

SECTION 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Trade name	Bismuth Alloy
Product code	None
Product list	Alloy: #117, #136, #158, #158-190, #203, #255, #281, #281-238, #291-325
Supplier	Xstrata Zinc, General Smelting Company of Canada, 1400 Norman Street, Lachine (Québec), Canada H8S 1A8
Information contact	Gino De Nobile, Chemist
Phone number (Business hours)	(514) 637-3591
Phone number (Emergency)	CANUTEC : (613) 996-6666
Synonym	Alliage bismuth (French)
Name / Chemical formula	Not applicable
Chemical family	Metal
Utilisation	Rays protection, fuses, tube bending ; Fire protectant, soldering, caulking.

SECTION 2. HAZARDS IDENTIFICATION

WHMIS (Canada) CLASS D-2A : Very toxic material causing other toxic effects



Hazard classes (categories)/Hazard statements

Cadmium : Cancerogen (1B) : H350-May cause cancer. Mutagen (2) : H341-Suspected of causing genetic defects. Reprotoxic (2) : H361fd-Suspected of damaging fertility or the unborn child. Toxicity acute (2) : H330-Fatal if inhaled. STOT RE (1) : H372-Causes damage to organs through prolonged or repeated exposure. Aquatic acute (1) : H400-Very toxic to aquatic life. Aquatic chronic (1) : H410-Very toxic to aquatic life with long lasting effects.

Hazards words

Danger



Sensitising, mutagen
cancerogen, reprotoxic



Toxic



Hazardous to the aquatic environment

Precautionary statements

P201-Obtain special instructions before use. P202-Do not handle until all safety precautions have been read and understood. P260-Do not breathe dust/fume/gas/mist/vapours/spray. P264-Wash (Hands, face, contaminated skin by the product) thoroughly after handling. P270-Do not eat, drink or smoke when using this product. P273-Avoid release to the environment. P281-Use personal protective equipment as required.

Other hazards

Reactive with : Acids, oxidants. Release of toxic vapours (Bismuth, lead), hydrogen. Possibility of eye and skin irritation, mucuous membranes, respiratory tract. Ingestion will nearly always cause acute gastro-intestinal irritation. Acute exposure : Possibility of other organs and body systems damages.

Environmental hazards

Toxic for aquatic life.

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Name	CAS No	Percentage (%)	EC No	Hazard statements
Bismuth	7440-69-9	10-60	231-177-4	none
Lead	7439-92-1	0-50	231-100-4	None
Tin	7440-31-5	0-50	231-141-8	none
Indium	7440-74-6	0-30	231-180-0	None
Cadmium	7440-43-9	0-20	231-152-8	H350-H341-H361fd-H330-H372-H400-H410

SECTION 4. FIRST-AID MEASURES

Eye contact	P305+P351+P338-IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Skin contact	P302+P352-IF ON SKIN: Wash with plenty of soap and water. P333+P313-If skin irritation or rash occurs: Get medical advice/attention. P363-Wash contaminated clothing before reuse.
Inhalation	P308+P313-IF exposed or concerned: Get medical advice/attention. If breathing is difficult, give oxygen.
Ingestion	P301+P310-IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. P330-Rinse mouth. Induce vomiting. UNCONSCIOUS person : DO NOT induce vomiting or give any liquid.

SECTION 5. FIRE-FIGHTING MEASURES

Flash point	Not available
Flammable limits	Not available
Auto-ignition temperature	Not available
Products of combustion	Metal oxides
Fire hazard	Solid form : Not a fire hazard. Avoid melting moist metal. Dust : Flammable when exposed to heat or flames.

Bismuth : Flammable with : Strong oxidants. May react with acid or acid fumes to emit toxic fumes. May react with $\text{Bi}(\text{OH})_3 + \text{Al}(\text{OH})_3$ coprecipitated, and hydrogen to produce a spontaneously flammable product. Superficially oxidized by air. Powder : Flammable.

Lead : In contact with fire or heat source, it may melt, and then if in contact with water, will cause a violent reaction. Possibility of toxic lead vapours formation.

