

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING**UNIMIN CORPORATION**

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PRODUCT NAME: Ball Clay

SYNONYMS: Clay, Hydrous Aluminum Silicate

Date Prepared: May 2006

SECTION 2: COMPOSITION/INFORMATION ON INGREDIENTS

CAS# / EINECS #	Component	Percentage	EU Classification (67/548/EEC)
1318-74-7 / 215-286-4	Kaolinite (Aluminum Silicate) (Kaolin)	≤91%	Xn R48/20
14808-60-7 / 238-878-4	Crystalline Silica in the form of Quartz	≤45%	Xn R48/20
12001-26-2	Mica (Muscovite)	≤35%	Xn R48/20
1327-36-2 / 215-475-1	Chlorite (Aluminosilicate)	≤25%	Not applicable
68476-25-5 / 270-666-7	Feldspar	≤15%	Not applicable
13463-67-7 / 236-675-5	Titanium Dioxide	≤3%	Not applicable

Refer to section 16 for further information on EU Classification.

This material contains trace amounts (parts per trillion) of naturally occurring polychlorinated dibenzodioxins ("PCDD"), including 2,3,7,8-tetrachlorodibenzo-p-dioxin ("TCDD")."

See Section 8 for occupational exposure limit information

SECTION 3: HAZARDS IDENTIFICATION

This product is a chemically inert, non-combustible mineral.

EMERGENCY OVERVIEW**WARNING!**

Lung injury and cancer hazard. Do not breathe dust. May cause delayed lung injury. Long term exposure can cause silicosis. Silicosis is a respiratory disease, which can result in delayed, disabling and sometimes fatal lung injury. IARC and NTP have determined that crystalline silica inhaled from occupational sources can cause cancer in humans. Risk of injury is dependent on the duration and level of exposure. A single exposure will not result in serious adverse effects. See "Health Hazards" in Section 11 for detailed information. See exposure limit presentation in Section 8 for further information.

Avoid creating dust when handling, using or storing. Use only with adequate ventilation to keep exposure below recommended exposure limits.

EU Classification of Substance/Preparation: Harmful (Xn) R48/20

SECTION 4: FIRST AID MEASURES

Gross Inhalation: Remove victim to fresh air. If breathing has stopped, perform artificial respiration. If breathing is difficult have qualified personnel administer oxygen. Get prompt medical attention.

Skin Contact: No first aid should be needed since dermal contact with this product does not affect the skin. Wash exposed skin with soap and water before breaks and at the end of the shift.

Eye Contact: Flush the eyes immediately with large amounts of running water, lifting the upper and lower lids occasionally. If irritation persists or for imbedded foreign body, get immediate medical attention.

Ingestion: If large amounts are swallowed, get immediate medical attention.

SECTION 5: FIREFIGHTING MEASURES

Extinguishing Media: This product will not burn but is compatible with all extinguishing media. Use any media that is appropriate for the surrounding fire.

Special Fire Fighting Procedures: None required with respect to this product. Firefighters should always wear self-contained breathing apparatus for fires indoors or in confined areas.

Unusual Fire and Explosion Hazards: None.

Hazardous Combustion Products: None.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Wear appropriate protective equipment. If uncontaminated, collect using dustless method (HEPA vacuum or wet method) and place in appropriate container for use. If contaminated: a) use appropriate method for the nature of contamination, and b) consider possible toxic or fire hazards associated with the contaminating substances. Collect for appropriate disposal.

SECTION 7: HANDLING AND STORAGE

Do not breathe dust. Do not rely on your sight to determine if dust is in the air. Silica may be in the air without a visible dust cloud. Use normal precautions against bag breakage or spills of bulk material. Avoid creation of respirable dust. Use good housekeeping in storage and use areas to prevent accumulation of dust in work area.

