

## MATERIAL SAFETY DATA SHEET

### SECTION 1: Product and Company Identification

Orbital Technologies Corporation  
1212 Fourier Drive  
Madison, WI 53717

Company Phone Number: 608-827-5000  
Availability: 8:00 am – 5:00 pm CDT  
Website: [www.lunarmarssimulant.com](http://www.lunarmarssimulant.com)  
Alternate Website: [www.orbitec.com](http://www.orbitec.com)

Product Name: JSC-1a Lunar Soil Simulant  
Issue Date: September 23, 2005

### SECTION 2: Hazards Identification

**Emergency Overview:** JSC-1a is an odorless powdery gray sand or dirt-like material.

**WARNING! MAY BE HARMFUL IF INHALED. MAY AFFECT RESPIRATORY SYSTEM AND CAUSE IRRITATION TO EYES AND RESPIRATORY TRACT.**

HAZARD	RATING (0-4)
Health	1
Reactivity	0
Flammability	0
Exposure	1
Storage	0

**JSC MSDS # 39744**

#### Potential Health Effects:

Inhalation: May cause irritation to the respiratory tract.

Skin Contact: No adverse effects expected.

Eye Contact: May cause mechanical irritation.

Chronic Exposure: No studies have been conducted on long-term effects.

Pre-existing conditions: Persons with impaired respiratory function may be more susceptible to the effects of the substance.

See SECTION 11: Toxicological Information.

**Potential Environmental Effects:** None identified.

### SECTION 3: Composition Information

Major Element Composition	CAS #	% by Wt.
Silicon Oxide (SiO <sub>2</sub> )	14808-60-7	46-49
Titanium Dioxide (TiO <sub>2</sub> )	13463-67-7	1-2
Aluminum Oxide (Al <sub>2</sub> O <sub>3</sub> )	1344-28-1	14.5 – 15.5
Ferric Oxide (Fe <sub>2</sub> O <sub>3</sub> )	1309-37-1	3-4

Iron Oxide (FeO)	1332-37-2	7 – 7.5
Magnesium Oxide (MgO)	1309-48-4	8.5 – 9.5
Calcium Oxide (CaO)	1305-78-8	10 – 11
Sodium Oxide (Na <sub>2</sub> O)	1313-59-3	2.5 – 3
Potassium Oxide (K <sub>2</sub> O)	12136-45-7	0.75 – 0.85
Manganese Oxide (MnO)	1344-43-0	0.15 – 0.20
Chromium III Oxide (Cr <sub>2</sub> O <sub>3</sub> )	1308-38-9	0.02 – 0.06
Diphosphorus Pentoxide (P <sub>2</sub> O <sub>5</sub> )	1314-56-3	0.6 – 0.7

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#### SECTION 4: First Aid Measures

Inhalation: Move to fresh air. Get medical attention if symptoms occur.

Skin Contact: Wash exposed area with soap and water.

Eye Contact: Immediately flush eyes with water for 15 minutes. Get medical attention if irritation persists.

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#### SECTION 5: Fire Fighting Measures

Fire: Not expected to be a fire hazard.

Explosion: No information found.

Fire extinguishing Media: Use any means suitable for extinguishing surrounding fire.

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#### SECTION 6: Accidental Release Measures

Personal Precautions: Use personal protection recommended in SECTION 8.

Methods for Containment: No special instructions necessary.

Methods for Clean-Up: For spills, pick up and place in a suitable container for reclamation or disposal, using a method that does not generate dust.

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#### SECTION 7: Handling and Storage

Handling: Use precaution when handling to minimize dust release of the material to the environment. Observe all warnings and precautions listed for this product.

Storage: Keep container closed when not in use and store in a cool, dry, ventilated area. Containers of the material may require caution when empty since they retain product residues (dust). Observe all warnings and precautions listed for this product.

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#### SECTION 8: Exposure Controls/Personal Protection

Airborne Exposure Limits: No exposure limits have been determined for JSC-1a. The following table is provided for exposure limits on JSC-1a major element compositions for reference:

Major Element Composition	OSHA PEL	ACGIH TLV
Silicon Oxide (SiO <sub>2</sub> )	30 mg/m <sup>3</sup>	0.05 mg/m <sup>3</sup>
Titanium Dioxide (TiO <sub>2</sub> )	15 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>
Aluminum Oxide (Al <sub>2</sub> O <sub>3</sub> )	3 mg/m <sup>3</sup>	3 mg/m <sup>3</sup>
Ferric Oxide (Fe <sub>2</sub> O <sub>3</sub> )	10 mg/m <sup>3</sup>	5 mg/m <sup>3</sup>
Iron Oxide (FeO)	10 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>
Magnesium Oxide (MgO)	15 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>
Calcium Oxide (CaO)	5 mg/m <sup>3</sup>	2 mg/m <sup>3</sup>
Sodium Oxide (Na <sub>2</sub> O)	N/A	2 mg/m <sup>3</sup>
Potassium Oxide (K <sub>2</sub> O)	N/A	N/A
Manganese Oxide (MnO)	5 mg/m <sup>3</sup>	0.2 mg/m <sup>3</sup>
Chromium III Oxide (Cr <sub>2</sub> O <sub>3</sub> )	N/A	0.5 mg/m <sup>3</sup>
Diphosphorus Pentoxide (P <sub>2</sub> O <sub>5</sub> )	N/A	N/A

Ventilation: A system of local and/or general exhaust is recommended to minimize employee exposure. A NIOSH/MSHA approved dust respirator is recommended for long exposure.

Skin Protection: Wear protective gloves.

Eye Protection: Use safety goggles.

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## SECTION 9: Physical and Chemical Properties

Appearance: Gray powder similar to sand or dirt

Odor: None detected

Specific Gravity: 2.9 g/cm<sup>3</sup>

pH: No information

Melting Point: 1100° - 1125° C

Angle of Internal Friction: 45°

Cohesion: 1.0 kPa

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## SECTION 10: Stability and Reactivity

Stability: Stable under ordinary conditions of use and storage.

Conditions to Avoid: None

Incompatible Materials: No information found

Hazardous Decomposition Products: No information found

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## SECTION 11: Toxicological Information

Toxicological Data: No LD50/LC50 testing completed.

Carcinogenicity: No testing completed. The following information is provided on applicable major element compositions substances:

SiO<sub>2</sub>: Quartz is a known NTP Carcinogen with an IARC Category 1

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**SECTION 12: Ecological Information**

Environmental Fate: No information found

Environmental Toxicity: No information found

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**SECTION 13: Disposal Consideration**

Whatever cannot be saved for recovery should be managed in an appropriate and approved waste disposal facility. Empty containers should remain covered to minimize any remaining dust exposure. This information only applies to the material as supplied. If the material has been used or otherwise contaminated it is the responsibility of the waste generator to determine the toxicity and physical properties of the materials generated to determine the proper waste identification and disposal methods.

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**SECTION 14: Transport Information**

Not regulated.

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**SECTION 15: Regulatory Information**

Not regulated.

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**SECTION 16: Other Information**

Hazard Rating System:

0 = No hazard

1 = Slight hazard

2 = Moderate hazard

3 = Severe hazard

4 = Extreme hazard

Prepared by: Orbital Technologies Corporation

The information contained in this document applies to this specific material as supplied. It may not be valid for this material if it is used in combination with any other materials. It is the user's responsibility to satisfy oneself as to the suitability and completeness of this information for his/her own particular use.