Indium : Flammable dust when exposed to heat or flames. Mixtures of indium with sulfur : Ignite when heated.

Explosion hazard

Not explosive (Mechanical impact ; Static discharge). **NEVER** spray water on burning metal because of the risk of explosion which would splatter flaming particles of metal to great distances. Dust : Slightly explosive to explosive in presence of open flames and sparks.

Bismuth : In contact with chloric acid.

Indium : Reacts explosively with : Dinitrogen tetraoxide + acetonitrile.

Extinguishing media

NON-FLAMMABLE. Use fire fighting materials and procedures adapted to the immediate environment.

Protective equipment

Firefighters must wear full protective clothing and self-contained breathing apparatus (SCBA).

SECTION 6. ACCIDENTAL RELEASE MEASURES

Measures

P391-Collect spillage.

Methods

Use appropriate tools to place spilled materials in suitable containers for reclamation or disposal.

Protective equipment

Solid form : No health hazard. Full protective clothing. Work gloves and boots.

SECTION 7. HANDLING AND STORAGE

Handling

DO NOT ingest or inhale dust. Wear adequate protective clothing. Wear approved respirators if adequate ventilation cannot be provided. Ingestion or inhalation : Seek medical advice immediately and provide medical personnel with a copy of this SDS.

Conditions for storage

P405-Store locked up. Dry, well ventilated area. Away from : Heat, dust, moisture, ignition sources, incompatible substances (Acids, oxidants).

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Name	CAS No	Percentage (%)	Control parameters		
			ACGIH (U.S.) 2011 TLV-TWA (mg/m ³)	OSHA (U.S.) PEL-TWA (mg/m ³)	QUEBEC (CA) TWA-EV (mg/m ³)
Bismuth	7440-69-9	10-60	Not established	Not established	Not established
Lead	7439-92-1	0-50	0.05 (Pb, inorganic compds Pb)	0.05 (Pb, Pb compds)	0.05 (Pb, inorganic compds)
Tin	7440-31-5	0-50	2 (Sn)	2 (metal, compounds)	2 (metal)
Indium	7440-74-6	0-30	0.1 (In, In compounds)	Not established	0.1 (In, In comp.)
Cadmium	7440-43-9	0-20	0.01 (Cd)	0.005 (Cd)	0.025 (Cd, dust, salt)
			0.002 (respirable fraction)	0.2 (dust)	0.1 (fume)

Note : **Lead** : ACGIH TLV TWA : 0.05 mg/m³ (Lead and inorganic compounds). NIOSH REL-TWA (≤10 hours) : 0.05 mg/m³ ; REL also applies to other lead compounds (as Pb) ; IDLH : 100 mg/m³ (Metal ; Compounds). OSHA PEL-TWA : PEL also applies to other lead compounds (as Pb).

Tin : ACGIH TLV TWA : Metal, oxide, inorganic compounds (Sn) except SnH₄. OSHA PEL-TWA : Metal, inorganic compounds (Sn) except oxides. NIOSH REL-TWA (≤10 hours) : 2 mg/m³ (Except oxides) ; IDLH : 100 mg/m³.

Indium : NIOSH REL-TWA (≤10 hours) : 0.1 mg/m³ (REL also applies to other indium compounds, as In).

Cadmium : OSHA Ceiling : 0.3 mg/m³ (Cd fume). NIOSH IDLH : 9 mg Cd/m³ (Metal dust and compounds).

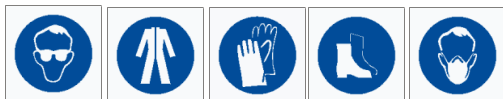
Consult local authorities for acceptable exposure limits

Engineering controls

Use process enclosures, local exhaust ventilation or other engineering controls to keep airborne levels below recommended exposure limits.

Individual protection

Safety goggles. Coveralls. Work gloves and boots. Dust respirator. Be sure to use a NIOSH approved respirator or equivalent when concentrations exceed occupational exposure limits.



SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical state and appearance

Solid (Small rod, ingot)

Molecular weight

Not applicable

pH (1% soln/water)

Not applicable

Boiling point

Not available

Melting point

47-163°C (117-325°F)

Vapour Density

Not available

Critical temperature

Not available

Odour

Odourless

Taste

Not applicable

Colour

Grey

Volatility

Not available

% Moisture

Not available

Odour threshold

Not available

Water/Oil dist. coeff.

Insoluble (Water, oil)

Specific gravity	Not available	Ionicity (in water)	Not available
Vapour pressure	Not available	Dispersion	No (Water)
Solubility	No (Water)		

SECTION 10. STABILITY AND REACTIVITY

Stability	Yes (Under normal conditions of ambient temperature)
Reactivity	Reactive or incompatible with : Acids. Bismuth : Self oxidation at room temperature when in contact with air.
Dangerous decomposition	Metallic oxides (Bismuth, lead, indium, cadmium)
Conditions to avoid	Acids
Dangerous polymerization	No
Materials to avoid	Bismuth : Can react with acid or acid fumes to emit toxic fumes. Incompatible with : Aluminum, bromine trifluoride, acids, ammonium nitrate and chlorides. Lead : Violent reaction on ignition with : Chlorine trifluoride, concentrated hydrogen peroxide, ammonium nitrate, sodium acetylide. Other incompatibilities : Sodium nitrate, zirconium, disodium acetylide, oxidants. Tin : Reacts violently under certain conditions with : Chlorine, bromine, trifluoride (Chlorine, bromine), acids, oxidants. Can react with some extinguishing agents (Bicarbonate powder, carbon dioxide). Indium : Violent reaction with mercury (II) bromide at 350°C. React with : Mineral acids, oxidizers. Cadmium : Combustants agents, acids, strong oxidants. <i>NOTE : This list of products is not exhaustive. Verify technical documents to determine any incompatibilities with your process.</i>
Corrosivity	No

SECTION 11. TOXICOLOGICAL INFORMATION

Routes of entry	Ingestion. Inhalation. Eyes and skin contact.
Carcinogenicity	Cadmium : PROVEN (Group 1, IARC) ; SUSPECTED (ACGIH) ; LISTED (NTP, OSHA). Lead : POSSIBLE (Group 2B, IARC) (EPA) ; CARCINOGEN (Animal, A3, ACGIH). Tin : NOT A CARCINOGEN (IARC, OSHA, NTP) ; NOT LISTED (ACGIH). Indium ; Bismuth : NOT LISTED (IARC, ACGIH).
Mutagenicity	Cadmium : DNA damages (Human, mouse) ; Cytogenetic analysis (1µmol/L, hamster ovary). Lead : Cytogenetic analysis ; DNA. (RTECS).
Teratogenicity	Cadmium : ORAL : Biochemical and metabolic effects (Mouse newborn) ; INTRAPERITONEAL : Specific developmental abnormalities of the CNS (Mouse). Lead : SUSPECTED (OSHA). Effects on embryo, foetus, fertility (RTECS).
Acute toxicity	Bismuth : LD50 and LC50 : Not available. (RTECS). Lead : ORAL acute (LoLD) : 155 mg/kg (Human) ; 0.2 mg/kg (Rat). INHALATION acute (LoTC) : 10 µg/m ³ (Human). INTRAPERITONEAL acute (LoLD) : 1 g/kg (Rat). (RTECS). Tin : UNREPORTED ROUTE acute (LoTD) : 250 mg/kg (Human). (RTECS). Indium : SUBCUTANEOUS acute (LoLD) : 10 mg/kg (Mouse). (RTECS). Cadmium : ORAL acute (LD50) : 225 mg/kg (Rat). (HSDB). ORAL acute (LD50) : 2 330 mg/kg (Rat) ; 890 mg/kg (Mouse). INHALATION acute (LC50) : 25 mg/m ³ /30 minute (Rat) (RTECS).
Acute effects	Solid form : No health hazards. Conditions and work practices which generate dust or fumes should be avoided or controlled. Possibility of irritation (Eyes, mucous membranes, skin, upper respiratory tract). Overexposure (Symptoms) : Burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, vomiting. Bismuth : Poison. Dust : respiratory irritation. May cause foul breath, metallic taste and gingivitis. Possibility of : Malaise, albuminuria, diarrhea, skin reactions, stomatitis, headache, fever, rheumatic pain and a black line may form on gums in the mouth. Skin and eye irritation. Lead : Absorption is easier by inhalation and the symptoms develop more quickly than by ingestion. Symptoms : Loss of appetite, anemia, insomnia, headache, muscle and joint pain. Toxicity by ingestion, compared to those by inhalation, requires greater concentrations before symptom onset.
Chronic effects	Non-controlled repeated or prolonged exposure : Possibility of target organ damages (Blood, kidneys, liver, lungs ; nervous and reproductive systems). Repeated exposure : Possibility of a general health deterioration by an accumulation in one or many organs. Bismuth : May cause kidney damage, although the degree of such damage is usually mild. Industrially it is considered one of the less toxic of the heavy metals. May cause : Diarrhea, anemia, skin reaction and sometimes serious skin irritation (Exodermatitis). Lead : Metal lead NOT CLASSIFIED as carcinogen but listed as teratogen and reproductive toxic (European Economic Community Expert Committee on Metal). Lead is a regulated substance in many jurisdictions. Target organs for acute and chronic overexposure (NIOSH 90-117) : Blood, gingival tissues ; gastro-intestinal, central nervous, renal systems. Symptoms of acute overexposure often develop abruptly and resemble those