To reduce the risk of developing silicosis, lung cancer and other adverse health effects, ACGIH recommends that the industrial hygienist use every means available to keep exposures below the recommended TLV. NIOSH recommends reducing airborne exposure levels as low as possible below NIOSH's recommended exposure limit, substituting less hazardous materials when feasible, using appropriate respiratory protection when source controls cannot keep exposures below the recommended limit and making medical examinations available to exposed workers.

Use adequate ventilation and dust collection. To minimize exposure, wear a respirator approved for silica dust when using, handling, storing or disposing of this product or bag. Refer to the most recent standards of ANSI (Z88.2), OSHA (29 CFR 1910.134), MSHA (30 CFR Parts 56 and 57) and NIOSH Respirator Decision Logic. Maintain, clean and fit test respirators in accordance with OSHA regulations. Maintain and test ventilation and dust collection equipment. Launder clothing that has become dusty. Empty containers (bags, bulk containers, storage tanks, etc.) retain silica residue and must be handled in accordance with the provisions of this Material Safety Data Sheet. **WARN and TRAIN** employees in accordance with state and federal regulations.

WARN YOUR EMPLOYEES (AND YOUR CUSTOMERS AND USERS IN CASE OF RESALE) BY POSTING, AND OTHER MEANS, OF THE HAZARDS AND OSHA PRECAUTIONS AND ANY OTHER APPLICABLE REGULATORY PRECAUTIONS TO BE USED. PROVIDE TRAINING FOR YOUR EMPLOYEES ABOUT OSHA PRECAUTIONS.

See also American Society for Testing and Materials (ASTM) Standard Practice E1132-99a, "Standard Practice for Health Requirements Relating to Occupational Exposure to Respirable Crystalline Silica".

Additional information on silica hazards and precautionary measures can be found at the following websites:

NIOSH Joint Campaign on Silicosis Prevention <http://www.cdc.gov/niosh/sicampn.html>

OSHA Crystalline Silica Website <http://www.osha-slc.gov/SLTC/silicacrystalline/index.html>

MSHA Silicosis Prevention Website <http://www.msha.gov/S&HINFO/SILICO/SILICO.HTM>

NIOSH Hazard Review – Health Effects of Occupational Exposure to Respirable Crystalline Silica Website
<http://www.cdc.gov/niosh/02-129pd.html>

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Limits

Definitions:

MSHA means Mine Safety and Health Administration.

NIOSH means National Institute for Occupational Safety and Health.

OSHA means Occupational Safety and Health Administration.

PEL means OSHA Permissible Exposure Limit.

REL means the NIOSH Recommended Exposure Limit.

TLV means American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value.

TWA means time-weighted average.

Quartz: OSHA PEL and MSHA Exposure Limit for Crystalline Silica, Quartz $\frac{10 \text{ mg/m}^3}{\text{Respirable measured as an 8-hour TWA}}$
TLV- 0.025 mg/m³ 8-hour TWA (respirable fraction) % Silica + 2

Kaolinite (Aluminum Silicate): PEL - 5 mg/m³ TWA (respirable fraction)
TLV- 2 mg/m³ TWA (respirable fraction)
MSHA - 5 mg/m³ TWA (respirable fraction)

Mica: PEL - 20 mppcfa TWA (respirable fraction)
TLV- 3 mg/m³ TWA (respirable fraction)
MSHA - 20 mppcfa TWA (respirable fraction)

Chlorite: PEL - 5mg/m³ TWA (respirable fraction), 15 mg/ m³ TWA (total dust) as Particulates not Otherwise Classified
TLV- None established (refer to ACGIH guidance for Particulates (insoluble or poorly soluble) Not Otherwise Specified)
MSHA - 5mg/m³ TWA (respirable fraction), 15 mg/ m³ TWA (total dust) as Particulates not Otherwise Classified

Feldspar: PEL - 5mg/m³ TWA (respirable fraction), 15 mg/ m³ TWA (total dust) as Particulates not Otherwise Classified
TLV- None established (refer to ACGIH guidance for Particulates (insoluble or poorly soluble) Not Otherwise Specified)
MSHA - 5mg/m³ TWA (respirable fraction), 15 mg/ m³ TWA (total dust) as Particulates not Otherwise Classified

