

MATERIAL SAFETY DATA SHEETMSDS No. EW130028
Revised Date: 2002/06/14

CODE: 131-00282, 132-00295, 133-00281, 135-00285, 137-07825

IDENTITY Magnesium Oxide (Heavy)**1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION**

PRODUCT NAME : Magnesium Oxide (Heavy)

MANUFACTURER : Wako Pure Chemical Industries, Ltd.

SUPPLIER : SUPPLIER(In JAPAN) : Wako Pure Chemical Industries, Ltd.

ADDRESS : 1-2, Doshomachi 3-chome, Chuo-ku, Osaka, 540-8605, Japan

TELEPHONE NUMBER & EMERGENCY TELEPHONE NUMBER: (06)6203-3741

SUPPLIER(In U.S.A.) : Wako Chemicals USA, Inc.

ADDRESS : 1600 Bellwood Road, Richmond, VA 23237, U.S.A.

TELEPHONE NUMBER : (800)992-9256

EMERGENCY TELEPHONE NUMBER : (800)424-9300 (CHEMTREC)

SUPPLIER(In EUROPE) : Wako Chemicals GmbH, Germany

ADDRESS : Nissanstrasse 2,D-41468 Neuss, GERMANY

TELEPHONE NUMBER & EMERGENCY TELEPHONE NUMBER : (02131)311-0

2. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL NAME : Magnesium oxide

SYNONYMS : Magnesia; Calcined magnesia; Magnesia usta; Magcal; Maglite

FORMULA : MgO

MOLECULAR WEIGHT : 40.30

CAS NUMBER : 1309-48-4

TSCA INVENTORY : Listed

EINECS No. : 215-171-9

IDENTIFICATION OF DANGER ;

SYMBOL : -----

R-phrases : -----

3. HAZARDS IDENTIFICATION

May be harmful if inhaled and ingested.

May cause eye and skin irritation.

HMIS : HR= health- 2 , flam.- 0 , react.- 0

4. FIRST AID MEASURES

GENERAL ADVICE : Wash off immediately with soap and plenty of water. In the case of respirable dust and/or fumes, use self-contained breathing apparatus and dust impervious protective suit. Use personal protective equipment.

INHALATION : Move victim to fresh air. If breathing is difficult, give oxygen. If irritation persists, consult a physician.

SKIN CONTACT : Remove contaminated clothes and shoes, rinse skin with plenty of water or shower. Use soap to help assure removal. If irritation persists, consult a physician.

EYE CONTACT : Remove any contact lenses at once. Flush eyes well with flooding amounts of running water for at least 15 minutes.

Assure adequate flushing by separating the eyelids with sterile fingers. If irritation persists, consult a physician.

INGESTION : Rinse mouth, give plenty of water to dilute the substance. Never give anything by mouth to an unconscious person. Consult a physician.

5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA :

Carbon dioxide, dry chemical powder, foam, water

FIRE & EXPLOSION HAZARDS :

Toxic and irritating dust, fumes or smoke may be emitted.

SPECIAL PROTECTIVE EQUIPMENT FOR FIREFIGHTERS : Firemen should wear normal protective equipment(full bunker gear)and positive-pressure self-contained breathing apparatus.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS : Remove ignition sources and ventilate area. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid raising dust and avoid contact with skin and eyes.

ENVIRONMENTAL PRECAUTIONS : Prevent spills from entering sewers, watercourses or low areas.

METHODS FOR CLEAN UP : Do not touch spilled material without suitable protection(See section 8). After material is completely picked up, wash the spill site with soap and water and ventilate the area. Put all wastes in a plastic bag for disposal and seal it tightly. Remove, clean, or dispose of contaminated clothing.

7. HANDLING AND STORAGE

Research use only.

HANDLING :

Avoid contact with eyes, skin and clothing. Avoid prolonged or repeated exposure. Handle material with suitable protection. This material is hygroscopic.

STORAGE :

Store away from sunlight in well-ventilated dry place at room temperature.

INCOMPATIBLE PRODUCTS :Strong oxidizers, strong acids, halogen

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING MEASURES :Use exhaust ventilation to keep airborne concentrations below exposure limits. Use only with adequate ventilation.

VENTILATION : Local Exhaust ; Necessary, Mechanical(General) ; Recommended

CONTROL PARAMETER :

OSHA Final Limits :TWA= 15mg/m³

ACGIH TLV(s) : TWA= 10mg/m³

PERSONAL PROTECTION :

Respiratory protection :NIOSH/MSHA approved respirator

Hand protection : Chemical resistant gloves

Eye protection : Safety glasses(goggles)

Skin protection : Protective clothing

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE : White powder

ODOR : Odorless

pH : Not available

BOILING POINT : 3600 ° C= 6512 ° F

MELTING POINT : 2800 ° C= 5072 ° F

FLASH POINT : Not available

FLAMMABILITY (solid, gas) : Not available (Nonflammable)

DECOMPOSITION TEMPERATURE :Not available

EXPLOSIVE LIMITS : Not available

VAPOR PRESSURE : Not available

SPECIFIC GRAVITY : 3.65-3.75 (at 4° C= 39 ° F)

SOLUBILITY IN ;

WATER : Practically insoluble

ALCOHOL : Practically insoluble

log Po/w : Not available

10. STABILITY AND REACTIVITY

CONDITION TO AVOID : Sunlight, heat, moisture, air

INCOMPATIBILITY(MATERIAL TO AVOID) : Strong oxidizers, strong acids, halogen

HAZARDOUS DECOMPOSITION PRODUCTS :Not available

HAZARDOUS POLYMERIZATION : Will not occur.

11. TOXICOLOGICAL INFORMATION

ACUTE TOXICITY DATA : TC_{Lo}(ihl,human): 400mg/m³(38MKAJ 2A,1745,1981)

IRRITATION DATA : Not available

MUTATION DATA : Not available

REPRODUCTIVE EFFECTS DATA :Not available

TUMORIGENIC DATA : TD_{Lo}(itr, hamster): 480mg/kg/30W-I(CNREA 33,2209,1973)

ADDITIONAL INFORMATION ;

NTP : Not listed

IARC : Not listed

OSHA : Not listed

ACGIH :Not listed

12. ECOLOGICAL INFORMATION

BIODEGRADABILITY : Not available

BIOACCUMULATION POTENTIAL :Not available

AQUATIC TOXICITY : Not available

OTHER INFORMATION : WGK; 1

13. DISPOSAL CONSIDERATION

Dispose in a hazardous-waste site in accordance with all applicable regulations. Any disposal practice must be in compliance with country, local, state, and federal laws and regulations (contact country, local or state environmental agency for specific rules).

14. TRANSPORT INFORMATION

IATA : Not Restricted.
DOT(Department of Transportation) :Not a Hazardous Material for DOT shipping.

15. REGULATORY INFORMATION

US REGULATIONS ;

NIOSH Recommend. Subst., Mass. Subst. List , New Jers. RTK Haz. Subst. List , Penn. Haz. Subst. List , Canad. WHMIS IDL 1% conc.

EPA : CERCLA RQ= Not listed

EPCRA TPQ= Not listed

OSHA :TQ= Not listed

EU REGULATIONS ;

SYMBOL : -----

R-phrases : -----

S-phrases :22

Do not breath dust.

EC index No. :Not listed

16. OTHER INFORMATION

No specific notes

The above information is believed to be correct to be the best of our knowledge and information but does not purport to be all inclusive and shall be used only as a guide. This product is intended to be used by expert persons having chemical knowledge and skill, at their own discretion and risk and Wako shall not be held liable for any damage resulting from handling or from contact with the above material.

MATERIAL SAFETY DATA SHEET

CODE: 035-12322, 037-12321, 039-12325

MSDS No. EW031232
Revised Date: 2004/12/15**IDENTITY** Calcium Carbonate, 99.9%**1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION**

PRODUCT NAME : Calcium Carbonate, 99.9%

MANUFACTURER : Wako Pure Chemical Industries, Ltd.

SUPPLIER : SUPPLIER(In JAPAN) : Wako Pure Chemical Industries, Ltd.

ADDRESS : 1-2, Doshomachi 3-chome, Chuo-ku, Osaka, 540-8605, Japan

TELEPHONE NUMBER & EMERGENCY TELEPHONE NUMBER: (06)6203-3741

SUPPLIER(In U.S.A.) : Wako Chemicals USA, Inc.

ADDRESS : 1600 Bellwood Road, Richmond, VA 23237, U.S.A.

TELEPHONE NUMBER : (804)271-7677

EMERGENCY TELEPHONE NUMBER : (800)424-9300 (CHEMTREC)

SUPPLIER(In EUROPE) : Wako Chemicals GmbH, Germany

ADDRESS : Nissanstrasse 2, D-41468 Neuss, GERMANY

TELEPHONE NUMBER & EMERGENCY TELEPHONE NUMBER : (02131)311-0

2. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL NAME : Calcium carbonate
 SYNONYMS : Carbonic acid calcium salt(1:1); Calcichew
 FORMULA : CaCO₃
 MOLECULAR WEIGHT : 100.09
 CAS NUMBER : 471-34-1
 TSCA INVENTORY : Listed
 EINECS No. : 207-439-9
 IDENTIFICATION OF DANGER ;
 SYMBOL : -----
 R-phrases : -----

3. HAZARDS IDENTIFICATION

May be harmful if inhaled and ingested.
Causes eye and skin irritation.

4. FIRST AID MEASURES

GENERAL ADVICE : Wash off immediately with soap and plenty of water. In the case of respirable dust and/or fumes, use self-contained breathing apparatus and dust impervious protective suit. Use personal protective equipment.

INHALATION : Move victim to fresh air. If breathing is difficult, give oxygen. If irritation persists, consult a physician.

SKIN CONTACT : Remove contaminated clothes and shoes, rinse skin with plenty of water or shower. Use soap to help assure removal. If irritation persists, consult a physician.