of chronic overexposure : Anaemia, lassitude, weakness, nausea, vomiting, abdominal cramps, constipation, confusion, convulsions, muscular weakness, muscular and joint pains. Target organs (Chronic overexposure) : Blood, kidneys, digestive, nervous and reproductive systems.

Tin : Low toxicity for humans. Chronic inhalation of oxide (Dust, fume) may cause stannosis (Benign pneumoconiosis) without any pulmonary functional impairment. Other sensitive organs : Kidneys, central nervous system.

Indium : Low toxicity (Solid).

Cadmium : Sensitive organs to acute and chronic overexposure : Respiratory system, bone structure, kidneys, blood. Possibility of symptoms after chronic overexposure : Shortness of breath, cough, osteoporosis, proteinuria.

Toxicity

Persons with the following pre-existing conditions warrant particular attention :

Bismuth : Skin and respiratory disorders.

Lead : Anaemia, pregnant or breast feeding women and women of child bearing age. Preferred method for biological monitoring : Blood lead levels (Pb blood) measurement (BEI 30 µg/100 ml) ; Sampling time : Not critical.

Tin : Respiratory system (Inorganic compounds).

Cadmium : Osteoporosis, chronic renal diseases, emphysema. Preferred method for biological monitoring : Urinary (BEI 5 µg/g creatinine, background) and blood (BEI 5 µg/g, background) levels measurement ; Sampling time : Not critical. Proteinuria detection : Beta-2 microglobulines or protein-retinol linked dosages.

Eating, drinking and smoking must be prohibited in areas where this material is handled and processed. Wash hands and face before eating, drinking and smoking.

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Heavy metals : Harmful to aquatic life.

Toxicity to animals

Lead : ORAL acute (LoLD) : 155 mg/kg (Human) ; 0.2 mg/kg (Rat). INHALATION acute (LoTC) : 10 µg/m³ (Human). INTRAPERITONEAL acute (LoLD) : 1 g/kg (Rat). (RTECS).

Tin : UNREPORTED ROUTE acute (LoTD) : 250 mg/kg (Human). (RTECS).

Indium : SUBCUTANEOUS acute (LoLD) : 10 mg/kg (Mouse). (RTECS).

Cadmium : ORAL acute (LD50) : 225 mg/kg (Rat). (HSDB). ORAL acute (LD50) : 2 330 mg/kg (Rat) ; 890 mg/kg (Mouse). INHALATION acute (LC50) : 25 mg/m³/30 minute (Rat) (RTECS).