Titanium Dioxide: PEL - 15 mg/m³ TWA (total dust)
TLV- 10 mg/m³ TWA
MSHA - 15 mg/m³ TWA (total dust)

In 2006 the ACGIH lowered the TLV for Silica, Crystalline: α -Quartz and Cristobalite to 0.025 mg/m³ stating in the *Documentation of the TLV* "Because the time between exposure and signs of fibrosis is characteristically very long, as much as 30 to 40 years, the margin of safety for exposure to crystalline silica at the proposed TLV-TWA is not known precisely. Given the observed association between silicosis and lung cancer, it is recommended that air concentrations be maintained as far below the proposed TLV as prudent practices permit. The recommended TLV-TWA of 0.025 mg/m³, respirable particulate mass, is intended to prevent pulmonary fibrosis that may be a risk factor for lung cancer. An A2, Suspected Human Carcinogen, notation is based on the demonstrated association between lung cancer and the presence of silicosis." The documentation further states "A lack of toxicological and industrial hygiene data does not permit the recommendation of

a TLV-STEL. However, it should be noted that high exposures of short duration to freshly fragmented crystalline particles do produce an acute and rapidly progressive form of silicosis. The reader is encouraged to review the section on *Excursion Limits* in the "Introduction to the Chemical Substances" of the current TLVs® and BEIs® book for guidance and control of excursions above the TLV-TWA, even when the 8-hour TWA is within the recommended limits"

NIOSH has issued its REL of 50 micrograms respirable free silica per cubic meter of air (0.05 mg/m^3) as determined by a full shift sample up to 10-hour working day, 40 hours per week. NIOSH has recommended that OSHA and MSHA adopt the NIOSH REL as the OSHA PEL and the MSHA Exposure Limit. The 1974 NIOSH Criteria for a Recommended Standard for Occupational Exposure to Crystalline Silica should be consulted for more detailed information. Additionally, NIOSH, In a publication entitled NIOSH Hazard Review Health Effects of Occupational Exposure to Respirable Silica (April 2002), NIOSH stated "...that workers have a significant risk of developing chronic silicosis when they are exposed to respirable crystalline silica over a working lifetime at the current Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL), the Mine Safety and Health Administration (MSHA) PEL, or the National Institute for Occupational Safety and Health (NIOSH) recommended exposure limit (REL). ...Current sampling and analytical methods used to evaluate occupational exposure to respirable crystalline silica do not meet the accuracy criterion needed to quantify exposures at concentrations below the NIOSH REL of 0.05 mg/m^3 as a time-weighted average (TWA) for up to a 10-hr workday during a 40-hr workweek. Until improved sampling and analytical methods are developed for respirable crystalline silica, NIOSH will continue to recommend an exposure limit of 0.05 mg/m^3 to reduce the risk of developing silicosis, lung cancer, and other adverse health effects. NIOSH also recommends minimizing the risk of illness that remains for workers exposed at the REL by substituting less hazardous materials for crystalline silica when feasible, by using appropriate respiratory protection when source controls cannot keep exposures below the NIOSH REL, and by making medical examinations available to exposed workers."

Crystalline silica exists in several forms, the most common of which are quartz (i.e. this product), trydimite and cristobalite, with quartz being the most common form found in nature. If quartz is heated to more than 870°C , it can change form to trydimite and if quartz is heated to more than 1450°C , it can change form to cristobalite. The OSHA PELs and MSHA Exposure Limits for trydimite and cristobalite are one-half of the PEL for quartz.

Ventilation: Use local exhaust as required to maintain exposures as far as possible below applicable occupational exposure limits. See also ACGIH "Industrial Ventilation - A Manual for Recommended Practice" (current edition). Control of exposure to dust must be accomplished as far as feasible by accepted engineering control measures (for example, enclosure or confinement of the operation, general or local exhaust ventilation and substitution of less toxic materials).