EYE CONTACT : Remove any contact lenses at once. Flush eyes well with flooding amounts of running water for at least 15 minutes. Assure adequate flushing by separating the eyelids with sterile fingers. If irritation persists, consult a physician.

INGESTION : Rinse mouth, give plenty of water to dilute the substance. Never give anything by mouth to an unconscious person. Consult a physician.

5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA :

Carbon dioxide, dry chemical powder, foam, water

FIRE & EXPLOSION HAZARDS :

Toxic and irritating dust, fumes or smoke may be emitted.

SPECIAL PROTECTIVE EQUIPMENT FOR FIREFIGHTERS : Firemen should wear normal protective equipment(full bunker gear) and positive-pressure self-contained breathing apparatus.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS : Remove ignition sources and ventilate the area. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid raising dust and avoid contact with skin and eyes.

ENVIRONMENTAL PRECAUTIONS : Prevent spills from entering sewers, watercourses or low areas.

METHODS FOR CLEAN UP : Do not touch spilled material without suitable protection(See section 8). After material is completely picked up, wash the spill site with soap and water and ventilate the area. Put all wastes in a plastic bag for disposal and seal it tightly. Remove, clean, or dispose of contaminated clothing.

7. HANDLING AND STORAGE

Research use only.

HANDLING : Avoid contact with eyes, skin and clothing. Avoid prolonged or repeated exposure. Handle material with suitable protection.

STORAGE : Store away from sunlight in well-ventilated dry place at room temperature. Keep container tightly closed.

INCOMPATIBLE PRODUCTS : fluorine, acids, alum, ammonium salts

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING MEASURES : Use exhaust ventilation to keep airborne concentrations below exposure limits. Use only with adequate ventilation.

VENTILATION : Local Exhaust ; Necessary, Mechanical(General) ; Recommended

PERSONAL PROTECTION :

Respiratory protection : Use a NIOSH/MSHA or European Standard EN149 approved respirator if the vapor concentrations exceed regulatory guidelines.

Hand protection : Chemical resistant gloves

Eye protection : Safety glasses(goggles)

Skin protection : Protective clothing

CONTROL PARAMETER :

OSHA Final Limits : None established

ACGIH TLV(s) : None established

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE : White powder

ODOR : Odorless

pH : Not available

BOILING POINT : Not available

MELTING POINT : 825 ° C= 1517 ° F (Decomposition)

FLASH POINT : Not available

FLAMMABILITY (solid, gas) : Nonflammable

DECOMPOSITION TEMPERATURE : Not available

EXPLOSIVE LIMITS : Not available

VAPOR PRESSURE : Not available

SPECIFIC GRAVITY : 2.7-2.9

SOLUBILITY IN :

WATER : Practically insoluble

DILUTE ACIDS : Soluble

log Po/w : Not available

10. STABILITY AND REACTIVITY

CONDITION TO AVOID : Sunlight, heat

INCOMPATIBILITY(MATERIAL TO AVOID) : fluorine, acids, alum, ammonium salts

HAZARDOUS DECOMPOSITION PRODUCTS : Carbon monoxide and calcium oxides may be formed.

HAZARDOUS POLYMERIZATION : Will not occur.

11. TOXICOLOGICAL INFORMATION

ACUTE TOXICITY DATA : LD50(oral, rat): 6450mg/kg(28ZPAK ,267,1972)

IRRITATION DATA : Eye; rabbit; 750µg/24H; Severe(28ZPAK ,267,1972)

Skin; rabbit; 500mg/24H; Moderate(28ZPAK ,267,1972)

MUTATION DATA : Not available

REPRODUCTIVE EFFECTS DATA : Not available

TUMORIGENIC DATA : Not available

ADDITIONAL INFORMATION :

NTP : Not listed

IARC : Not listed

OSHA : Not listed

ACGIH : Not listed

12. ECOLOGICAL INFORMATION

BIODEGRADABILITY : Not available

BIOACCUMULATION POTENTIAL : Not available

AQUATIC TOXICITY : Not available

OTHER INFORMATION : WGK; nwg

13. DISPOSAL CONSIDERATION

Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. And then bury in landfill in accordance with all applicable regulations. Any disposal practice must be in compliance with country, local, state, and federal laws and regulations (contact country, local or state environmental agency for specific rules).

14. TRANSPORT INFORMATION

IATA : Not Restricted.
DOT(Department of Transportation) :Not a Hazardous Material for DOT shipping.

15. REGULATORY INFORMATION

US REGULATIONS ;
EPA : CERCLA RQ= Not listed
EPCRA TPQ= Not listed
OSHA :TQ= Not listed

EU REGULATIONS ;
SYMBOL : -----
R-phrases : -----
S-phrases :26-36
In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
Wear suitable protective clothing.
EC index No. :Not listed

16. OTHER INFORMATION

No specific notes

The above information is believed to be correct to be the best of our knowledge and information but does not purport to be all inclusive and shall be used only as a guide. This product is intended to be used by expert persons having chemical knowledge and skill, at their own discretion and risk and Wako shall not be held liable for any damage resulting from handling or from contact with the above material.

MATERIAL SAFETY DATA SHEET

MSDS No. EW190334

Revised Date: 2007/10/12

CODE: 191-03343, 191-03348, 193-03342, 194-07135, 194-12221, 195-03341, 195-07481, 197-03345, 197-07485, 199-03344

IDENTITY Sodium Sulfate**1. IDENTIFICATION OF THE SUBSTANCE OR MIXTURE AND OF THE SUPPLIER**

PRODUCT IDENTIFIER :Sodium Sulfate

MANUFACTURER : Wako Pure Chemical Industries, Ltd.

SUPPLIER(In JAPAN) : Wako Pure Chemical Industries, Ltd.

ADDRESS : 1-2, Doshomachi 3-chome, Chuo-ku, Osaka, 540-8605, Japan

TELEPHONE NUMBER & EMERGENCY TELEPHONE NUMBER: (06)6203-3741

SUPPLIER(In U.S.A.) : Wako Chemicals USA, Inc.

ADDRESS : 1600 Bellwood Road, Richmond, VA 23237, U.S.A.

TELEPHONE NUMBER : (804)271-7677

EMERGENCY TELEPHONE NUMBER : (800)424-9300 (CHEMTREC)

SUPPLIER(In EUROPE) : Wako Chemicals GmbH, Germany

ADDRESS : Fuggerstrasse 12 ,D-41468 Neuss, GERMANY

TELEPHONE NUMBER & EMERGENCY TELEPHONE NUMBER : (02131)311-0

RECOMMENDED USE : Research use only.

2. HAZARDS IDENTIFICATION

SYMBOL : -----

HAZARD STATEMENTS, including R-phrase : -----

ADDITIONAL HAZARD STATEMENTS :

May be harmful if inhaled and ingested.

May cause eye and skin irritation.

PRECAUTIONARY STATEMENTS, including S-phrase : -----

3. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL IDENTITY :Sodium sulfate

SYNONYMS : Sodium sulfate, anhydrous

FORMULA : Na₂SO₄

MOLECULAR WEIGHT :142.04

CAS NUMBER : 7757-82-6

TSCA INVENTORY : Listed

EINECS No. : 231-820-9

EC INDEX NUMBER : Not listed

4. FIRST AID MEASURES

GENERAL ADVICE :Wash off immediately with soap and plenty of water. In the case of respirable dust and/or fumes, use self-contained breathing apparatus and dust impervious protective suit. Use personal protective equipment.

INHALATION : Move victim to fresh air. If breathing is difficult, give oxygen. If irritation persists, consult a physician.

SKIN CONTACT :Remove contaminated clothes and shoes, rinse skin with plenty of water or shower. Use soap to help assure removal. If irritation persists, consult a physician.

EYE CONTACT : Remove any contact lenses at once. Flush eyes well with flooding amounts of running water for at least 15 minutes. Assure adequate flushing by separating the eyelids with sterile fingers. If irritation persists, consult a physician.

INGESTION : Rinse mouth, give plenty of water to dilute the substance. Never give anything by mouth to an unconscious person. Consult a physician.

5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA :

Carbon dioxide, dry chemical powder, foam, water

FIRE & EXPLOSION HAZARDS :

Toxic and irritating dust, fumes or smoke may be emitted.

SPECIAL PROTECTIVE EQUIPMENT FOR FIREFIGHTERS :Firemen should wear normal protective equipment(full bunker gear) and positive-pressure self-contained breathing apparatus.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS : Remove ignition sources and ventilate the area. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid raising dust and avoid contact with skin and eyes.

ENVIRONMENTAL PRECAUTIONS :Prevent spills from entering sewers, watercourses or low areas.

METHODS FOR CLEANING UP : Do not touch spilled material without suitable protection(See section 8). After material is completely picked up, wash the spill site with soap and water and ventilate the area. Put all wastes in a plastic bag for disposal and seal it tightly. Remove, clean, or dispose of contaminated clothing.

7. HANDLING AND STORAGE

PRECAUTION FOR SAFE HANDLING : Avoid contact with eyes, skin and clothing. Avoid prolonged or repeated exposure. Handle material with suitable protection. This material is hygroscopic.

CONDITIONS FOR SAFE STORAGE : Store away from sunlight in well-ventilated dry place at room temperature. Keep container tightly closed.

INCOMPATIBILITIES : Strong acids, aluminum, magnesium

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING MEASURES : Use exhaust ventilation to keep airborne concentrations below exposure limits. Use only with adequate ventilation.

VENTILATION : Local Exhaust ; Necessary, Mechanical(General) ; Recommended

INDIVIDUAL PROTECTION MEASURES :

Respiratory protection : Use a NIOSH/MSHA or European Standard EN149 approved respirator if the vapor concentrations exceed regulatory guidelines.

