MATERIAL SAFETY DATA SHEET (MSDS)
In accordance with EU Directive 91/155/EEC and Regulations 1907/2006 (REACH) and 453/2010

Silicious material-based mixture of mineral components, Commodity code 3824909708

1. PRODUCT AND COMPANY IDENTIFICATION

| Trade Name: | Silicious material-based mixture of mineral components, TS 1978–001–90478277–2015, with Amendment No.1 |
| Company: | NanoSi Limited Liability Company |
| Service: | 140000, Russian Federation, Lyubertsy, Krasnaya Str. 1, office 90 |
| Emergency telephone: | +7 (903) 961-54-95 |
| E-mail, website: | info@nano-si.ru |

2. COMPOSITION/INFORMATION ON INGREDIENTS

Chemical characteristics and designation:
Silicious material-based mixture of mineral components is designated to be used as:
- binding agent for soil;
- pelleting binder for mineral fertilizers;
- dye (marker) for presowing treatment of seeds;
- antidote in agricultural production and private subsidiary farming for presowing treatment of seeds and treatment of vegetative plants of vegetable, horticultural, grain, industrial, floral/decorative and forestry crops, fodder and decorative grasses.

The mixture is a silicious material-based paste or viscous fluid.

Hazardous components:

<table>
<thead>
<tr>
<th>Name</th>
<th>Mass content, %</th>
<th>Hazard Class</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystal silicon, CAS № 7440-21-3, EC № 231-130-8</td>
<td>15…60</td>
<td>3 (MAC = 6/2 mg/m³, for silicate-based dust)</td>
</tr>
<tr>
<td>Polyethylene glycol (PEG-200), CAS № 25322-68-3</td>
<td>35…70</td>
<td>4 (MAC w.a. = 10 mg/m³)</td>
</tr>
<tr>
<td>Silicon carbide, CAS № 409-21-2, EC № 206-991-8</td>
<td>15…40</td>
<td>4 (MAC = 6/2 mg/m³)</td>
</tr>
<tr>
<td>Zinc powder, CAS № 7440-66-6, EC № 231-175-3</td>
<td>0.1…1.0</td>
<td>2 (MAC w.a. = 1.5/0.5 mg/m³, for zinc oxide)</td>
</tr>
<tr>
<td>Cuprum powder, CAS № 7440-50-8, EC № 231-159-6</td>
<td>0.1…2.0</td>
<td>2 (MAC w.a. = 1/0.5 mg/m³)</td>
</tr>
<tr>
<td>Iron powder, CAS № 7439-89-6, EC № 231-096-4</td>
<td>under 10</td>
<td>4 (MAC w.a. = 10 mg/m³)</td>
</tr>
</tbody>
</table>

Mixture of mineral components does not contain sources of ionizing radiation and other components or additions not complying with "Unified Sanitary Epidemiological and Hygienic Requirements for Goods Subject to Sanitary and Epidemiological Control" (approved by the decision of Customs Union Commission dated May 28, 2010 No. 299), chapter II, section 19.

3. HAZARD IDENTIFICATION

Underlying hazard of supplied products:
Mixture of mineral components by summary hazard falls into hazard class 3 (moderately hazardous substances) [1].

Eye contact – aerosol causes irritation (redness, tearing, smarting)
Ingestion - nausea, coughing, vomiting, up to abdominal pains and diarrhea. There is no identified cases of acute poisoning in production environment.
Skin contact – skin dryness, redness, itching.
Inhalational intoxication – irritation of the upper respiratory tract, sore throat, activation followed by retardation, headache, cardiac arrhythmia.

Mixture of mineral components is flammable, explosion-proof.
Mixture open-cup flash point: 179°C, burning point: 184°C, self-ignition temperature: not less than 350°C.
For silicate dust: aerosol self-ignition temperature: 790°C, LFL (lower flammability level): 100 m3, minimum ignition energy: 2.1 mJ, maximum explosion pressure: 530 kPa.

When working with mixture of mineral components, gaseous and liquid effluents are formed, polluting the environment. The main adverse effect on the environment is polluting the open air of populated areas with dust, muddiness of sewage and natural waters (water bodies), appearance of coastal deposits, mechanical pollution of soil.

If pack ignites and/or transport and storage precautions are violated, hazardous substances are released to the aerial...
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environment, and, having contacted with water, hydrogen may be released.
Weak cumulativeness.
No cumulative, embryotropic, gonadotropic, teratogenic, mutagenic and cancerogenic effect.