Respiratory Protection: When effective engineering controls are not feasible, or while they are being implemented, appropriate respiratory protection must be used. Use appropriate respiratory protection for respirable particulates based on consideration of airborne workplace concentrations and duration of exposure arising from intended end use. Refer to the most recent standards of ANSI (Z88.2), OSHA (29 CFR 1910.134), MSHA (30 CFR Parts 56 and 57) and NIOSH Respirator Decision Logic.

Gloves: Protective gloves recommended. Wash hands and face before eating and drinking.

Eye Protection: Safety glasses or goggles recommended.

Other Protective Equipment/Clothing: As appropriate for the work environment. Dusty clothing should be laundered before reuse. Wear clean, sanitized work clothes at the start of each shift.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance and Odor: Cream to buff colored powder with an earthy odor.

pH: 5-9 (in a 5% slurry)

Boiling Point: Not applicable

Melting Point: Not applicable

Solubility in Water: Negligible

Percent Volatile: Slight

Autoignition Temp: Will not burn.

Specific Gravity (water=1): 2.6-2.7

Vapor Pressure: Not applicable

Vapor Density: Not applicable

Evaporation Rate: Not applicable

Flash Point (Method Used): Non-combustible, inorganic material.

Flammable Limits: LEL: Not applicable

UEL: Not applicable**SECTION 10: STABILITY AND REACTIVITY**Stability: StableConditions to Avoid: NoneIncompatibility: Powerful oxidizing agents such as fluorine, chlorine trifluoride, manganese trioxide, etc.Hazardous Decomposition Products: Silica will dissolve in hydrofluoric acid producing a corrosive gas, silicon tetrafluoride.Hazardous Polymerization: Will not occur.Conditions to Avoid: None**SECTION 11: TOXICOLOGICAL INFORMATION****HEALTH HAZARDS:**Inhalation: Breathing dust may not cause noticeable injury or illness even though permanent lung damage may be occurring. Inhalation of dust may have the following serious chronic health effects:

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 mycobacterial infections (tuberculous and non-tuberculous) and fungal infections. Inhalation of air with a very high concentration of respirable silica dust can cause the most serious forms of silicosis in a matter of months or a few years. Some epidemiologic studies have concluded that there is significant risk of developing silicosis even at airborne exposure levels that are equal to the recommended NIOSH REL, the ACGIH TLV, the OSHA PEL, and the MSHA Exposure Limit.

Pneumoconiosis: Excessive inhalation of respirable kaolin dust or mica dust may cause pneumoconiosis, a respiratory disease, which can result in delayed, progressive, disabling and sometimes fatal lung injury. Symptoms include cough, shortness of breath, wheezing, non-specific chest illness and reduced pulmonary function. This disease is exacerbated by smoking. Individuals with pneumoconiosis are predisposed to develop tuberculosis.

Cancer Status: The International Agency for Research on Cancer has determined that crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans (Group 1 - carcinogenic to humans). Refer to IARC Monograph 68, Silica, Some Silicates and Organic Fibrils (published in June 1997) in conjunction with the use of these materials. The National Toxicology Program classifies respirable crystalline silica as "known to be a human carcinogen". Refer to the Eleventh Report on Carcinogens (2005). The American Conference of Governmental Industrial Hygienists (ACGIH) classifies crystalline silica, quartz, as a suspected human carcinogen (A2).

Other Data with Possible Relevance to Human Health:

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 fibrosis of the lungs, skin and other internal organs) rheumatoid arthritis, systemic lupus erythematosus, sarcoidosis, chronic bronchitis, chronic obstructive pulmonary disease (COPD), emphysema, chronic kidney disease and end-stage renal disease.