Hand protection : Chemical resistant gloves

Eye protection : Safety glasses(goggles)

Skin protection : Protective clothing

CONTROL PARAMETER :

OSHA Final Limits : None established

ACGIH TLV(s) : None established

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE : White, powder-small granules

ODOUR : Odourless

pH : Not available

MELTING POINT : 888 ° C= 1630 ° F

INITIAL BOILING POINT : Not available

FLASH POINT : Not available

FLAMMABILITY (solid, gas) : Not available

EXPLOSIVE LIMITS : Not available

VAPOR PRESSURE : Not available

SPECIFIC GRAVITY : 2.671 (at 4 ° C= 39 ° F)

SOLUBILITY IN :

WATER : Freely soluble

ALCOHOL : Practically insoluble

PARTITION COEFFICIENT : Not available

DECOMPOSITION TEMPERATURE : Not available

10. STABILITY AND REACTIVITY

CHEMICAL STABILITY : Will not occur.

CONDITIONS TO AVOID : Sunlight, heat, moisture

INCOMPATIBLE MATERIALS : Strong acids, aluminum, magnesium

HAZARDOUS DECOMPOSITION PRODUCTS : Sulfur oxides and sodium compounds may be formed.

11. TOXICOLOGICAL INFORMATION

ACUTE TOXICITY(oral/dermal/inhalation) : LD50(oral,mouse): 5989mg/kg(SKEZAP 4,15,1963)
LD50(ivn,rabbit): 1220mg/kg(NIIRDN,-,1257,1990)

SKIN CORROSION/IRRITATION : Not available

EYE DAMAGE/EYE IRRITATION : Not available

RESPIRATORY OR SKIN SENSITIZATION : Not available

GERM CELL MUTAGENICITY : Not available

TOXIC TO REPRODUCTION : TDLo(oral,mouse): 14gm/kg(8-12 D preg);Effects on newborn(TCMUD8,6,361,1986)
TDLo(par,mouse): 60mg/kg(8 D preg)(Effects on embryo(JPMSAE,62,1626,1973)

STOT-SINGLE EXPOSURE : Not available

STOT-REPEATED EXPOSURE : Not available

ASPIRATION TOXICITY : Not available

CARCINOGENICITY : TDLo(scu,mouse): 806mg/kg/26W-I(IVIVE4,1,39,1987)

ADDITIONAL INFORMATION :

NTP : Not listed

IARC : Not listed

OSHA : Not listed

ACGIH : Not listed

EPA GENETOX PROGRAM 1988, Negative:Cell transform,-SA7/SHE

12. ECOLOGICAL INFORMATION

ECOTOXICITY : LC50(mosquito fish) : 17500mg/L/48hr
PERSISTENCE AND DEGRADABILITY :Not available
BIOACCUMULATION POTENTIAL : Not available
MOBILITY IN SOIL : Not available
OTHER ADVERSE EFFECTS : Not available

13. DISPOSAL CONSIDERATION (INCLUDING CONTAINER)

Flush with a lot of water to dilute in accordance with all applicable regulations. Any disposal practice must be in compliance with country, local, state, and federal laws and regulations (contact country, local or state environmental agency for specific rules).

After contents are completely removed, dispose of its container at hazardous or special waste collection point. (in accordance with local/regional/national/international regulation).

14. TRANSPORT INFORMATION

IATA : Not Restricted.
MARINE POLLUTANT : No
DOT(Department of Transportation) :Not a Hazardous Material for DOT shipping.

15. REGULATORY INFORMATION

US REGULATIONS :
Mass. Subst. List, Penn. Haz. Subst. List
EPA : CERCLA RQ= Not listed
EPCRA TPQ= Not listed
FIFRA 1988 PESTICIDE SUBJECT TO REGISTRATION OR RE-REGISTRATION
OSHA :TQ= Not listed

16. OTHER INFORMATION INCLUDING INFORMATION ON PREPARATION AND REVISION OF THE SDS

No specific notes

The above information is believed to be correct to be the best of our knowledge and information but does not purport to be all inclusive and shall be used only as a guide. This product is intended to be used by expert persons having chemical knowledge and skill, at their own discretion and risk and Wako shall not be held liable for any damage resulting from handling or from contact with the above material.

MATERIAL SAFETY DATA SHEET

MSDS No. EW160424

Revised Date: 2007/05/24

CODE: 160-04258, 160-04275, 162-22555, 162-22631, 163-04243, 163-04265, 164-22635, 165-04242, 165-04247, 166-04255, 167-04241, 168-09391, 168-18463, 169-04245

IDENTITY Potassium Dihydrogenphosphate**1. IDENTIFICATION OF THE SUBSTANCE OR MIXTURE AND OF THE SUPPLIER**

PRODUCT IDENTIFIER :Potassium Dihydrogenphosphate

MANUFACTURER : Wako Pure Chemical Industries, Ltd.

SUPPLIER : SUPPLIER(In JAPAN) : Wako Pure Chemical Industries, Ltd.

ADDRESS : 1-2, Doshomachi 3-chome, Chuo-ku, Osaka, 540-8605, Japan

TELEPHONE NUMBER & EMERGENCY TELEPHONE NUMBER: (06)6203-3741

SUPPLIER(In U.S.A.) : Wako Chemicals USA, Inc.

ADDRESS : 1600 Bellwood Road, Richmond, VA 23237, U.S.A.

TELEPHONE NUMBER : (804)271-7677

EMERGENCY TELEPHONE NUMBER : (800)424-9300 (CHEMTRAC)

SUPPLIER(In EUROPE) : Wako Chemicals GmbH, Germany

ADDRESS : Fuggerstrasse 12 ,D-41468 Neuss, GERMANY

TELEPHONE NUMBER & EMERGENCY TELEPHONE NUMBER : (02131)311-0

RECOMMENDED USE : Research use only.

2. HAZARDS IDENTIFICATION

SYMBOL : -----

HAZARD STATEMENTS, including R-phrase :

ADDITIONAL HAZARD STATEMENTS :

May be harmful if inhaled and ingested.

May cause eye and skin irritation.

PRECAUTIONARY STATEMENTS, including S-phrase : -----

3. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL IDENTITY :Potassium dihydrogenphosphate

SYNOMYS : Potassium phosphate, monobasic, Potassium diphosphate

FORMULA : KH₂PO₄

MOLECULAR WEIGHT :136.09

CAS NUMBER : 7778-77-0

TSCA INVENTORY : Listed

EINECS No. : 231-913-4

EC INDEX NUMBER : Not listed

4. FIRST AID MEASURES

GENERAL ADVICE :Wash off immediately with soap and plenty of water. In the case of respirable dust and/or fumes, use self-contained breathing apparatus and dust impervious protective suit. Use personal protective equipment.

INHALATION : Move victim to fresh air. If breathing is difficult, give oxygen. If irritation persists, consult a physician.

SKIN CONTACT :Remove contaminated clothes and shoes, rinse skin with plenty of water or shower. Use soap to help assure removal. If irritation persists, consult a physician.

EYE CONTACT : Remove any contact lenses at once. Flush eyes well with flooding amounts of running water for at least 15 minutes. Assure adequate flushing by separating the eyelids with sterile fingers. If irritation persists, consult a physician.

INGESTION : Rinse mouth, give plenty of water to dilute the substance. Never give anything by mouth to an unconscious person. Consult a physician.

5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA :

Carbon dioxide, dry chemical powder, foam, water

FIRE & EXPLOSION HAZARDS :

Toxic and irritating dust, fumes or smoke may be emitted.

SPECIAL PROTECTIVE EQUIPMENT FOR FIREFIGHTERS :Firemen should wear normal protective equipment(full bunker gear) and positive-pressure self-contained breathing apparatus.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS : Remove ignition sources and ventilate the area. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid raising dust and avoid contact with skin and eyes.

ENVIRONMENTAL PRECAUTIONS :Prevent spills from entering sewers, watercourses or low areas.

METHODS FOR CLEANING UP : Do not touch spilled material without suitable protection(See section 8). After material is completely picked up, wash the spill site with soap and water and ventilate the area. Put all wastes in a plastic bag for disposal and seal it tightly. Remove, clean, or dispose of

contaminated clothing.

7. HANDLING AND STORAGE

PRECAUTION FOR SAFE HANDLING : Avoid contact with eyes, skin and clothing. Avoid prolonged or repeated exposure. Handle material with suitable protection. This material is hygroscopic.

CONDITIONS FOR SAFE STORAGE : Store away from sunlight in well-ventilated dry place at room temperature. Keep container tightly closed.

INCOMPATIBILITIES : Strong oxidizers

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING MEASURES : Use exhaust ventilation to keep airborne concentrations below exposure limits. Use only with adequate ventilation.

VENTILATION : Local Exhaust ; Necessary, Mechanical(General) ; Recommended

INDIVIDUAL PROTECTION MEASURES :

Respiratory protection : Use a NIOSH/MSHA or European Standard EN149 approved respirator if the vapor concentrations exceed regulatory guidelines.

Hand protection : Chemical resistant gloves

Eye protection : Safety glasses(goggles)

Skin protection : Protective clothing

CONTROL PARAMETER :

OSHA Final Limits : None established

ACGIH TLV(s) : None established

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE : White crystals - crystalline powder

ODOUR : Odourless

pH : 4.2-4.6 (50g/L at 25 ° C= 77 ° F)

MELTING POINT : 256 ° C= 492.8 ° F (Decomposition)

INITIAL BOILING POINT : Not available

FLASH POINT : Not available

FLAMMABILITY (solid, gas) : Not available

EXPLOSIVE LIMITS : Not available

VAPOR PRESSURE : Not available

SPECIFIC GRAVITY : 2.338

SOLUBILITY IN :

WATER : Freely soluble (33g/100mL at 20 ° C= 68 ° F)

ETHANOL : Practically insoluble

PARTITION COEFFICIENT : Not available

DECOMPOSITION TEMPERATURE : Not available

10. STABILITY AND REACTIVITY

CHEMICAL STABILITY : Will not occur.

CONDITIONS TO AVOID : Sunlight, heat, moisture

INCOMPATIBLE MATERIALS : Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS : Phosphor oxides and potassium compounds may be formed.