4. FIRST AID MEASURES

Eye contact: immediately wash eyes with copious amounts of water for 10 minutes, eye fissure wide open; if necessary, seek medical attention of ophthalmologist.

Skin Contact: remove with cotton pad or clean rag. Rinse under running water. If necessary seek medical attention of dermatologist. Take off contaminated clothes and shoes. If necessary seek medical attention of dermatologist.

Inhalation: Fresh air, take off the constraining clothes, provide warmth and calm. If necessary, seek medical attention.

Ingestion: drink lots of water, activated carbon, salt laxative. If necessary, seek medical attention.

5. FIRE FIGHTING MEASURES:

Suitable extinguishing media:
CO2, chemical foam, PF powder, PO-II-based air-filled foam, in enclosed rooms – total flooding, foam or CO2 fire extinguisher OU-2, OU-5, OP-10, OVL-100, OVPU-250, sand, fire blanket, and asbestos blanket.

Unsuitable extinguishing media: Water.

Hazard during fire: A flammable concentration of toxic fumes and gases may form over the surface of spilled mixture of mineral components. Having contacted with water, hydrogen may be released.

Special protection: Fire retardant clothing, type Tn complete with escape hood SPI-20 shall be used. If SPI-20 is unavailable, all-service protecting suit L1, L2 complete with industrial respirator RPG-67, aerosol filter and cartridges A, B, B8, BKF; special clothing; gloves made of butyl rubber dispersion, and special shoes shall be used. The need for evacuation from the accident area is determined on the basis of the local evacuation plan.

Hazardous combustion products:
Ethylene oxide fumes, carbon mono- and dioxides, flue gases.
Carbon monoxide causes asphyxia caused by carboxyhemoglobin formation; affects central nervous system.
Carbon dioxide causes breathing acceleration and lung ventilation, has vasodilatory action (up to fainting and death in case of prolonged exposure to high concentrations).

Ethylene oxide fumes cause irritation of eye, nose, throat mucous membrane, central nervous system and liver dysfunction, have sensitizing, cancerogenic, mutagenic and narcotic effect. High concentrations may cause pulmonary edema and damage of cardiovascular system, at that, damaging effect of ethylene may manifest only 72 hours later after the moment of poisoning.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions:
Use individual protection equipment. Avoid inhaling aerosols.

Environmental precautions:
Avoid dispersal of mixture of mineral components to housing and drinking as well as amenity superficial water bearing strata, open air and soils. In case mixture of mineral components causes damages to environment inform corresponding organizations.

Cleaning up methods:
Isolate the danger area within a radius of 200 m. Adjust said distance according to the results of chemical reconnaissance. Clear the zone from strangers. Enter the danger area with the protective equipment. Stay upward. Avoid flatlands. Observe the fire safety measures. Don’t smoke. Remove sources of fire and sparks. Provide first aid to the injured. Send people out of the center of contamination for a medical examination. Do not allow penetration of mixture of mineral components to water bodies, basements and sewage pipes [23, 25].

7. HANDLING AND STORAGE

Handling safety measures:
Consider local and general ventilation. Avoid contact with skin and eyes.

All works shall be performed in the room equipped with draw-in/exhaust air ventilation system providing indoor air conditions and maximum allowable concentration (MAC) content in the work area air in compliance with set norms (Section 8).

Work area air analysis in industrial buildings and on open areas [1]. Totally enclosed equipment and connecting units. Workplace shall be equipped with primary fire-fighting means. During repair works use non-sparking tools. Do not smoke or use open fire. Mandatory showering after work. Regular cleaning of rooms.

Storage safety measures:
Keep transporting pack tightly closed and sealed and store it in closed dry and ventilated warehouses at the temperature no
more and no less than +40 °C and relative humidity in the range of 75...90%, in conditions eliminating the chance of exposure to heating units, open fire, precipitation and aggressive environments. In case of mixture of mineral components contact with protective clothing, change protective clothing.

**Special measures:**
Mixture of mineral components shall be transported by all types of covered transport vehicles (including heated airplane compartments) in accordance with [18] and cargo handling rules effective for one or another type of transport.

**Information on package:**
Mixture of mineral components shall be packed in polymeric bags, soft containers and polymeric packs (buckets, bottles, canisters). Gross weight of product pack unit shall not exceed 2 000 kg. Filled packs are formed into bags on a palette.

**Materials not suitable for packing:**
Not available

### 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**Process control:**
Control of hazardous substances content in work area air must be regularly carried out (in accordance with [30], [32], [1] and [2] and in accordance with control methods for hazardous substances content in work area air [33]).

