MATERIAL SAFETY DATA SHEET

Product Trade Name: BENTONITE

Revision Date: 24-Jul-2014

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Trade Name: BENTONITE
Synonyms: None
Chemical Family: Mineral
Application: Weight Additive

Manufacturer/Supplier
Halliburton Energy Services, Inc.
P.O. Box 1431
Duncan, Oklahoma 73536-0431
Emergency Telephone: (281) 575-5000

Prepared By
Chemical Compliance
Telephone: 1-580-251-4335
e-mail: fdunexchem@halliburton.com

2. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Substances</th>
<th>CAS Number</th>
<th>PERCENT (w/w)</th>
<th>ACGIH TLV-TWA</th>
<th>OSHA PEL-TWA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bentonite</td>
<td>1302-78-9</td>
<td>60 - 100%</td>
<td>TWA: 1 mg/m³</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Crystalline silica, quartz</td>
<td>14808-60-7</td>
<td>1 - 5%</td>
<td>TWA: 0.025 mg/m³</td>
<td>10 mg/m³ %SiO₂ + 2</td>
</tr>
<tr>
<td>Crystalline silica, cristobalite</td>
<td>14464-46-1</td>
<td>0.1 - 1%</td>
<td>TWA: 0.025 mg/m³</td>
<td>1/2 x 10 mg/m³ %SiO₂ + 2</td>
</tr>
<tr>
<td>Crystalline silica, tridymite</td>
<td>15468-32-3</td>
<td>0.1 - 1%</td>
<td>0.05 mg/m³</td>
<td>1/2 x 10 mg/m³ %SiO₂ + 2</td>
</tr>
</tbody>
</table>

More restrictive exposure limits may be enforced by some states, agencies, or other authorities.

3. HAZARDS IDENTIFICATION
4. FIRST AID MEASURES

**Inhalation**
If inhaled, remove from area to fresh air. Get medical attention if respiratory irritation develops or if breathing becomes difficult.

**Skin**
Wash with soap and water. Get medical attention if irritation persists.

**Eyes**
In case of contact, immediately flush eyes with plenty of water for at least 15 minutes and get medical attention if irritation persists.

**Ingestion**
Under normal conditions, first aid procedures are not required.

**Notes to Physician**
Treat symptomatically.

5. FIRE FIGHTING MEASURES

**Flash Point/Range (F):** Not Determined
**Flash Point/Range (C):** Not Determined
**Flash Point Method:** Not Determined
**Autoignition Temperature (F):** Not Determined
**Autoignition Temperature (C):** Not Determined
**Flammability Limits in Air - Lower (%):** Not Determined
**Flammability Limits in Air - Upper (%):** Not Determined

**Fire Extinguishing Media**
All standard firefighting media.

**Special Exposure Hazards**
Not applicable.

**Special Protective Equipment for Fire-Fighters**
Not applicable.

**NFPA Ratings:** Health 0, Flammability 0, Reactivity 0
**HMIS Ratings:** Health 0*, Flammability 0, Physical Hazard 0, PPE: E

6. ACCIDENTAL RELEASE MEASURES

**Personal Precautionary Measures**
Use appropriate protective equipment. Avoid creating and breathing dust.

**Environmental Precautionary Measures**
None known.
Procedure for Cleaning / Absorption
Collect using dustless method and hold for appropriate disposal. Consider possible toxic or fire hazards associated with contaminating substances and use appropriate methods for collection, storage and disposal.

7. HANDLING AND STORAGE

Handling Precautions
This product contains quartz, cristobalite, and/or tridymite which may become airborne without a visible cloud. Avoid breathing dust. Avoid creating dusty conditions. Use only with adequate ventilation to keep exposure below recommended exposure limits. Wear a NIOSH certified, European Standard En 149, or equivalent respirator when using this product. Material is slippery when wet.

Storage Information
Use good housekeeping in storage and work areas to prevent accumulation of dust. Close container when not in use. Do not reuse empty container.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls
Use approved industrial ventilation and local exhaust as required to maintain exposures below applicable exposure limits.

