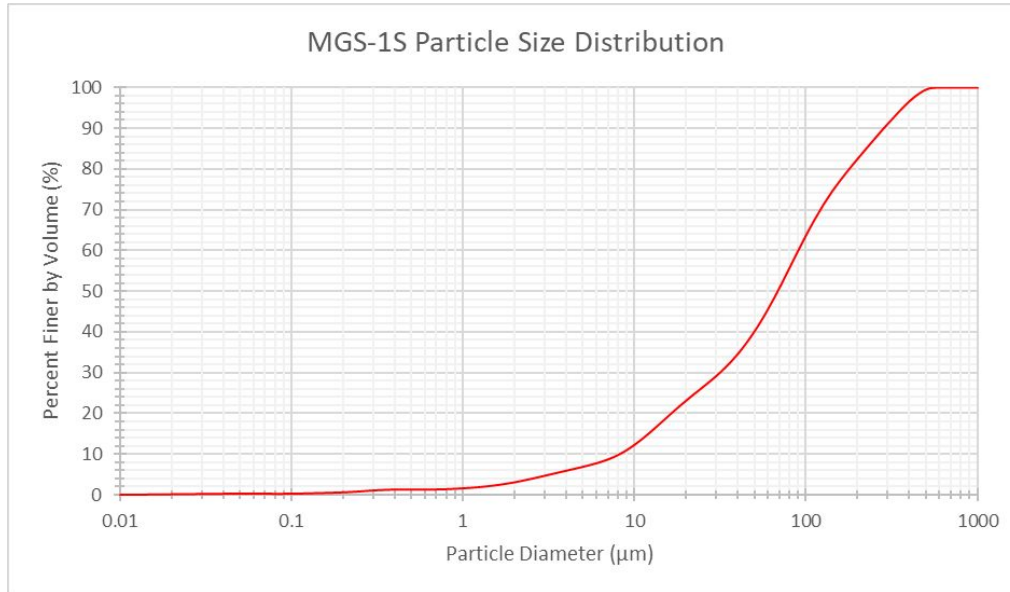
As measured on an ASD Fieldspec at 30° incidence and 0° emergence angles.





## 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	62.3333	6.2%	6.2%	93.8%
35	500.000	95.0000	9.5%	15.8%	84.2%
45	355.000	111.6667	11.2%	27.0%	73.0%
70	212.000	174.6667	17.5%	44.5%	55.5%
140	106.000	273.0000	27.4%	71.8%	28.2%
200	75.000	150.0000	15.0%	86.9%	13.1%
270	53.000	82.3333	8.3%	95.1%	4.9%
PAN		48.6667	4.9%	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