**Hazardous ingredients control:**

<table>
<thead>
<tr>
<th>Name</th>
<th>Allowable concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Crystal silicon</td>
<td>3 (MAC = 6/2 mg/m³, for silicate-based dust)</td>
</tr>
<tr>
<td>Silicon carbide</td>
<td>4 (MAC = -6 mg/m³)</td>
</tr>
<tr>
<td>Polyethylene glycol</td>
<td>4 (MAC&lt;sub&gt;W.A.&lt;/sub&gt; = 10 mg/m³)</td>
</tr>
<tr>
<td>Zinc</td>
<td>2 (MAC&lt;sub&gt;W.A.&lt;/sub&gt; = 1.5/0.5 mg/m³, for zinc oxide)</td>
</tr>
<tr>
<td>Cuprum</td>
<td>2 (MAC&lt;sub&gt;W.A.&lt;/sub&gt; = 1/0.5 mg/m³)</td>
</tr>
<tr>
<td>Iron</td>
<td>4 (MAC&lt;sub&gt;W.A.&lt;/sub&gt; = -10 mg/m³)</td>
</tr>
<tr>
<td>Carbon monoxide</td>
<td>4 (value MAC&lt;sub&gt;W.A.&lt;/sub&gt; = 20 mg/m³)</td>
</tr>
<tr>
<td>Carbon dioxide</td>
<td>4 (value MAC&lt;sub&gt;W.A.&lt;/sub&gt; = 27000/9000 mg/m³)</td>
</tr>
<tr>
<td>Ethylene oxide</td>
<td>2 (value MAC&lt;sub&gt;W.A.&lt;/sub&gt; = 3/1 mg/m³)</td>
</tr>
</tbody>
</table>

**In case of fire:**

- **Carbon monoxide:** 4 (value MAC<sub>W.A.</sub> = 20 mg/m³)
- **Carbon dioxide:** 4 (value MAC<sub>W.A.</sub> = 27000/9000 mg/m³)
- **Ethylene oxide:** 2 (value MAC<sub>W.A.</sub> = 3/1 mg/m³)

**Personal protective equipment**

- **Respiratory protection:** Suitable protective breathing apparatus (RU-60, RU-60mu, RPG-67A) shall be used [11]. Inhalation: remove to fresh air. In case of high concentrations – A or BKF filter masks in accordance with [15], PFM-1, IP-4M, PN-1, PSh-2, IP-46 and IP-48 self-contained masks.
- **Hand protection:** Chemical gloves [19] and dermatological products [12] shall be used for skin protection.
- **Eye protection:** Chemical or airtight goggles. Access to running water must be ensured to flush eyes.
- **Skin protection:** Protective clothes for mechanical impacts and general industrial pollution in accordance with [20], [21] or [13], [14], [16], [17] (cloth or cotton overalls, warehouse coats, rubber-proofed fabric apron, leather shoes or rubber boots). Wash protective clothing before re-using.
- **Hygienic measures:** In accordance with the rules of industrial hygiene. Don’t smoke. Use protective gloves and eye protection equipment. Wash hands thoroughly after work.
- **Environment protection:** see sections 6 and 12.

### 9. PHYSICAL AND CHEMICAL PROPERTIES

**Appearance**

- **Form:** paste-like (dough-like) mass or viscous fluid, free from admixture/residue and free of foreign matter.
- **Color:** Brownish-black. **Odor:** Discreet, specific.

**Additional information:**

<table>
<thead>
<tr>
<th>Item name</th>
<th>Norm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Solubility in water</td>
<td>good</td>
</tr>
</tbody>
</table>
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<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Density, g/cm³</td>
<td>1.3…2.8</td>
</tr>
<tr>
<td>Freezing point, °C, not higher than</td>
<td>-50</td>
</tr>
<tr>
<td>Particle size, mkm</td>
<td></td>
</tr>
<tr>
<td>- silicon carbide;</td>
<td>0.005…25</td>
</tr>
<tr>
<td>- crystal silicon;</td>
<td>0.005…4.0</td>
</tr>
<tr>
<td>- zinc powder;</td>
<td>0.005…1.0</td>
</tr>
<tr>
<td>- cuprum powder;</td>
<td>0.005…1.0</td>
</tr>
<tr>
<td>- iron powder;</td>
<td>0.005…1.0</td>
</tr>
</tbody>
</table>

10. STABILITY AND REACTIVITY

**Stability:**
Mixture of mineral components is stable under normal conditions if handling rules are observed. In case of prolonged exposure to high temperatures (starting from +150°C and up) releasing of polyethylene glycol thermal degradation products is possible. Reactive with oxidizers, organic and inorganic acids, alkali.