Respiratory Protection
Wear a NIOSH certified, European Standard EN 149 (FFP2/FFP3), AS/NZS 1715, or equivalent respirator when using this product.

Hand Protection
Normal work gloves.

Skin Protection
Wear clothing appropriate for the work environment. Dusty clothing should be laundered before reuse. Use precautionary measures to avoid creating dust when removing or laundering clothing.

Eye Protection
Wear safety glasses or goggles to protect against exposure.

Other Precautions
None known.

9. PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical State:</td>
<td>Solid</td>
</tr>
<tr>
<td>Color:</td>
<td>Various</td>
</tr>
<tr>
<td>Odor:</td>
<td>Odorless</td>
</tr>
<tr>
<td>pH:</td>
<td>9.9</td>
</tr>
<tr>
<td>Specific Gravity @ 20 C (Water=1):</td>
<td>2.65</td>
</tr>
<tr>
<td>Density @ 20 C (lbs./gallon):</td>
<td>Not Determined</td>
</tr>
<tr>
<td>Bulk Density @ 20 C (lbs/ft^3):</td>
<td>60</td>
</tr>
<tr>
<td>Boiling Point/Range (F):</td>
<td>Not Determined</td>
</tr>
<tr>
<td>Boiling Point/Range (C):</td>
<td>Not Determined</td>
</tr>
<tr>
<td>Freezing Point/Range (F):</td>
<td>Not Determined</td>
</tr>
<tr>
<td>Freezing Point/Range (C):</td>
<td>Not Determined</td>
</tr>
<tr>
<td>Vapor Pressure @ 20 C (mmHg):</td>
<td>Not Determined</td>
</tr>
<tr>
<td>Vapor Density (Air=1):</td>
<td>Not Determined</td>
</tr>
<tr>
<td>Percent Volatiles:</td>
<td>Not Determined</td>
</tr>
<tr>
<td>Evaporation Rate (Butyl Acetate=1):</td>
<td>Not Determined</td>
</tr>
<tr>
<td>Solubility in Water (g/100ml):</td>
<td>Insoluble</td>
</tr>
<tr>
<td>Solubility in Solvents (g/100ml):</td>
<td>Not Determined</td>
</tr>
<tr>
<td>VOCs (lbs./gallon):</td>
<td>Not Determined</td>
</tr>
<tr>
<td>Viscosity, Dynamic @ 20 C (centipoise):</td>
<td>Not Determined</td>
</tr>
<tr>
<td>Viscosity, Kinematic @ 20 C (centistokes):</td>
<td>Not Determined</td>
</tr>
</tbody>
</table>
10. STABILITY AND REACTIVITY

**Stability Data:** Stable

**Hazardous Polymerization:** Will Not Occur

**Conditions to Avoid**

None anticipated

**Incompatibility (Materials to Avoid)**

Hydrofluoric acid.

**Hazardous Decomposition Products**

Amorphous silica may transform at elevated temperatures to tridymite (870 °C) or cristobalite (1470 °C).

**Additional Guidelines**

Not Applicable

11. TOXICOLOGICAL INFORMATION

**Principle Route of Exposure**

Eye or skin contact, inhalation.

**Symptoms related to exposure**

**Acute Toxicity**

**Inhalation**

Inhaled crystalline silica in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (IARC, Group 1). There is sufficient evidence in experimental animals for the carcinogenicity of tridymite (IARC, Group 2A).

Breathing silica dust may cause irritation of the nose, throat, and respiratory passages. Breathing silica dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may also have serious chronic health effects (See “Chronic Effects/Carcinogenicity” subsection below).

**Eye Contact**

May cause eye irritation

**Skin Contact**

May cause mechanical skin irritation.

**Ingestion**

None known

**Chronic Effects/Carcinogenicity**

Silicosis: Excessive inhalation of respirable crystalline silica dust may cause a progressive, disabling, and sometimes-fatal lung disease called silicosis. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness, and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with silicosis are predisposed to develop tuberculosis.

