MGS-1 Mars Global Simulant | **Fact Sheet**

December, 2022

Simulant Name: MGS-1 Mars Global Simulant
Simulant Type: General purpose
Reference Material: Rocknest soil
Uncompressed Bulk Density: 1.29 g/cm^3
Mean Particle Size: 90 µm
Median Particle Size: 60 µm
Particle Size Range: >0.04 µm – 600 µm

Geotechnical Properties

Avg Angle of Repose: 38.9°
Max Angle of Repose: 43.6°

More coming soon!

Mineralogy

As mixed.

Component	Wt.%
Anorthosite	27.1
Glass-rich basalt	22.9
Pyroxene	20.3
Olivine	13.7
Mg- sulfate	4.0
Ferrihydrite	3.5
Hydrated silica	3.0
Magnetite	1.9
Anhydrite	1.7
Fe-carbonate	1.4
Hematite	0.5

Safety

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

Bulk Chemistry

Relative abundances. Measured by XRF.

Oxide	Wt.%
SiO_2	42.9
TiO_2	0.6
Al_2O_3	12.8
FeO	11.2
MnO	0.1
MgO	14.6
CaO	7.4
Na_2O	1.5
K_2O	0.6
P_2O_5	0.1
LOI*	5.3
Total**	97.1

* Loss on ignition
** Excluding volatiles and trace elements

Photo credit Matthew Villegas. XRF data obtained by Hamilton Analytical Lab using fused bead sample preparation. Reflectance spectrum courtesy of Dr. Takahiro Hiroi, NASA RELAB, Brown University.

MGS-1 Mars Global Simulant | **Fact Sheet**

December, 2022

Trace Elements
Measured by XRF

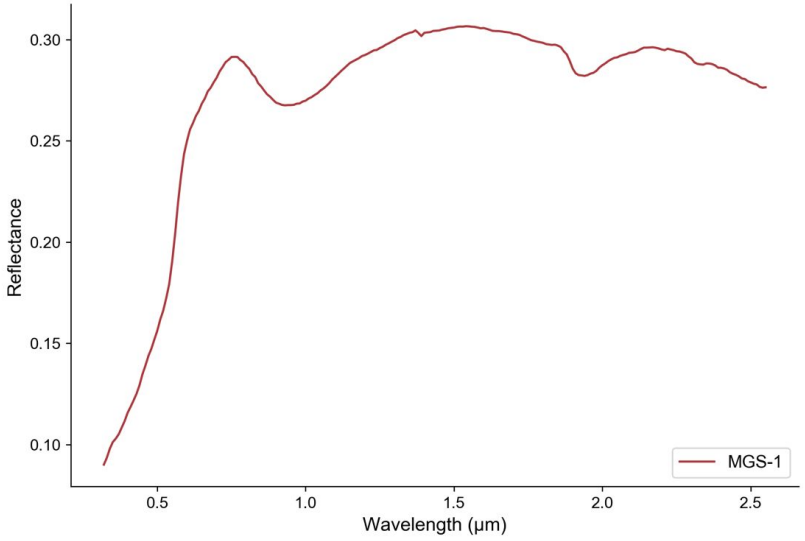
Element	ppm
Ni	540
Cr	1375
V	92
Sc	13.8
Cu	19
Zn	51
Ga	12
Ba	144
Rb	10
Cs	0
Sr	236
Y	9
Zr	64
Hf	2.3
Nb	14.5
Ta	1
Mo	8
La	6
Ce	21
Nd	13
Sm	2.4
Dy	2.2
Yb	1.1
Th	0
U	1
Tl	1
Pb	3
Sn	2
Bi	0
Sb	1