*For polyethylene glycol: dissolves in benzol, acetonitrile, chloroform, acetan, methoxybenzene, dioxan. Does not dissolve in paraffins, glycols, glycerol. In aqueous solutions precipitates from aqueous solutions above 100 °C as well as when inorganic salts are introduced.*

**Intolerable conditions:** Avoid exposure to open fire, oxidizers, flammable and explosive substances, excessive heating as well as water and high humidity effect.

**Uncompatibility:** Avoid excessive heating, high humidity, exposure to open fire and water.

**Hazardous polymerization:** None under normal conditions.

**PH:** 6.5…7.5 (for 0.05% aqueous solution)

**Biodegradation persistency:** For polyethylene glycol: falls into quick biodegradable substances category (class 1 under GOST R 50595). Non-transformable in ambient environment.

11. TOXICOLOGICAL INFORMATION

**Eye contact:** Inactive substance: may damage eyes.

**Skin contact:** May cause irritation upon prolonged contact. No allergenic or percutaneous effect. For silicon: DL₅₀ > 5 000 mg/kg (dermal, rabbit).

**Inhalation:** Irritates respiratory system. No fibrogenic effect.

*For silicon: CL₅₀ > 2.08 mg/kg inh., rats;*

*For silicon carbide: CL₅₀ > 50 mg/m³ inh., rats (bronchitis, peribronchial and perivascular sclerosis).*

**Ingestion:**

*For polyethylene glycol:*

DL₅₀ = 15 700 mg/kg, guinea pigs, intragastric;

DL₅₀ = 28 915 mg/kg, rats, intragastric;

CL₅₀ is unobtainable;

*For silicon carbide:

DL₅₀ > 5 000 mg/kg (intragastric, rats)*

**Additional information connected with hazard to health:**

Target human organs, tissues and systems: central nervous and respiratory systems, liver, kidneys, bladder, ureter, and gastrointestinal tract.

*For polyethylene glycol:*

DL₅₀ = 9 708 mg/kg, rats, abdominally; DL₂₀ = 73 120 mg/kg, rats, intravenous.

Minimal toxic effect doses: 587 mg/m³, inh., for 6 h, 2 weeks, rats – change in lungs mass and blood biochemical indicators.

Rats, lifetime feeding with food containing 20 or 25% PEG-200 showed growth impairment, impairment of reproduction function and progeny survival.

**Carcinogenicity:**

In accordance with national toxicology program (NTP) – none; in accordance with International Agency for Research on Cancer (IARC) – none; in accordance with Occupational Safety and Health Administration (OSHA) – none.

12. ECOLOGICAL INFORMATION

**Environmental distribution and behavior:**

MAC in atmospheric air of populated areas is 0.05 mg/m³, single dose /0.15 mg/m³ mean daily, res. (hazard class 3); for dust containing less than 20% silicon 0.05 mg/m³, single dose res. (hazard class 3), for zinc 0.03 mg/m³, single dose /0.1 mg/m³ mean daily, res. (hazard class 3); for inorganic dust containing silicon dioxide;
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SRLI in atmospheric air of populated areas = 0.15 mg/m^3 (for polyethylene glycol);
MAC in water bodies of household and general use = 1.0 mg/l, mean tox. (hazard class 2) for zinc;
SRLI in water bodies of household and general use = 0.25 mg/l, (hazard class 3) for polyethylene glycol;
MAC in fishery water bodies = 0.001 mg/l, san.-tox. (hazard class 3) for polyethylene glycol;
MAC in soil = 23 mg/kg, translocat., for zinc

Ecotoxicology: when applying mixture of mineral components, gaseous and liquid effluent are formed, polluting atmospheric air, water and soil. Mixture of mineral components is toxic for aquatic organisms, changes taste of water [23].

For fish: CL_{50} > 5 000 mg/l (Carassius auratus), 24 h

Behavior at sewage treatment plants:
Does not adversely affect bacteria.

13. DISPOSAL

Product disposal:
For spills: necessary to collect mixture of mineral components and clean leftovers using inert absorbent. For small leaks – cover by sand (wood dust, vermiculite, rock flour etc.), for large leaks embank with earth to prevent spreading, remove pack with mixture of mineral components from leakage zone, collect and dispose of [25].

Packaging materials disposal: Disposal in accordance with local regulations set out by authorized body.

14. TRANSPORT INFORMATION

UN Number: Not applicable.

Packing group: Mixture of mineral components is not classified as hazardous cargo.

Emergency card: Not applicable. Mixture of mineral components is not classified as hazardous cargo.

