

United Nuclear

Scientific Equipment & Supplies

MATERIAL SAFETY AND DATA SHEET (MSDS) MMS-1 MARS REGOLITH SIMULANT



SECTION I. SUMMARY

Mojave Mars Simulant (MMS) was originally developed by scientists at the In Situ Systems section and the Planetary Science section at NASA's Jet Propulsion Laboratory (JPL). MMS was created in order to support testing and development of instruments for the Mars Phoenix Lander.

MMS is produced by the mechanical crushing of Saddleback Basalt from the western Mojave desert. Whole rocks are crushed to gravel, sand and dust grades. Processed material is filtered to remove foreign bodies, sift-separated by grade, sterilized by baking at 200F, and vacuum sealed.

United Nuclear only supplies genuine Mojave Mars Simulant from the same sources identified by the JPL.

SECTION II. CHEMICAL PRODUCT AND COMPANY INFORMATION

Product Name: MMS-1 Mojave Mars Regolith Simulant

Catalog Codes: MMS-1-[QUANTITY]-[GRADE]

Product Description: Basalt Aggregate (Gravel / Sand / Dust)

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SECTION III. COMPOSITION

<u>Compound</u>	<u>% By Weight</u>
Silicate (SiO ₂)	49%
Iron Oxide (Fe ₂ O ₃)	11%
Aluminum Oxide (Al ₂ O ₃)	17%
Calcium Oxide (CaO)	10%
Magnesium Oxide (MgO)	6%
Sulfate (SO ₃)	<1%
Trace	6%

SECTION IV. HAZARD INFORMATION

Potential Acute Health Effects: Slightly hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation.

SECTION V. FIRST AID MEASURES

Eye Contact: Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Ingestion: Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

SECTION VI. FIRE AND EXPLOSION DATA

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

SECTION VII. ACCIDENTAL RELEASE MEASURES

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and dispose of according to local and regional authority requirements.

Large Spill: Use a shovel to put the material into a convenient waste disposal container. Finish cleaning by spreading water on the contaminated surface and allow to evacuate through the sanitary system

SECTION VIII. HANDLING AND STORAGE

Precautions: Do not breathe dust. Wear suitable protective clothing.

Storage: Keep container tightly closed.

SECTION IX. EXPOSURE CONTROLS / PERSONAL PROTECTIVE EQUIPMENT

Engineering Controls: Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill: Splash goggles. Full suit. Dust respirator. Gloves.

Exposure Limits: TWA: 0.05 (mg/m³) from ACGIH (TLV) [United States] Respirable [Quartz or Crystalline Silica] TWA: 0.05 (mg/m³) from NIOSH Respirable. [Quartz or Crystalline Silica] Consult local authorities for acceptable exposure limits.

SECTION X. PHYSICAL AND CHEMICAL PROPERTIES

Physical state and appearance: Solid. (Granular solid / Aggregate)

Odor: Odorless.

Taste: Tasteless.

Color: Amber. Grey.

Specific Gravity: 0.9 to 1.3+ (depending on grade) (Water = 1)

Solubility: Insoluble in cold water, hot water, methanol, diethyl ether, n-octanol.

SECTION XI. STABILITY AND REACTIVITY DATA

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Incompatibles

Incompatibility with various substances: Reactive with oxidizing agents, alkalis.

Special Remarks on Reactivity: Incompatible with oxidizing agents such as fluorine, chlorine trifluoride, manganese trioxide, oxygen difluoride. When exposed to high temperature quartz can change crystalline structure to form tridymite (above 870 C) or cristobalite (above 1470 C). Soluble in hydrofluoric acid and produces a corrosive gas - silicon tetrafluoride. Quartz is attacked by strong alkalis and hydrofluoric acid.

SECTION XII. ECOLOGICAL INFORMATION

Products of Biodegradation: Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

SECTION XIII. TRANSPORT INFORMATION

DOT Classification: Not a DOT controlled material (United States).

Special Provisions for Transport: Not applicable.