Volatiles
Measured by XRF

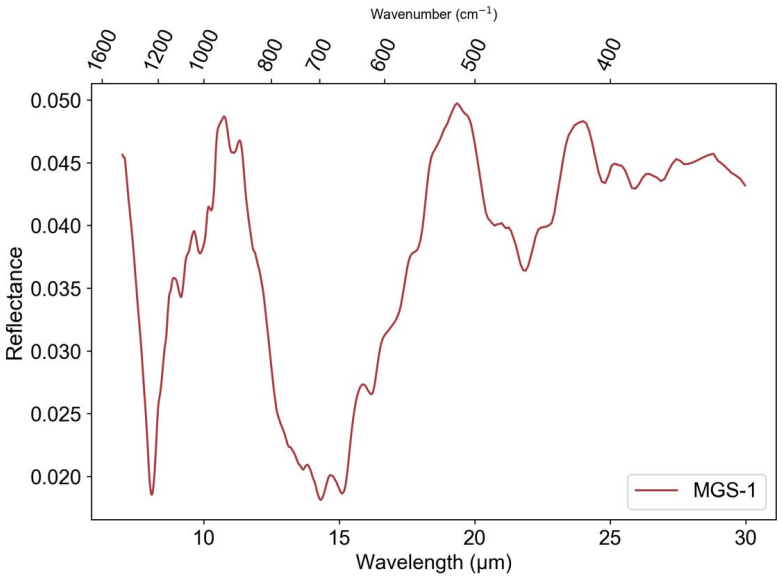
Compound	Wt%
F	≥0.1
Cl	≥0.005
SO_3	≥1.27

Compound	ppm
Br	≥2
As	≥1

Reflectance Spectrum
Incidence angle 30°, emission angle 0°



Mid-Infrared FTIR Spectrum



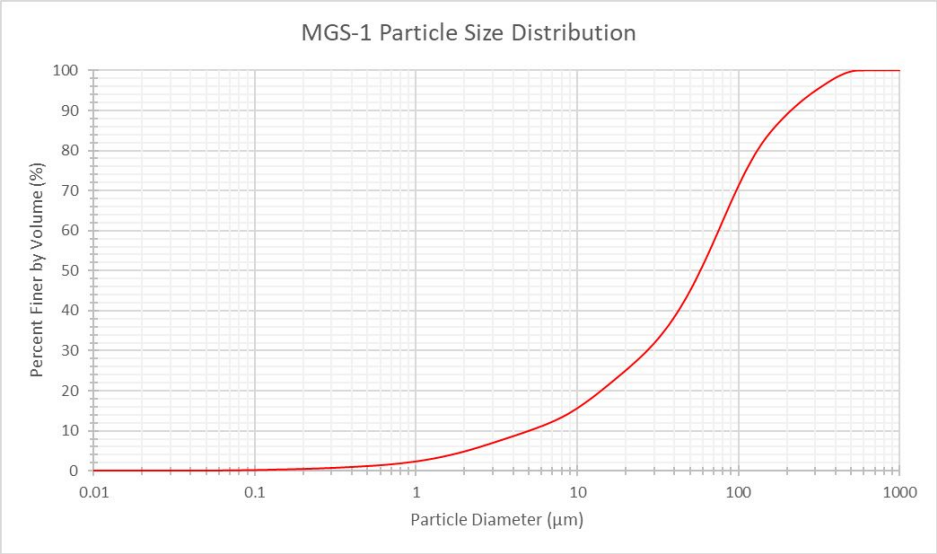
XRF data obtained by Hamilton Analytical Lab using fused bead sample preparation. FTIR spectrum courtesy of Dr. Takahiro Hiroi, NASA RELAB, Brown University.

MGS-1 Mars Global Simulant | **Fact Sheet**

December, 2022

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	65.0000	6.6%	6.6%	93.4%
35	500.000	61.0000	6.2%	12.8%	87.2%
45	355.000	66.1667	6.7%	19.5%	80.5%
70	212.000	112.1667	11.4%	30.8%	69.2%
140	106.000	383.5000	38.8%	69.6%	30.4%
200	75.000	166.8333	16.9%	86.5%	13.5%
270	53.000	97.6667	9.9%	96.4%	3.6%
PAN		35.6667	3.6%	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