11. TOXICOLOGICAL INFORMATION

ACUTE TOXICITY(oral/dermal/inhalation) : LD₅₀(orl, rat): 4640mg/kg(NTIS** OTS0571153)
LD₅₀(skin, rabbit): >4640mg/kg(NTIS** OTS0571153)

SKIN CORROSION/IRRITATION : Not available

EYE DAMAGE/EYE IRRITATION : Not available

RESPIRATORY OR SKIN SENSITIZATION : Not available

GERM CELL MUTAGENICITY : Not available

TOXIC TO REPRODUCTION : Not available

STOT-SINGLE EXPOSURE : Not available

STOT-REPEATED EXPOSURE : Not available

ASPIRATION TOXICITY : Not available

CARCINOGENICITY : Not available

ADDITIONAL INFORMATION :

NTP : Not listed

IARC : Not listed

OSHA : Not listed

ACGIH : Not listed

12. ECOLOGICAL INFORMATION

ECOTOXICITY : Not available

PERSISTENCE AND DEGRADABILITY :Not available
BIOACCUMULATION POTENTIAL : Not available
MOBILITY IN SOIL : Not available
OTHER ADVERSE EFFECTS : Not available

13. DISPOSAL CONSIDERATION (INCLUDING CONTAINER)

Cautiously add to a large stirred excess of water. Adjusting the pH to neutral, separate any insoluble solids or liquids and package them for hazardous-waste disposal. Flush the aqueous solutions down the drain with plenty of water. Any disposal practice must be in compliance with country, local, state, and federal laws and regulations (contact country, local or state environmental agency for specific rules).

After contents are completely removed, dispose of its container at hazardous or special waste collection point. (in accordance with local/regional/national/international regulation).

14. TRANSPORT INFORMATION

IATA : Not Restricted.
MARINE POLLUTANT : No
DOT(Department of Transportation) :Not a Hazardous Material for DOT shipping.

15. REGULATORY INFORMATION

US REGULATIONS ;
EPA : CERCLA RQ= Not listed
EPCRA TPQ= Not listed
OSHA :TQ= Not listed

16. OTHER INFORMATION INCLUDING INFORMATION ON PREPARATION AND REVISION OF THE SDS

No specific notes

The above information is believed to be correct to be the best of our knowledge and information but does not purport to be all inclusive and shall be used only as a guide. This product is intended to be used by expert persons having chemical knowledge and skill, at their own discretion and risk and Wako shall not be held liable for any damage resulting from handling or from contact with the above material.

Material Safety Data Sheet

Zirconium(IV) oxide, 98.5%

ACC# 96644

Section 1 - Chemical Product and Company Identification

MSDS Name: Zirconium(IV) oxide, 98.5%

Catalog Numbers: AC190520000, AC190520010, AC190522500

Synonyms: None.

Company Identification:

Acros Organics N.V.

One Reagent Lane

Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01

For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
1314-23-4	Zirconium oxide	98.5	215-227-2

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: white solid.

Warning! Causes eye, skin, and respiratory tract irritation. The toxicological properties of this material have not been fully investigated.

Target Organs: Lungs.

Potential Health Effects

Eye: Dust may cause mechanical irritation.

Skin: Dust may cause mechanical irritation.

Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea. The toxicological properties of this substance have not been fully investigated.

Inhalation: Dust is irritating to the respiratory tract. The toxicological properties of this substance have not been fully investigated.

Chronic: Repeated inhalation may cause chronic bronchitis. Chronic inhalation may cause pulmonary fibrosis.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.

Skin: Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists. Wash clothing before reuse.

Ingestion: Never give anything by mouth to an unconscious person. Get medical aid. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.

Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid if cough or other symptoms appear.

Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes.

Extinguishing Media: Substance is noncombustible; use agent most appropriate to extinguish surrounding fire.

Flash Point: Not available.

Autoignition Temperature: Not available.

Explosion Limits, Lower: Not available.

Upper: Not available.

NFPA Rating: (estimated) Health: 2; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Clean up spills immediately, observing precautions in the Protective Equipment section. Avoid generating dusty conditions. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation.

Storage: Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Zirconium oxide	5 mg/m ³ TWA (as Zr) (listed under Zirconium compounds, n.o.s.).10 mg/m ³ STEL (as Zr) (listed under Zirconium compounds, n.o.s.).	5 mg/m ³ TWA (as Zr, except Zirconium tetrachloride) (listed under Zirconium compounds, n.o.s.).50 mg/m ³ IDLH (as Zr except Zirconium tetrachloride) (listed under Zirconium compounds, n.o.s.).	5 mg/m ³ TWA (as Zr) (listed under Zirconium compounds, n.o.s.).

OSHA Vacated PELs: Zirconium oxide: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Solid

Appearance: white

Odor: Not available.

pH: Not available.

Vapor Pressure: Not available.

Vapor Density: Not available.

Evaporation Rate: Not available.

Viscosity: Not available.

Boiling Point: Not available.

Freezing/Melting Point: > 2500 deg C

Decomposition Temperature: Not available.

Solubility: Insoluble.

Specific Gravity/Density: Not available.

Molecular Formula: ZrO₂

Molecular Weight: 123.22

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.

Conditions to Avoid: Dust generation.

Incompatibilities with Other Materials: No significant incompatibilities identified with common materials and contaminants..

Hazardous Decomposition Products: Irritating and toxic fumes and gases.

Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:

CAS# 1314-23-4: ZH8800000

LD50/LC50:

Not available.

Carcinogenicity:

CAS# 1314-23-4: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: In the case of a man who worked as a lens grinder for 39 years, pulmonary fibrosis was believed to be caused by zirconium exposure. He had been exposed to a variety of dusts and had not worn a mask.

Teratogenicity: No information found

Reproductive Effects: No information found

Mutagenicity: No information found

Neurotoxicity: No information found

Other Studies:

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-Series: None listed.

RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	Not regulated as a hazardous material	No information available.
Hazard Class:		
UN Number:		
Packing Group:		

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 1314-23-4 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

None of the chemicals in this material have an RQ.

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

Section 313 No chemicals are reportable under Section 313.

Clean Air Act:

This material does not contain any hazardous air pollutants.

This material does not contain any Class 1 Ozone depleters.

This material does not contain any Class 2 Ozone depleters.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.

None of the chemicals in this product are listed as Priority Pollutants under the CWA.

None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 1314-23-4 can be found on the following state right to know lists: California, (listed as Zirconium compounds, n.o.s.), Minnesota, (listed as Zirconium compounds, n.o.s.), Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations**European Labeling in Accordance with EC Directives****Hazard Symbols:**

Not available.

Risk Phrases:**Safety Phrases:**

S 37 Wear suitable gloves.

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

S 28A After contact with skin, wash immediately with plenty of water

WGK (Water Danger/Protection)

CAS# 1314-23-4: 0

Canada - DSL/NDSL

CAS# 1314-23-4 is listed on Canada's DSL List.

Canada - WHMIS

not available.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 1314-23-4 (listed as Zirconium compounds, n.o.s.) is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 6/08/1999

Revision #8 Date: 9/25/2006

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

MATERIAL SAFETY DATA SHEET

Revised Date: 2013/06/10

IDENTITY Barium Sulfate**1. IDENTIFICATION OF THE SUBSTANCE OR MIXTURE AND OF THE SUPPLIER**

PRODUCT IDENTIFIER 212-21650-43 STD-SAMPLE ASSY BaSO4
 MANUFACTURER: Shimadzu Corporation

Address: 1 Nishino-kyo Kuwabara-cho Nakagyo-ku
 Kyoto 604-8511 Japan

Tel: +81-75-823-1092
 FAX: +81-75-823-4614

2. HAZARDS IDENTIFICATION

GHS CLASSIFICATION: Not classified hazardous.
 PRECAUTIONARY STATEMENTS: _

EU CLASSIFICATION: Not classified dangerous according to Directive 67/548/EEC.

3. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL IDENTITY: Barium sulfate
 SYNONYMS: Barium sulphate; Actybaryte
 FORMULA: BaSO4
 MOLECULAR WEIGHT: 233.40
 CAS NUMBER: 7727-43-7
 TSCA INVENTORY: Listed
 EINECS No.: 231-784-4
 EC INDEX NUMBER: Not listed

4. FIRST AID MEASURES

GENERAL ADVICE: Wash off immediately with soap and plenty of water. In the case of respirable dust and/or fumes, use self-contained breathing apparatus and dust impervious protective suit. Use personal protective equipment.

INHALATION: Move victim to fresh air. If breathing is difficult, give oxygen. If irritation persists, consult a physician.
 SKIN CONTACT: Remove contaminated clothes and shoes, rinse skin with plenty of water or shower. Use soap to help assure removal. If irritation persists, consult a physician.
 EYE CONTACT: Remove any contact lenses at once. Flush eyes well with flooding amounts of running water for at least 15 minutes. Assure adequate flushing by separating the eyelids with sterile fingers. If irritation persists, consult a physician.
 INGESTION: Rinse mouth, give plenty of water to dilute the substance. Never give anything by mouth to an unconscious person. Consult a physician.

5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA: Not combustible. Use extinguishing media appropriate to the surrounding fire.
 FIRE & EXPLOSION HAZARDS: Toxic and irritating dust, fumes or smoke may be emitted.
 SPECIAL PROTECTIVE EQUIPMENT FOR FIREFIGHTERS: Firemen should wear normal protective equipment(full bunker gear)and positive-pressure self-contained breathing apparatus.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS : Remove ignition sources and ventilate the area. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid raising dust and avoid contact with skin and eyes.

ENVIRONMENTAL PRECAUTIONS : Prevent spills from entering sewers, watercourses or low areas.

METHODS FOR CLEANING UP : Do not touch spilled material without suitable protection(See section 8). After material is completely picked up, wash the spill site with soap and water and ventilate the area. Put all wastes in a plastic bag for disposal and seal it tightly. Remove, clean, or dispose of contaminated clothing.