The material contains trace amounts (parts per trillion) of naturally occurring dioxin congeners including TCDD. 2,3,7,8-TCDD has been classified as a known human carcinogen by the U.S. National Toxicological Program in its Tenth Annual Report, by the IARC in Monograph 69 (1997), and by the State of California in its Proposition 65 list of chemicals known to cause cancer and developmental toxicity. The regulatory limit for TCDD in drinking water and bottled water is 3×10^{-8} milligram per liter of water (0.03 ppt). NIOSH has recommended that the exposure limit of TCDD be the lowest feasible concentration. OSHA regulates TCDD under the Hazard Communication Standard. In 1998, the World Health Organization set a lifetime tolerable daily intake for dioxin congeners using the toxicity equivalent factors to convert each dioxin congener into the equivalent concentration of TCDD ("TEQs") of 1 – 4 TEQ picograms per kilogram of body weight (for dioxins and dioxin-like compounds), based on the view that below this threshold level of exposure no adverse health impacts are likely to occur. Exposure is the amount of a chemical that actual enters the body and is not the same as concentrations in soil or on dust particles. WHO emphasized that occasional short-term excursions above the total daily intake would have no health consequences provided that the average intake over long periods is not exceeded. Furthermore, in an Investigative Report, MSHA has determined that clay miners' risk of harmful exposure to naturally occurring trace amounts of 2,3,7,8 TCDD by inhalation or ingestion or both is very low. (See U.S. Dept. of Labor, Mine Safety and Health Administration, Investigative Report PP-004-98M, December 18, 1997.) EPA dioxin soil cleanup guidance states that exposure of workers at an industrial site to soil containing 20 ppb or less of total dioxin toxicity equivalents should be safe.

For further information consult "Adverse Effects of Crystalline Silica Exposure" published by the American Thoracic Society Medical Section of the American Lung Association, American Journal of Respiratory and Critical Care Medicine, Volume 155, pages 761-768, 1997, and see also NIOSH Hazard Review – Health Effects of Occupational Exposure to Respirable Crystalline Silica, April 2002 (see Section 7 for NIOSH Hazard Review Website).

Skin Contact: No adverse effects expected.

Eye Contact: Contact may cause mechanical irritation and possible injury.

Ingestion: No adverse effects expected for normal, incidental ingestion.

Chronic Health Effects: See "Inhalation" subsection above with respect to silicosis, cancer status and other data with possible relevance to human health.

Medical Conditions Aggravated by Exposure: Individuals with respiratory disease, including but not limited to asthma and bronchitis, or subject to eye irritation, should not be exposed to respirable dust.

Signs and Symptoms of Exposure: Exposure to dust may cause mucous membrane and respiratory irritation, cough, sore throat, nasal congestion, sneezing and shortness of breath. However, there may be no immediate signs or symptoms of exposure to hazardous concentrations of respirable crystalline silica (quartz). See "Inhalation" subsection above for symptoms of silicosis. The absence of symptoms is not necessarily indicative of safe conditions.

Acute Toxicity Values: Silica: LD50 oral rat >22,500 mg/kg.
Titanium Dioxide: LD50 oral rat >12,000 mg/kg

SECTION 12: ECOLOGICAL INFORMATION

Silica: LC50 carp >10,000 mg/L/72 hr. This product is not expected to present an environmental hazard.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal Method: These products are not classified as a hazardous waste under US EPA RCRA regulations. If uncontaminated, dispose as an inert, non-metallic mineral. If contaminated, dispose in accordance with all applicable local, state/provincial and federal regulations in light of the contamination present. Local regulations may be more stringent than regional and national requirements. It is the responsibility of the waste generator to determine the toxicity and physical characteristics of the material to determine the proper waste identification and disposal in compliance with applicable regulations.

SECTION 14: TRANSPORT INFORMATION**U.S. DOT HAZARD CLASSIFICATION**

Proper Shipping Name: Not Regulated

Technical Name: N/A

UN Number: N/A

Hazard Class/Packing Group: N/A

Labels Required: None

DOT Packaging Requirements: N/A

Exceptions: N/A

SECTION 15: REGULATORY INFORMATION

SARA 311/312: Hazard Categories for SARA Section 311/312 Reporting: Chronic Health

SARA 313 This Product Contains the Following Chemicals Subject to Annual Release Reporting Requirements Under the SARA Section 313 (40 CFR 372): None

CERCLA Section 103 Reportable Quantity: None

California Proposition 65: This product contains crystalline silica (respirable) which is known to the State of California to cause cancer. This product also contains and trace amounts of TCDD dioxin which is listed as a chemical known to the State of California to cause cancer and developmental toxicity.