**Cancer Status:** The International Agency for Research on Cancer (IARC) has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources can cause lung cancer in humans (Group 1 - carcinogenic to humans) and has determined that there is sufficient evidence in experimental animals for the carcinogenicity of tridymite (Group 2A - possible carcinogen to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibres (June 1997) in conjunction with the use of these minerals. The National Toxicology Program classifies respirable crystalline silica as “Known to be a human carcinogen”. Refer to the 9th Report on Carcinogens (2000). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).

There is some evidence that breathing respirable crystalline silica or the disease silicosis is associated with an increased incidence of significant disease endpoints such as scleroderma (an immune system disorder manifested by scarring of the lungs, skin, and other internal organs) and kidney disease.
### Toxicology data for the components

<table>
<thead>
<tr>
<th>Substances</th>
<th>CAS Number</th>
<th>LD50 Oral</th>
<th>LD50 Dermal</th>
<th>LC50 Inhalation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bentonite</td>
<td>1302-78-9</td>
<td>&gt; 5000 mg/kg (Rat)</td>
<td>No data</td>
<td>&gt; 5.27 mg/L (Rat)</td>
</tr>
<tr>
<td>Crystalline silica, quartz</td>
<td>14808-60-7</td>
<td>&gt; 5000 mg/kg (Rat)</td>
<td>No data</td>
<td>No data available</td>
</tr>
<tr>
<td>Crystalline silica, cristobalite</td>
<td>14464-46-1</td>
<td>&gt; 5000 mg/kg (Rat)</td>
<td>No data</td>
<td>No data available</td>
</tr>
<tr>
<td>Crystalline silica, tridymite</td>
<td>15468-32-3</td>
<td>&gt; 5000 mg/kg (Rat)</td>
<td>No data</td>
<td>No data available</td>
</tr>
</tbody>
</table>

### 12. ECOLOGICAL INFORMATION

#### Ecotoxicological Information

Ecotoxicity Product

<table>
<thead>
<tr>
<th>Acute Fish Toxicity:</th>
<th>Not determined</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Crustaceans Toxicity:</td>
<td>Not determined</td>
</tr>
<tr>
<td>Acute Algae Toxicity:</td>
<td>Not determined</td>
</tr>
</tbody>
</table>

#### Ecotoxicity Substance

<table>
<thead>
<tr>
<th>Substances</th>
<th>CAS Number</th>
<th>Toxicity to Algae</th>
<th>Toxicity to Fish</th>
<th>Toxicity to Microorganisms</th>
<th>Toxicity to Invertebrates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bentonite</td>
<td>1302-78-9</td>
<td>EC50(72h): &gt; 100 mg/L (freshwater algae)</td>
<td>TLM96: 10000 ppm (Oncorhynchus mykiss) LC50(96h): 16000 - 19000 mg/L (Oncorhynchus mykiss) LC50(24h): 2800 – 3200 mg/L (black bass, warmouth bass, blue gill and sunfish)</td>
<td>No information available</td>
<td>EC50(96h): 81.6 mg/L (Metacarcinus magister) EC50(96h): 24.8 mg/L (Pandalus danae) EC50(48h) &gt; 100 mg/L (Daphnia magna)</td>
</tr>
<tr>
<td>Crystalline silica, quartz</td>
<td>14808-60-7</td>
<td>No information available</td>
<td>LL0(96h): 10000 mg/L (Danio rerio) (similar substance)</td>
<td>No information available</td>
<td>LL50(24h): &gt; 10000 mg/L (Daphnia magna) (similar substance)</td>
</tr>
<tr>
<td>Crystalline silica, cristobalite</td>
<td>14464-46-1</td>
<td>No information available</td>
<td>LL0(96h): 10000 mg/L (Danio rerio) (similar substance)</td>
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<td>LL50(24h): &gt; 10000 mg/L (Daphnia magna) (similar substance)</td>
</tr>
</tbody>
</table>

### 12.2. Persistence and degradability

The methods for determining biodegradability are not applicable to inorganic substances.