7. HANDLING AND STORAGE

PRECAUTION FOR SAFE HANDLING : Avoid contact with eyes, skin and clothing. Avoid prolonged or repeated exposure. Handle material with suitable protection.

CONDITIONS FOR SAFE STORAGE : Store away from sunlight in well-ventilated dry place at room temperature (preferably cool place). Keep container tightly closed.

INCOMPATIBILITIES : Aluminum, phosphorus, oxidizers

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING MEASURES : Use exhaust ventilation to keep airborne concentrations below exposure limits. Use only with adequate ventilation.

VENTILATION : Local Exhaust ; Necessary, Mechanical(General) ; Recommended

INDIVIDUAL PROTECTION MEASURES :

Respiratory protection : Use a NIOSH/MSHA or European Standard EN149 approved respirator if the vapor concentrations exceed regulatory guidelines.

Hand protection : Chemical resistant gloves

Eye protection : Safety glasses(goggles)

Skin protection : Protective clothing

CONTROL PARAMETER :

OSHA Final Limits : TWA= 15mg/m³(as total dust), TWA= 5mg/m³(as respirable fraction)

ACGIH TLV(s) : TWA= 10mg/m³

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE : White powder

ODOUR : Odorless

pH : Not available

MELTING POINT : Approx. 1600 °C= 2912°F (Decomposition)

INITIAL BOILING POINT : Not applicable

FLASH POINT : Not available (Nonflammable)

FLAMMABILITY (solid, gas) : Not available

EXPLOSIVE LIMITS : Not available

VAPOR PRESSURE : Not available

SPECIFIC GRAVITY : Not available

SOLUBILITY IN :

WATER : Practically insoluble

ALCOHOL : Practically insoluble

PARTITION COEFFICIENT : Not available

DECOMPOSITION TEMPERATURE : Not available

10. STABILITY AND REACTIVITY

CHEMICAL STABILITY : Stable under recommended storage conditions.

CONDITIONS TO AVOID : Sunlight, heat

INCOMPATIBLE MATERIALS : Aluminum, phosphorus, oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS : Sulfur oxides and barium compounds

11. TOXICOLOGICAL INFORMATION

ACUTE TOXICITY(oral/dermal/inhalation) : LD(itr,mouse): > 600µL/kg(OYYAA2 50,123,1995)

SKIN CORROSION/IRRITATION : Not available

EYE DAMAGE/EYE IRRITATION : Not available

RESPIRATORY OR SKIN SENSITIZATION : Not available

GERM CELL MUTAGENICITY : Micronucleus test; mouse; ipr; 12500µg/kg(GWZHEW 12,77,1986)

TOXIC TO REPRODUCTION : Not available

STOT-SINGLE EXPOSURE : Not available

STOT-REPEATED EXPOSURE : Not available

ASPIRATION TOXICITY : Not available

CARCINOGENICITY : TDLo(ipl,rat): 200mg/kg(BJCAAI 28,173,1973)

ADDITIONAL INFORMATION :

NTP : Not listed
 IARC : Not listed
 OSHA : Not listed
 ACGIH :Not listed

12. ECOLOGICAL INFORMATION

ECOTOXICITY : Not available
 PERSISTENCE AND DEGRADABILITY :Not available
 BIOACCUMULATION POTENTIAL : Not available
 MOBILITY IN SOIL : Not available
 OTHER ADVERSE EFFECTS : WGK;nwg

13. DISPOSAL CONSIDERATION (INCLUDING CONTAINER)

Dispose in a hazardous-waste site in accordance with all applicable regulations.
 Any disposal practice must be in compliance with country, local, state, and federal laws and regulations (contact country, local or state environmental agency for specific rules).

After contents are completely removed, dispose of its container in accordance with local/regional/national/international regulation.

USEPA(RCRA) hazardous waste No. :D005(as Barium)

14. TRANSPORT INFORMATION

IATA : Not Restricted.
 MARINE POLLUTANT : No
 DOT(Department of Transportation) :Not a Hazardous Material for DOT shipping.

15. REGULATORY INFORMATION

US REGULATIONS :
 Mass. Subst. List, Penn. Haz. Subst. List
 EPA : CERCLA RQ= Not listed
 EPCRA TPQ= Not listed
 OSHA :TQ= Not listed
 HMIS : HR= health- 1 , flam.- 0 , react.- 0

16. OTHER INFORMATION INCLUDING INFORMATION ON PREPARATION AND REVISION OF THE SDS

No specific notes

The above information is believed to be correct to be the best of our knowledge and information but does not purport to be all inclusive and shall be used only as a guide. This product is intended to be used by expert persons having chemical knowledge and skill, at their own discretion and risk and Wako shall not be held liable for any damage resulting from handling or from contact with the above material.

MATERIAL SAFETY DATA SHEET

Revised Date: 2013/06/10

IDENTITY Boric Acid

1. IDENTIFICATION OF THE SUBSTANCE OR MIXTURE AND OF THE SUPPLIER

PRODUCT IDENTIFIER 212-21650-43 STD-SAMPLE ASSY BaS04
 MANUFACTURER : Shimadzu Corporation

Address: 1 Nishino-kyo Kuwabara-cho Nakagyo-ku
 Kyoto 604-8511 Japan

Tel : +81-75-823-1092
 FAX : +81-75-823-4614

2. HAZARDS IDENTIFICATION

CLASSIFICATION: according to Regulation (EC)No 1272/2008
 GHS CLASSIFICATION : Reproductive toxicity: Category 1B
 PICTOGRAM :



DANGER

HAZARD STATEMENTS : H360 May damage fertility or the unborn child.

PRECAUTIONARY STATEMENTS :P201 Obtain special instructions before use.

P308+P313 IF exposed or concerned; Get medical advice/attention.

EU CLASSIFICATION: according to Directive 67/548/EEC

SYMBOL : T

R-phrase : R60 May impair fertility.

R61 May cause harm to the unborn child.

S-phrase : S53 Avoid exposure-obtain special instructions before use.

S45 In case of accident or if you feel unwell, seek medical advice immediately.

3. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL IDENTITY : Boric acid
 SYNONYMS : Boracic acid; Orthoboric acid
 FORMULA : H₃BO₃
 MOLECULAR WEIGHT : 61.83
 CAS NUMBER : 10043-35-3
 TSCA INVENTORY : Listed
 EINECS No. : 233-139-2
 EC INDEX NUMBER : 005-007-00-2

4. FIRST AID MEASURES

GENERAL ADVICE :Wash off immediately with soap and plenty of water. In the case of respirable dust and/or fumes, use self-contained breathing apparatus and dust impervious protective suit. Use personal protective equipment.

INHALATION : Move victim to fresh air. If breathing is difficult, give oxygen. If irritation persists, consult a physician.

SKIN CONTACT :Remove contaminated clothes and shoes, rinse skin with plenty of water or shower. Use soap to help assure removal. If irritation persists, consult a physician.

EYE CONTACT : Remove any contact lenses at once. Flush eyes well with flooding amounts of running water for at least 15 minutes. Assure adequate flushing by separating the eyelids with sterile fingers. If irritation persists, consult a physician.

INGESTION : Rinse mouth, give plenty of water to dilute the substance. Never give anything by mouth to an unconscious person. Transport to a hospital immediately.

5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA : Carbon dioxide, dry chemical powder, foam, water
 FIRE & EXPLOSION HAZARDS : Toxic and irritating dust, fumes or smoke may be emitted.
 SPECIAL PROTECTIVE EQUIPMENT FOR FIREFIGHTERS : Firemen should wear normal protective equipment(full bunker gear)and positive-pressure self-contained breathing apparatus.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS : Remove ignition sources and ventilate the area. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid raising dust and avoid contact with skin and eyes.
 ENVIRONMENTAL PRECAUTIONS : Prevent spills from entering sewers, watercourses or low areas.
 METHODS FOR CLEANING UP : Do not touch spilled material without suitable protection(See section 8). After material is completely picked up, wash the spill site with soap and water and ventilate the area. Put all wastes in a plastic bag for disposal and seal it tightly. Remove, clean, or dispose of contaminated clothing.

7. HANDLING AND STORAGE

PRECAUTION FOR SAFE HANDLING : Avoid contact with eyes, skin and clothing. Avoid prolonged or repeated exposure.
 Handle material with suitable protection.
 This material is hygroscopic.
 CONDITIONS FOR SAFE STORAGE : Store away from sunlight in well-ventilated dry place at room temperature. Keep container tightly closed.
 INCOMPATIBILITIES : Alkali carbonates, hydroxides

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING MEASURES : Use exhaust ventilation to keep airborne concentrations below exposure limits. Use only with adequate ventilation.
 VENTILATION : Local Exhaust ; Necessary, Mechanical(General) ; Recommended
 INDIVIDUAL PROTECTION MEASURES :
 Respiratory protection : Use a NIOSH/MSHA or European Standard EN149 approved respirator if the vapor concentrations exceed regulatory guidelines.
 Hand protection : Chemical resistant gloves
 Eye protection : Safety glasses(goggles)
 Skin protection : Protective clothing
 CONTROL PARAMETER :
 OSHA Final Limits : None established
 ACGIH TLV(s) : None established

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE : White, crystals - crystalline powder
 ODOUR : Odourless
 pH : 5.1(as 0.1mol/l solution)
 MELTING POINT : 171 - 185 °C= 340 - 365 °F (dec.)
 INITIAL BOILING POINT : Not available
 FLASH POINT : Not available
 FLAMMABILITY (solid, gas) : Not available
 EXPLOSIVE LIMITS : Not available
 VAPOR PRESSURE : Not available
 SPECIFIC GRAVITY : 1.4347 (at 15 °C= 59 °F)
 SOLUBILITY IN :
 WATER : Soluble (5.6 g/100ml)
 ALCOHOL : Soluble
 PARTITION COEFFICIENT (log Po/w) : Not available
 DECOMPOSITION TEMPERATURE : Not available