Auto transport (ADR/RID): no marking is necessary.

Railway transport (ADR): no marking is necessary.

Sea transport (IMDG): no marking is necessary.

Air transport (ICAO/IATA): no marking is necessary.

Hazard symbols: “X: Skin irritation”

Signal word: “Caution”

Hazard summary: H316: Causes mild skin irritation, H333: May be harmful if inhaled, H320: Causes eye irritation.

Pack marking: Not applicable, may be marked by additional “Vacuum packing” mark.

15. REGULATORY INFORMATION

EEC marking

S-phrases:
S29 – Do not empty into drains, S23 – Do not breathe aerosols, S24/25 – Avoid contact with skin/eyes, S36/37 – Wear suitable protective clothing/gloves, S45 – In case of accident or if you feel unwell seek medical advice immediately (show the label where possible), S61 – Avoid release to the environment.
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R-codes and phrases:
R36 – Irritating to eyes, R38 – Irritating to skin

General regulatory limitations
Ozone-depleting chemicals:
No ozone-depleting chemicals; such chemicals are not used during production.

Status
TSCA:
All chemical substances in this material are included on or exempted from listing on the TSCA Inventory of Chemical Substances.
EINECS:
All ingredients are listed or not subject to control.

16. OTHER INFORMATION
16.1 Manufacturer guarantees that mixture of mineral components complies with the requirements of technical documents during 2 year from the date of manufacture provided that transport and storage rules are observed.
16.2 This mixture of mineral components safety specification complies with the requirements of 91/155/EEC Directive. Information contained herein is used to characterize mixture of mineral components regarding required safety rules. It does not guarantee specific properties and is based on scientific evidences, as well as on regulatory and technical documentation known at the present. No liabilities provided.
16.3 State standards and regulations that are referenced in this document are mandatory for use in the Russian Federation and their host CIS countries; in other countries these documents are recommendatory and may be modified according to the documents of Purchaser's country of origin.

17. REFERENCES TO REGULATIONS AND SPECIFICATIONS:

1. GOST 12.1.005-88 Occupational Safety Standards. General hygiene requirements for workzone air.
8. GOST 12.4.001-80 Occupational Safety Standards. Protective glasses. Terms and definitions.
21. GOST 27575-84 Men's overalls for protection against industrial pollution and mechanical impacts. Technical specifications.
- zinc Certificate No. AT-000562 – М: RPOHV, 02.08.1995;
24. SNIP 41-01-2003 Heating, ventilation and air conditioning.
25. SanPin 2.1.7.1322-03 Hygienic requirements for placement and neutralization of industrial and consumer wastes.
26. GN 2.2.5.2893-11 Maximum Allowable Levels (MAL) of Skin Contamination by Harmful Substances.
27. GN 2.2.5.1313-03 Maximum Allowable Concentrations (MAC) of Hazardous Substances in the Air of Working Area.
28. GN 2.1.5.1315-03 Maximum Allowable Concentrations (MAC) of Chemical Substances in Bodies of Water Used.
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[29] GN 2.1.6.1338-03
[30] SP 1.1.1058-01
[31] SP 2.2.2.1327-03
[32] SP 1.1.2193-07
[33] R 2.2.755-99

as Sources of Industrial and Drinking Water Supply, and for Drinking and Domestic Use

Maximum Allowable Concentrations of pollutants in the ambient atmosphere of populated areas

Organization of and carrying out industrial control of sanitary rules observance and sanitary-epidemic (preventative) measures.

Hygienic requirements for technological process organization, production equipment and work tools.

Organization of and carrying out industrial control of sanitary rules observance and sanitary-epidemic (preventative) measures.

Hygienic criteria for assessment and classification of working conditions by harmfulness and dangerousness of working-environment factors.

[34] “Rules for admission of industrial wastewaters to municipal sewer” for Moscow City.

[35] “Water quality standards for fishery water bodies, including standards for maximum allowable concentrations of harmful substances in fishery water bodies” Approved by Order No. 20 dd. 18.01.2010 of the Federal Agency for Fishery

[36] “Uniform Sanitary and Epidemiological and Hygienic Requirements for Products Subject to Sanitary and Epidemiological Supervision (Control)” (Approved by Decision of the Customs Union Commission No. 2010 of 36 May, 28). Chapter II, Section 299


[41] Regulation 1999/45/WE on approximation of laws, regulations and administrative provisions of EU Member States, concerning classification, packing and marking of hazardous materials.


Prepared by:

__________________ M.Y. Zotov

“___” _____________ 2016