Toxic Substances Control Act: All of the components of this product are listed on the EPA TSCA Inventory or exempt from premanufacture notification requirements.

European Inventory of Commercial Chemical Substances: All of the components of this product are listed on the EINECS Inventory or exempt from notification requirements.

European Community Labeling: Harmful Xn

Contains crystalline silica, quartz (238-878-4), kaolinite (215-286-4) and mica

R48/20 Harmful: Danger of serious damage to health by prolonged exposure by inhalation.

S22 Do not breathe dust

S38 In case of insufficient ventilation, wear suitable respiratory equipment.

Canadian Environmental Protection Act: All the components of this product are listed on the Canadian Domestic Substances List or exempt from notification requirements.

Canadian WHMIS Classification: Class D, Division 2, Subdivision A (Very Toxic Material causing other Toxic Effects)

This MSDS has been prepared according to the criteria of the Controlled Products Regulation (CPR) and the MSDS contains all of the information required by the CPR.

Japan METI: All of the components of this product are existing chemical substances as defined in the Chemical Substance Control Law.

Australian Inventory of Chemical Substances: All of the components of this product are listed on the AICS inventory or exempt from notification requirements.

Australian National Occupational Health & Safety Commission Status: Hazardous according to the criteria of Australian National Occupational Health & Safety Commission -Harmful (Xn) R48/20 Harmful: Danger of serious damage to health by prolonged exposure by inhalation.

Korea: All of the components of this product are listed on the ECL inventory or exempt from notification requirements.

Philippines: All of the components of this product are listed on the PICCS inventory or exempt from notification requirements.

16: OTHER INFORMATION

EU Classes and Risk Phrases for Reference (See Sections 2 and 3)

Xn Harmful

R48/20 Harmful: Danger of serious damage to health by prolonged exposure by inhalation.

S22 Do not breathe dust

S38 In case of insufficient ventilation, wear suitable respiratory equipment.

NFPA Hazard Rating: Health: 1 Fire: 0 Reactivity: 0

HMIS Hazard Rating: Health: * Fire: 0 Reactivity: 0

* Warning - Chronic health effect possible - inhalation of silica dust may cause lung injury/disease (silicosis). Take appropriate measures to avoid breathing dust. See Section 3.

References:

- Registry for Toxic Effects of Chemical Substances (RTECS), 2006
- Patty's Industrial Hygiene and Toxicology
- NIOSH Hazard Review – Health Effects of Occupational Exposure to Respirable Crystalline Silica, April 2002
- NTP Eleventh Report on Carcinogens, 2005
- IARC Monograph Volume 68, Silica, Some Silicates and Organic Fibres, 1997
- Hazardous Substances Data Bank (HSDB), 2006
- Documentation of the TLV – Silica, Crystalline: α -Quartz and Cristobalite, American Conference of Governmental Industrial Hygienists, 2006

Revision Summary: Moved flash point and explosive limits fields to Section 9 (Section 5), Revised Handling and Storage (Section 7). Revised Occupational Exposure Limits (Section 8), Section 15 – Added Australian Hazard Classification.

The data in this Material Safety Data Sheet relates only to the specific material designated herein and does not relate to use in combination with any other material or in any process. The information set forth herein is based on technical data the Unimin Corporation believes reliable. It is intended for use by persons having technical skill and at their own discretion and risk. Since conditions of use are outside the control of Unimin Corporation, no warranties, expressed or implied, are made and no liability is assumed in connection with any use of this information. Any use of these data and information must be determined by the user to be in accordance with federal, state and local laws and regulations.