10. STABILITY AND REACTIVITY

CHEMICAL STABILITY : Stable under recommended storage conditions.
 CONDITIONS TO AVOID : Sunlight, heat, moisture
 INCOMPATIBLE MATERIALS : Alkali carbonates, hydroxides
 HAZARDOUS DECOMPOSITION PRODUCTS : Boron compounds

11. TOXICOLOGICAL INFORMATION

ACUTE TOXICITY(oral/dermal/inhalation) : LD50(orl, rat): 2660mg/kg(HBPTO* 2,1430,2001)
LD50(orl, mouse): 3450mg/kg(HBPTO* 2,1413,2001)
LD50(orl, rat): 5000mg/kg(DFGOT vol 5,1993)
LD50(orl, rat): 4080mg/kg(DFGOT vol 5,1993)
LD50(orl, rat): 3241mg/kg(Calculate)

SKIN CORROSION/IRRITATION : Skin; human; 15mg/3D-I; Mild(85DKA8 -,127,1977)

EYE DAMAGE/EYE IRRITATION : guinea pig; ; Moderate/24hrs, 72 hrs(CERI hazard data 2001-30,2002)

RESPIRATORY OR SKIN SENSITIZATION : Human. irritation(ATSDR, 1992, ACGIH 7th, 2005)

GERM CELL MUTAGENICITY : Mutation in microorganisms; E.coli; 17000ppm/24H(AMNTA4 85,119,1951)
Specific locus test; mouse; orl; 2.4 μ g/kg(EMMUEG 39,69,2002)

REPRODUCTIVE TOXICITY : Cytogenetic analysis; mouse; orl; 2.4 μ g/kg(EMMUEG 39,69,2002)
TDLo(orl, rat): 1600mg/kg(female 6-9 D preg); (BTERDG 66,373,1998)
TCLo(ihl, rat): 9600 μ g/m³/4H(16 weeks male); Paternal Effects -
spermato genesis(GTPZAB 16(11),13,1972)

STOT (SINGLE EXPOSURE) : Human; nausea and vomiting, stomachache, diarrhea, headache, pyrexia, muscular convulsion(CERI hazard data 2001-30, 2002)
Cyanosis, Stiffening of limbs, Convulsion, Shock externals symptom(CERI hazard data 2001-30, 2002)

STOT (REPEATED EXPOSURE) : Human; Renal damage including necrosis of convoluted tubule , poor urine and no urine(CERI hazard data, 2001-30,2002)

ASPIRATION HAZARD : Not available

CARCINOGENICITY : Not available

ADDITIONAL INFORMATION :
NTP : Not listed
IARC : Not listed
OSHA : Not listed
ACGIH :Not listed

12. ECOLOGICAL INFORMATION

ECOTOXICITY : EC50(daphnids): 658-875mg/L/48hr (Borax Consolidated Ltd.)
LC50(orange-red killifish): 78.1mg(B)/L/96hr(EHC 204,1998)

PERSISTENCE AND DEGRADABILITY : This material is the recalcitrant.

BIOACCUMULATION POTENTIAL : This material is not high bioaccumulatable.

MOBILITY IN SOIL : Not available

OTHER ADVERSE EFFECTS : WGK; 1

13. DISPOSAL CONSIDERATION (INCLUDING CONTAINER)

Dispose of contents/container in accordance with local/regional/national/international regulations.

14. TRANSPORT INFORMATION

IATA : Not Restricted.
MARINE POLLUTANT : No
DOT(Department of Transportation) :Not a Hazardous Material for DOT shipping.

15. REGULATORY INFORMATION

US REGULATIONS :
NTP Test. Prog., Canad. WHMIS IDL 1% conc.
EPA : CERCLA RQ= Not listed
EPCRA TPQ= Not listed
FIFRA 1998 STATUS OF PESTICIDES: RED Completed
OSHA :TQ= Not listed

16. OTHER INFORMATION INCLUDING INFORMATION ON PREPARATION AND REVISION OF THE SDS

REFERENCE :
1. Chemical Risk Information Platform (CHRIPI), <http://www.safe.nite.go.jp>
2. Regulation (EC)No 1272/2008 [CLP]

No specific notes

inclusive and shall be used only as a guide. This product is intended to be used by expert persons having chemical knowledge and skill, at their own discretion and risk and Wako shall not be held liable for any damage resulting from handling or from contact with the above material.

MATERIAL SAFETY DATA SHEET

MSDS No. EW191087

Revised Date: 2007/05/24

CODE: 191-01665, 191-14377, 192-10745, 194-01677, 195-01663, 195-01668, 195-14375, 196-01671, 197-01667, 197-10871, 198-01675, 199-01661, 199-10015

IDENTITY Sodium Chloride**1. IDENTIFICATION OF THE SUBSTANCE OR MIXTURE AND OF THE SUPPLIER**

PRODUCT IDENTIFIER :Sodium Chloride

MANUFACTURER : Wako Pure Chemical Industries, Ltd.

SUPPLIER : SUPPLIER(In JAPAN) : Wako Pure Chemical Industries, Ltd.

ADDRESS : 1-2, Doshomachi 3-chome, Chuo-ku, Osaka, 540-8605, Japan

TELEPHONE NUMBER & EMERGENCY TELEPHONE NUMBER: (06)6203-3741

SUPPLIER(In U.S.A.) : Wako Chemicals USA, Inc.

ADDRESS : 1600 Bellwood Road, Richmond, VA 23237, U.S.A.

TELEPHONE NUMBER : (804)271-7677

EMERGENCY TELEPHONE NUMBER : (800)424-9300 (CHEMTREC)

SUPPLIER(In EUROPE) : Wako Chemicals GmbH, Germany

ADDRESS : Fuggerstrasse 12 ,D-41468 Neuss, GERMANY

TELEPHONE NUMBER & EMERGENCY TELEPHONE NUMBER : (02131)311-0

RECOMMENDED USE : Research use only.

2. HAZARDS IDENTIFICATION

SYMBOL : -----

HAZARD STATEMENTS, including R-phrase : -----

ADDITIONAL HAZARD STATEMENTS :

May be harmful if inhaled and ingested.

May cause eye and skin irritation.

PRECAUTIONARY STATEMENTS, including S-phrase : -----

3. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL IDENTITY :Sodium chloride

SYNOMYS : Common salt; Salt

FORMULA : NaCl

MOLECULAR WEIGHT :58.44

CAS NUMBER : 7647-14-5

TSCA INVENTORY : Listed

EINECS No. : 231-598-3

EC INDEX NUMBER : Not listed

4. FIRST AID MEASURES

GENERAL ADVICE :Wash off immediately with soap and plenty of water. In the case of respirable dust and/or fumes, use self-contained breathing apparatus and dust impervious protective suit. Use personal protective equipment.

INHALATION : Move victim to fresh air. If breathing is difficult, give oxygen. If irritation persists, consult a physician.

SKIN CONTACT :Remove contaminated clothes and shoes, rinse skin with plenty of water or shower. Use soap to help assure removal. If irritation persists, consult a physician.

EYE CONTACT : Remove any contact lenses at once. Flush eyes well with flooding amounts of running water for at least 15 minutes. Assure adequate flushing by separating the eyelids with sterile fingers. If irritation persists, consult a physician.

INGESTION : Rinse mouth, give plenty of water to dilute the substance. Never give anything by mouth to an unconscious person. Consult a physician.

5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA :

Carbon dioxide, dry chemical powder, foam, water

FIRE & EXPLOSION HAZARDS :

Toxic and irritating dust, fumes or smoke may be emitted.

SPECIAL PROTECTIVE EQUIPMENT FOR FIREFIGHTERS :Firemen should wear normal protective equipment(full bunker gear) and positive-pressure self-contained breathing apparatus.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS : Remove ignition sources and ventilate the area. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid raising dust and avoid contact with skin and eyes.

ENVIRONMENTAL PRECAUTIONS :Prevent spills from entering sewers, watercourses or low areas.

METHODS FOR CLEANING UP : Do not touch spilled material without suitable protection(See section 8). After material is completely picked up, wash the spill site with soap and water and ventilate the area. Put all wastes in a plastic bag for disposal and seal it tightly. Remove, clean, or dispose of

contaminated clothing.

7. HANDLING AND STORAGE

PRECAUTION FOR SAFE HANDLING : Avoid contact with eyes, skin and clothing. Avoid prolonged or repeated exposure. Handle material with suitable protection. This material is hygroscopic.

CONDITIONS FOR SAFE STORAGE : Store away from sunlight in well-ventilated dry place at room temperature. Keep container tightly closed.

INCOMPATIBILITIES : Strong oxidizers, strong acids, bromine trifluoride, lithium

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING MEASURES : Use exhaust ventilation to keep airborne concentrations below exposure limits. Use only with adequate ventilation.

VENTILATION : Local Exhaust ; Necessary, Mechanical(General) ; Recommended

INDIVIDUAL PROTECTION MEASURES :

Respiratory protection : Use a NIOSH/MSHA or European Standard EN149 approved respirator if the vapor concentrations exceed regulatory guidelines.

Hand protection : Chemical resistant gloves

Eye protection : Safety glasses(goggles)

Skin protection : Protective clothing

CONTROL PARAMETER :

OSHA Final Limits : None established

ACGIH TLV(s) : None established

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE : White crystals-crystalline powder

ODOUR : Odourless

pH : 5.0-7.5 (50g/l at 25 ° C= 77 ° F)

MELTING POINT : 801 ° C= 1474 ° F

INITIAL BOILING POINT : 1413 ° C= 2575 ° F

FLASH POINT : Not available

FLAMMABILITY (solid, gas) : Nonflammable

EXPLOSIVE LIMITS : Not available

VAPOR PRESSURE : Not available

SPECIFIC GRAVITY : 2.165

SOLUBILITY IN :

WATER : Freely soluble (1g/2.8ml at 25 ° C= 77 ° F)

ALCOHOL : Very slightly soluble

PARTITION COEFFICIENT : Not available

DECOMPOSITION TEMPERATURE : Not available

10. STABILITY AND REACTIVITY

CHEMICAL STABILITY : Will not occur.

