MATERIAL SAFETY DATA SHEET

SECTION 1: Product and Company Identification

Orbital Technologies Corporation
1212 Fourier Drive
Madison, WI 53717

Phone Number: 608-827-5000
Availability: 8:00 am – 5:00 pm CDT
Website: www.lunarmarssimulant.com
Alternate Website: www.orbitec.com

Product Name: JSC-1AF, JSC-1A, JSC-1AC Lunar Mare Regolith Simulant
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SECTION 2: Hazards Identification

Overview: The JSC-1A simulant family is a set of odorless powder/gray sand-like materials comprised of crushed basalt. JSC-1AF is primarily 50 micron particle size and lower, JSC-1A is 1 mm particle size and lower, and JSC-1AC is 5 mm particle size and lower. All JSC-1A types contain no asbestos or quartz. Since a fraction of all JSC-1A types contain particle sizes under 25 micron, JSC-1A is to be considered a nuisance dust and safe handling procedures per NIOSH 0500 nuisance dust classification should be followed to avoid symptoms of overexposure.

Caution: Excessive inhalation over long period may cause harmful irritation to eyes and respiratory tract. Use a NIOSH approved mask for nuisance dust for prolonged exposure.

HAZARD	RATING (0-4)
Health	1 (Slight hazard)
Reactivity	0 (No hazard)
Flammability	0 (No hazard)
Exposure	1 (Slight hazard)
Storage	0 (No hazard)

Potential Health Effects:
Inhalation: May cause irritation to the respiratory tract.
Skin Contact: No adverse effects expected.
Eye Contact: May cause irritation.
Chronic Exposure: No studies have been conducted on long-term effects.
Pre-existing conditions: Persons with impaired respiratory function may be aggravated by a nuisance dust.

See SECTION 11: **Toxicological Information.**

Potential Environmental Effects: None identified.

SECTION 3: Composition Information

The normal convention for data presentation uses oxide formulae from an assumed oxidation state for each element (with the exception of Fe) and oxygen is calculated by stoichiometry. For example, silicon is analyzed as an element but presented at SiO_2. It is important to understand that these are representations of the chemistry and do not represent actual phases or minerals in the simulant.

Major Element Composition	**CAS #**	**% by Wt.**
Silicon Dioxide (SiO_2)	14808-60-7	46-49
Titanium Dioxide ($TiO_{2)}$	13463-67-7	1-2
Aluminum Oxide (Al_2O_3)	1344-28-1	14.5 – 15.5
Ferric Oxide (Fe_2O_3)	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_2O)	1313-59-3	2.5 – 3
Potassium Oxide (K_2O)	12136-45-7	0.75 – 0.85
Manganese Oxide (MnO)	1344-43-0	0.15 – 0.20
Chromium III Oxide (Cr_2O_3)	1308-38-9	0.02 – 0.06
Diphosphorus Pentoxide (P_2O_5)	1314-56-3	0.6 – 0.7

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.

SECTION 5: Fire Fighting Measures

Fire: Not a fire hazard.
Explosion: No information found.
Fire extinguishing: Use any means suitable for extinguishing surrounding fire.

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 avoids creating airborne dust.

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).

SECTION 8: Exposure Controls/Personal Protection

Airborne Exposure Limits: No ACGIH TLV exposure limits have been determined for JSC-1A, therefore maintain exposure limits for nuisance dust as defined by OSHA (15 mg/m^3) or ACGIH (10 mg/m^3).

Ventilation: When working with large quantities of JSC-1AF, 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 as a precaution.

Eye Protection: Use safety goggles as a precaution.

SECTION 9: Physical and Chemical Properties

Appearance: JSC-1A and JSC-1AC: Gray material similar to sand or dirt
JSC-1AF: Gray material similar to powder

Odor: None detected

Specific Gravity: 2.9 g/cm^3

pH: No information

Melting Point: 1100º - 1125º C

Angle of Internal Friction: 45º

Cohesion: 1.0 kPa

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

SECTION 11: Toxicological Information

General Comments: Inhalation of dust may irritate nose, throat and lungs. Eye contact with solids may produce irritation. Use NIOSH nuisance dust masks or respirators and eye protection to avoid long term exposure to dust component if applicable during use.

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