<table>
<thead>
<tr>
<th>Substances</th>
<th>CAS Number</th>
<th>Persistence and Degradability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bentonite</td>
<td>1302-78-9</td>
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</tr>
</tbody>
</table>

### 12.3. Bioaccumulative potential

Does not bioaccumulate

<table>
<thead>
<tr>
<th>Substances</th>
<th>CAS Number</th>
<th>Log Pow</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bentonite</td>
<td>1302-78-9</td>
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<td>Crystalline silica, quartz</td>
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</tr>
<tr>
<td>Crystalline silica, tridymite</td>
<td>15468-32-3</td>
<td>No information available</td>
</tr>
</tbody>
</table>
12.4. Mobility in soil
No information available

12.5. Results of PBT and vPvB assessment
No information available.

<table>
<thead>
<tr>
<th>Substances</th>
<th>PBT and vPvB assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystalline silica, quartz</td>
<td>Not PBT/vPvB</td>
</tr>
</tbody>
</table>

12.6. Other adverse effects

13. DISPOSAL CONSIDERATIONS

Disposal Method
Bury in a licensed landfill according to federal, state, and local regulations. Substance should NOT be deposited into a sewage facility.

Contaminated Packaging
Follow all applicable national or local regulations. Contaminated packaging may be disposed of by: rendering packaging incapable of containing any substance, or treating packaging to remove residual contents, or treating packaging to make sure the residual contents are no longer hazardous, or by disposing of packaging into commercial waste collection.

14. TRANSPORT INFORMATION

US DOT
- UN Number: Not restricted.
- UN Proper Shipping Name: Not restricted
- Transport Hazard Class(es): Not applicable
- Packing Group: Not applicable

US DOT Bulk
- DOT (Bulk) Not Applicable

Canadian TDG ul0
- UN Number: Not restricted.
- UN Proper Shipping Name: Not restricted
- Transport Hazard Class(es): Not applicable
- Packing Group: Not applicable

IMDG/IMO
- UN Number: Not restricted.
- UN Proper Shipping Name: Not restricted
- Transport Hazard Class(es): Not applicable
- Packing Group: Not applicable

IATA/ICAO
- UN Number: Not restricted.
- UN Proper Shipping Name: Not restricted
- Transport Hazard Class(es): Not applicable
- Packing Group: Not applicable

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: Not applicable
Special Precautions for User: None

15. REGULATORY INFORMATION

US Regulations
US TSCA Inventory
All components listed on inventory or are exempt.

EPA SARA Title III Extremely Hazardous Substances
Not applicable

EPA SARA (311,312) Hazard Class
Acute Health Hazard
Chronic Health Hazard

EPA SARA (313) Chemicals
This product does not contain a toxic chemical for routine annual "Toxic Chemical Release Reporting" under Section 313 (40 CFR 372).

EPA CERCLA/Superfund Reportable Spill Quantity
Not applicable.

EPA RCRA Hazardous Waste Classification
If product becomes a waste, it does NOT meet the criteria of a hazardous waste as defined by the US EPA.

California Proposition 65
The California Proposition 65 regulations apply to this product.

MA Right-to-Know Law
One or more components listed.

NJ Right-to-Know Law
One or more components listed.

PA Right-to-Know Law
One or more components listed.

Canadian Regulations

Canadian DSL Inventory
All components listed on inventory or are exempt.

WHMIS Hazard Class
D2A  Very Toxic Materials
Crystalline silica

16. OTHER INFORMATION

The following sections have been revised since the last issue of this SDS
Not applicable

Additional information
For additional information on the use of this product, contact your local Halliburton representative.

For questions about the Safety Data Sheet for this or other Halliburton products, contact Chemical Compliance at 1-580-251-4335.

Disclaimer Statement
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***END OF MSDS***