CONDITIONS TO AVOID : Sunlight, heat, moisture

INCOMPATIBLE MATERIALS : Strong oxidizers, strong acids, bromine trifluoride, lithium

HAZARDOUS DECOMPOSITION PRODUCTS : Sodium compounds and chlorine compounds may be formed.

11. TOXICOLOGICAL INFORMATION

ACUTE TOXICITY(oral/dermal/inhalation) : LC₅₀(orl,man): 1gm/kg(MACPAJ 65,1587,1990)

LD₅₀(orl,rat): 3000mg/kg(VCVN1* -,36,1998)

SKIN CORROSION/IRRITATION : Skin; rabbit; 500mg/24H; Mild(28ZPAK -, 7,1972)

EYE DAMAGE/EYE IRRITATION : Eye; rabbit; 100mg/24H; Moderate(28ZPAK -, 7,1972)

RESPIRATORY OR SKIN SENSITIZATION : Not available

GERM CELL MUTAGENICITY : Mutation in microorganisms; S.cerevisiae; 2mol/L(MUREAV 189, 11, 1987)

DNA damage; mouse; lymphocyte; 101mmol/L(MUREAV 203,155,1988)

Mutation in microorganisms; E.coli; 150mmol/L(ABCHA6 41,257,1977)

TOXIC TO REPRODUCTION : TD_{Lo}(orl,rat): 56400mg/kg(5 D pre-21 D post);Maternal Effects - postpartum(AJPHAP 264,R296,1993)

TD_{Lo}(ipc,woman): 27mg/kg(15 W preg); Fertility - Abortion(AJOGAH 118, 218, 1974)

STOT-SINGLE EXPOSURE : Not available

STOT-REPEATED EXPOSURE : Not available

ASPIRATION TOXICITY : Not available

CARCINOGENICITY : Not available

ADDITIONAL INFORMATION :

NTP : Not listed

IARC : Not listed

OSHA : Not listed

ACGIH : Not listed

EPA GENETOX PROGRAM 1988, Inconclusive: Mammalian micronucleus

12. ECOLOGICAL INFORMATION

ECOTOXICITY : Not available
PERSISTENCE AND DEGRADABILITY : Not available
BIOACCUMULATION POTENTIAL : Not available
MOBILITY IN SOIL : Not available
OTHER ADVERSE EFFECTS : WGK; 1

13. DISPOSAL CONSIDERATION (INCLUDING CONTAINER)

Flush with a lot of water to dilute in accordance with all applicable regulations. Any disposal practice must be in compliance with country, local, state, and federal laws and regulations (contact country, local or state environmental agency for specific rules).

After contents are completely removed, dispose of its container at hazardous or special waste collection point. (in accordance with local/regional/national/international regulation).

14. TRANSPORT INFORMATION

IATA : Not Restricted.
MARINE POLLUTANT : No
DOT(Department of Transportation) :Not a Hazardous Material for DOT shipping.

15. REGULATORY INFORMATION

US REGULATIONS ;
EPA : CERCLA RQ= Not listed
EPCRA TPQ= Not listed
FIFRA 1998 STATUS OF PESTICIDES: RED Completed
OSHA :TQ= Not listed

16. OTHER INFORMATION INCLUDING INFORMATION ON PREPARATION AND REVISION OF THE SDS

No specific notes

The above information is believed to be correct to be the best of our knowledge and information but does not purport to be all inclusive and shall be used only as a guide. This product is intended to be used by expert persons having chemical knowledge and skill, at their own discretion and risk and Wako shall not be held liable for any damage resulting from handling or from contact with the above material.

Material Safety Data Sheet

Indium(III) oxide, 99.999%

ACC# 98831

Section 1 - Chemical Product and Company Identification

MSDS Name: Indium(III) oxide, 99.999%

Catalog Numbers: AC315740000, AC315740050

Synonyms: Diindium trioxide; Indium sesquioxide.

Company Identification:

Acros Organics N.V.

One Reagent Lane

Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01

For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
1312-43-2	Indium(III) oxide	99.999	215-193-9

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: white powder.

Warning! May cause eye, skin, and respiratory tract irritation. Long-term exposure may cause bone and joint changes. May cause blood abnormalities. May cause lung damage.

Target Organs: Blood, lungs, gastrointestinal system, bone.

Potential Health Effects

Eye: May cause eye irritation.

Skin: May cause skin irritation.

Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea.

Inhalation: May cause respiratory tract irritation. May cause pulmonary edema and severe respiratory disturbances. May cause lung damage.

Chronic: The lungs of rats exposed daily to In₂O₃ at concentrations from 24-97 mg/m³ for a total of 224 hrs showed evidence of widespread alveolar edema, which differs from the usual toxic edema fluid by being granular and containing a few alveolar phagocytes, polymorphonuclear cells, & nuclear debris. The injury was further characterized by alteration of the alveolar walls by spindle-shaped & other type cells. The lesion showed little change either during exposure or after a 12-week postexposure period, & no fibrosis resulted from the healing process. Thus, In₂O₃ dust uniquely produces a widespread alveolar stasis resembling alveolar proteinosis in which alveolar clearance is reduced. Associated chronic respiratory insufficiency, recurrent acute pneumonitis, or complicating infections may result in a fatal outcome.

Section 4 - First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.

Skin: Get medical aid if irritation develops or persists. Flush skin with plenty of soap and water.

Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid.

Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Approach fire from upwind to avoid hazardous vapors and toxic decomposition products.

Extinguishing Media: Use extinguishing media most appropriate for the surrounding fire.

Flash Point: Not available.

Autoignition Temperature: Not available.

Explosion Limits, Lower: Not available.

Upper: Not available.

NFPA Rating: (estimated) Health: 2; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Avoid generating dusty conditions. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Avoid breathing dust.

Storage: Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Indium(III) oxide	0.1 mg/m ³ TWA (as In) (listed under Indium compounds, n.o.s.).	0.1 mg/m ³ TWA (as In) (listed under Indium compounds, n.o.s.).	none listed

OSHA Vacated PELs: Indium(III) oxide: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to minimize contact with skin.

Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Powder

Appearance: white

Odor: Not available.

pH: Not available.

Vapor Pressure: Not available.

Vapor Density: Not available.

Evaporation Rate: Not available.

Viscosity: Not available.

Boiling Point: 850 deg C

Freezing/Melting Point: Not available.

Decomposition Temperature: Not available.

Solubility: Insoluble.

Specific Gravity/Density: Not available.

Molecular Formula: In₂O₃

Molecular Weight: 277.64

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.

Conditions to Avoid: Dust generation.

Incompatibilities with Other Materials: No significant incompatibilities identified with common materials and contaminants..

Hazardous Decomposition Products: No data available.

Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:

CAS# 1312-43-2: NL1770000

LD50/LC50:

Not available.

Oral mouse LDLo: 10 g/kg.

Carcinogenicity:

CAS# 1312-43-2: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: Workers exposed to In compounds during the production of indium complained of tooth decay, pains in joints & bones, nervous & gastrointestinal disorders, heart pains, & general debility. The air concentrations & durations of exposure were not reported.

Teratogenicity: No data available.

Reproductive Effects: No data available.

Mutagenicity: No data available.

Neurotoxicity: No data available.

Other Studies:

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-Series: None listed.

RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	Not regulated	Not Regulated
Hazard Class:		
UN Number:		
Packing Group:		

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 1312-43-2 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

None of the chemicals in this material have an RQ.

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

Section 313 No chemicals are reportable under Section 313.

Clean Air Act:

This material does not contain any hazardous air pollutants.

This material does not contain any Class 1 Ozone depleters.

This material does not contain any Class 2 Ozone depleters.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.

None of the chemicals in this product are listed as Priority Pollutants under the CWA.

None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 1312-43-2 can be found on the following state right to know lists: California, (listed as Indium compounds, n.o.s.), Minnesota, (listed as Indium compounds, n.o.s.).

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations**European Labeling in Accordance with EC Directives****Hazard Symbols:**

Not available.

Risk Phrases:**Safety Phrases:**

S 24/25 Avoid contact with skin and eyes.

WGK (Water Danger/Protection)

CAS# 1312-43-2: No information available.

Canada - DSL/NDSL

CAS# 1312-43-2 is listed on Canada's DSL List.

Canada - WHMIS

WHMIS: Not available.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 1312-43-2 (listed as Indium compounds, n.o.s.) is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 9/02/1997

Revision #5 Date: 3/16/2007

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

MATERIAL SAFETY DATA SHEET

CODE: 190-09212, 192-09211, 198-09213

MSDS No. EW190921
Issue Date: 2005/01/26**IDENTITY** Samarium(III) Oxide, 99.9%**1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION**

PRODUCT NAME : Samarium(III) Oxide, 99.9%

MANUFACTURER : Wako Pure Chemical Industries, Ltd.

SUPPLIER : SUPPLIER(In JAPAN) : Wako Pure Chemical Industries, Ltd.

ADDRESS : 1-2, Doshomachi 3-chome, Chuo-ku, Osaka, 540-8605, Japan

TELEPHONE NUMBER & EMERGENCY TELEPHONE NUMBER: (06)6203-3741

SUPPLIER(In U.S.A.) : Wako Chemicals USA, Inc.

ADDRESS : 1600 Bellwood Road, Richmond, VA 23237, U.S.A.

TELEPHONE NUMBER : (804)271-7677

EMERGENCY TELEPHONE NUMBER : (800)424-9300 (CHEMTREC)

SUPPLIER(In EUROPE) : Wako Chemicals GmbH, Germany

ADDRESS : Nissanstrasse 2,D-41468 Neuss, GERMANY

TELEPHONE NUMBER & EMERGENCY TELEPHONE NUMBER : (02131)311-0

2. COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL NAME : Samarium(III) Oxide

FORMULA : Sm₂O₃

MOLECULAR WEIGHT : 348.72

CAS NUMBER : 12060-58-1

TSCA INVENTORY : Listed

EINECS No. : 235-043-6

IDENTIFICATION OF DANGER :

SYMBOL : -----

R-phrases : -----

3. HAZARDS IDENTIFICATION

May be harmful if inhaled and ingested.

May cause eye and skin irritation.

4. FIRST AID MEASURES

GENERAL ADVICE : Wash off immediately with soap and plenty of water. In the case of respirable dust and/or fumes, use self-contained breathing apparatus and dust impervious protective suit. Use personal protective equipment.

INHALATION : Move victim to fresh air. If breathing is difficult, give oxygen. If irritation persists, consult a physician.

SKIN CONTACT : Remove contaminated clothes and shoes, rinse skin with plenty of water or shower. Use soap to help assure removal. If irritation persists, consult a physician.

EYE CONTACT : Remove any contact lenses at once. Flush eyes well with a large amount of running water for at least 15 minutes. Assure adequate flushing by separating the eyelids with sterile fingers. If irritation persists, consult a physician.

INGESTION : Rinse mouth, give plenty of water to dilute the substance. Never give anything by mouth to an unconscious person. Consult a physician.

5. FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA :

Carbon dioxide, dry chemical powder, foam, water fog

FIRE & EXPLOSION HAZARDS :

Toxic, irritating dust or smoke may be emitted.

SPECIAL PROTECTIVE EQUIPMENT FOR FIREFIGHTERS : Firemen should wear normal protective equipment(full bunker gear)and positive-pressure self-contained breathing apparatus.

6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS : Remove ignition sources and ventilate the area. In case of insufficient ventilation, wear suitable respiratory equipment. Avoid raising dust and avoid contact with skin and eyes.

ENVIRONMENTAL PRECAUTIONS : Prevent spills from entering sewers, watercourses or low areas.

METHODS FOR CLEAN UP : Do not touch spilled material without suitable protection(See section 8). After material is completely picked up, wash the spill site with soap and water and ventilate the area. Put all wastes in a plastic bag for disposal and seal it tightly. Remove, clean, or dispose of contaminated clothing.

7. HANDLING AND STORAGE

Research use only.

HANDLING :

Avoid contact with eyes, skin and clothing. Avoid prolonged or repeated exposure. Handle material with suitable protection.

STORAGE :

Store away from sunlight in well-ventilated dry place at room temperature. Keep container tightly closed.

INCOMPATIBLE PRODUCTS :Oxidizers and strong acids

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

ENGINEERING MEASURES :Use exhaust ventilation to keep airborne concentrations below exposure limits. Use only with adequate ventilation.

VENTILATION : Local Exhaust ; Necessary, Mechanical(General) ; Recommended

PERSONAL PROTECTION :

Respiratory protection :Use a NIOSH/MSHA or European Standard EN149 approved respirator if the vapor concentrations exceed regulatory guidelines.

Hand protection : Chemical resistant gloves

Eye protection : Safety glasses(goggles)

Skin protection : Protective clothing

CONTROL PARAMETER :

OSHA Final Limits :None established

ACGIH TLV(s) : None established

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE : Slightly yellow - pale orange, powder

ODOR : Not available

pH : Not available

BOILING POINT : Not available

MELTING POINT : 2300 ° C= 4172 ° F

FLASH POINT : Not available

FLAMMABILITY (solid, gas) : Not available

DECOMPOSITION TEMPERATURE :Not available

EXPLOSIVE LIMITS : Not available

VAPOR PRESSURE : Not available

SPECIFIC GRAVITY : 8.347

SOLUBILITY IN ;

WATER : Insoluble

ACIDS : Soluble

log Po/w : Not available

10. STABILITY AND REACTIVITY

CONDITION TO AVOID : Sunlight, heat

INCOMPATIBILITY(MATERIAL TO AVOID) : Oxidizers and strong acids

HAZARDOUS DECOMPOSITION PRODUCTS :Samarium compounds may be formed.

HAZARDOUS POLYMERIZATION : Will not occur.

11. TOXICOLOGICAL INFORMATION

ACUTE TOXICITY DATA : LD50(ori,rat): >5gm/kg(ATDAEI 12,627,1993)

IRRITATION DATA : Not available

MUTATION DATA : Not available

REPRODUCTIVE EFFECTS DATA :Not available

TUMORIGENIC DATA : Not available

ADDITIONAL INFORMATION ;

NTP : Not listed

IARC : Not listed

OSHA : Not listed

ACGIH :Not listed

12. ECOLOGICAL INFORMATION

BIODEGRADABILITY : Not available

BIOACCUMULATION POTENTIAL :Not available

AQUATIC TOXICITY : Not available

OTHER INFORMATION : Not available

13. DISPOSAL CONSIDERATION

Dispose in a hazardous-waste site in accordance with all applicable regulations. Any disposal practice must be in compliance with country, local, state, and federal laws and regulations (contact country, local or state environmental agency for specific rules).

14. TRANSPORT INFORMATION

IATA : Not Restricted.
DOT(Department of Transportation) :Not a Hazardous Material for DOT shipping.

15. REGULATORY INFORMATION

US REGULATIONS ;
EPA : CERCLA RQ= Not listed
EPCRA TPQ= Not listed
OSHA :TQ= Not listed

EU REGULATIONS ;
SYMBOL : -----

R-phrases : -----

S-phrases : -----

EC index No. :Not listed

16. OTHER INFORMATION

No specific notes

The above information is believed to be correct to be the best of our knowledge and information but does not purport to be all inclusive and shall be used only as a guide. This product is intended to be used by expert persons having chemical knowledge and skill, at their own discretion and risk and Wako shall not be held liable for any damage resulting from handling or from contact with the above material.

Material Safety Data Sheet

Hafnium(IV) oxide, 98%

ACC# 89384

Section 1 - Chemical Product and Company Identification

MSDS Name: Hafnium(IV) oxide, 98%

Catalog Numbers: AC192030000, AC192030010

Synonyms: Hafnium dioxide; Hafnia.

Company Identification:

Acros Organics N.V.

One Reagent Lane

Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01

For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
12055-23-1	Hafnium dioxide	98	235-013-2

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: white powder.

Warning! Causes eye and respiratory tract irritation. May cause liver damage.

Target Organs: Liver, lungs, eyes.

Potential Health Effects

Eye: Causes eye irritation.

Skin: Dust may cause mechanical irritation.

Ingestion: May cause irritation of the digestive tract. The toxicological properties of this substance have not been fully investigated.

Inhalation: Causes respiratory tract irritation. The toxicological properties of this substance have not been fully investigated.

Chronic: Animal studies indicate that hafnium compounds cause liver damage. In a study with rats, 9 months after a single intratracheal injection of 50 mg of hafnium oxide, a pronounced cell reaction was found in the lungs around the dust, accompanied by moderate production of collagen fibers in the alveolar walls.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical aid.

Skin: In case of contact, flush skin with plenty of water. Remove contaminated clothing and shoes. Get medical aid if irritation develops and persists. Wash clothing before reuse.

Ingestion: If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical aid.

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

Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear.

Extinguishing Media: Use extinguishing media most appropriate for the surrounding fire.

Flash Point: Not applicable.

Autoignition Temperature: Not available.

Explosion Limits, Lower: N/A

Upper: N/A

NFPA Rating: (estimated) Health: 2; Flammability: 0; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Avoid generating dusty conditions. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid breathing dust.

Storage: Store in a cool, dry place. Keep container closed when not in use.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Hafnium dioxide	0.5 mg/m ³ TWA (as Hf) (listed under Hafnium compounds).	0.5 mg/m ³ TWA (as Hf) (listed under Hafnium compounds).50 mg/m ³ IDLH (as Hf) (listed under Hafnium compounds).	none listed

OSHA Vacated PELs: Hafnium dioxide: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to minimize contact with skin.

Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Powder

Appearance: white

Odor: Not available.

pH: Not available.

Vapor Pressure: Not available.

Vapor Density: Not available.

Evaporation Rate: Not available.

Viscosity: Not available.

Boiling Point: 5400 deg C

Freezing/Melting Point: 2774 deg C

Decomposition Temperature: Not available.

Solubility: Insoluble.

Specific Gravity/Density: 9.68 g/cm³

Molecular Formula: HfO₂

Molecular Weight: 210.49

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.

Conditions to Avoid: Dust generation.

Incompatibilities with Other Materials: No significant incompatibilities identified with common materials and contaminants..

Hazardous Decomposition Products: No data available.

Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:

CAS# 12055-23-1 unlisted.

LD50/LC50:

Not available.

Carcinogenicity:

CAS# 12055-23-1: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information available.

Teratogenicity: No information available.

Reproductive Effects: No information available.

Mutagenicity: No information available.

Neurotoxicity: No information available.

Other Studies:

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-Series: None listed.

RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	Not regulated	Not Regulated
Hazard Class:		
UN Number:		
Packing Group:		

Section 15 - Regulatory Information

US FEDERAL

TSCA

CAS# 12055-23-1 is listed on the TSCA inventory.

Health & Safety Reporting List

None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule

None of the chemicals in this material have a SNUR under TSCA.

CERCLA Hazardous Substances and corresponding RQs

None of the chemicals in this material have an RQ.

SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

Section 313 No chemicals are reportable under Section 313.

Clean Air Act:

This material does not contain any hazardous air pollutants.

This material does not contain any Class 1 Ozone depleters.

This material does not contain any Class 2 Ozone depleters.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.

None of the chemicals in this product are listed as Priority Pollutants under the CWA.

None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 12055-23-1 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations**European Labeling in Accordance with EC Directives****Hazard Symbols:**

Not available.

Risk Phrases:**Safety Phrases:**

S 24/25 Avoid contact with skin and eyes.

WGK (Water Danger/Protection)

CAS# 12055-23-1: No information available.

Canada - DSL/NDSL

CAS# 12055-23-1 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D2B.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 12055-23-1 is not listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 1/08/1999

Revision #4 Date: 3/16/2007

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.