Mobility (Soil)

Cadmium : Soluble cadmium produced by acidic conditions, becomes mobile in water and in soil.

Persistence and degradability

Not applicable

Bioaccumulation

Cadmium : Bioconcentrated in aquatic invertebrates and fish ; Aquatic and terrestrial plants. Low soil pH tends to increase the availability of cadmium

Biodegradation products

Not biodegradable

Biodegradation products (Toxicity)

Not applicable

Remarks on environment

Due to the product's composition, particular attention must be taken.

BOD5 and COD

Not available

SECTION 13. DISPOSAL CONSIDERATIONS

Disposal methods

Recycle to process, if possible. P501-Dispose of contents/container in full compliance with Federal, Provincial and local regulations.

SECTION 14. TRANSPORT INFORMATION

TDG (Pictograms)

Not regulated (Canada)

PIN

Not applicable

Special provisions (Transport)

Not applicable

SECTION 15. REGULATORY INFORMATION

Labelling (GHS)

Regulation (EC) No 1272/2008 CLP : Listed.

Cadmium (Non pyrophoric) : Index number : 048-002-00-0 ; EC Number 231-152-8

Labelling (DSD)

EU (Regulation 67/548/EEC) : Listed.

Cadmium (non pyrophoric) : T+ Very toxic ; N Dangerous for the environment

Annex I Index number : 048-002-00-0 ; EU Consolidated Inventories : EC Number 231-152-8

Classification : Carc. C2 R45 ; Muta. Cat 3 R68 ; Repr. Cat 3 R62,63 ; T+ R26 ; T 48/23/25 ; N R50/53

R45, 26, 48/23/25, 62, 63, 68, 50/53 ; S53, 45, 60, 61

EU: Consolidated Inventories : Listed

Bismuth : EU Consolidated Inventories : numéro EC 231-177-4

Lead : EU Consolidated Inventories : EC Number 231-100-4

Tin : EU Consolidated Inventories : EC Number 231-141-8

Indium : EU Consolidated Inventories : numéro EC 231-180-0



Not classified in the Annex I of Directive 67/548/EEC
 Not listed in the Annex I of Council Regulation No (EC) 304/2003
 Not listed in a priority list (as foreseen under Council Regulation (EEC) No 793/93

Risk phrases (DSD)

R26-Very toxic by inhalation
 R45- May cause cancer
 R48/23/25- Toxic: danger of serious damage to health by prolonged exposure through inhalation and if swallowed.
 R50/53-Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
 R62-Possible risk of impaired fertility.
 R63-Possible risk of harm to the unborn child.
 R68-Possible risk of irreversible effects

Safety phrases (DSD)

S45-In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
 S53-Avoid exposure - obtain special instructions before use
 S60-This material and/or its container must be disposed of as hazardous waste.
 S61-Avoid release to the environment. Refer to special instructions/Safety data sheets

CEPA DSL (CANADA)

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) : on the Domestic Substances List (DSL) ; acceptable for use under the provisions of CEPA.

Regulation (U.S.A.)

CERCLA Section 103 Hazardous substances (40 CFR 302.4) ; SARA 110 ATSDR CERCLA Priority List : Listed ; SARA Section 313, Toxic Chemicals (40 CFR 372.65) : Listed.

Lead (RQ) : *10 pounds (4.54 kg)
Cadmium (RQ) : *10 pounds (4.54 kg)

TSCA (EPA, Toxic Substance Control Act) Chemical Inventory (40 CFR710) : Listed.
Bismuth ; Lead ; Tin ; Indium ; Cadmium.

*No declaration required if the diameter of the piece of solid metal released is equal to or exceeds 100 micrometers (0.004 inches).

Classifications HCS (U.S.A.)

Toxic

NFPA (National Fire Protection Association) (U.S.A.)

Fire Hazard 0 **Reactivity** 0 **Health** 3 **Special Hazard**

SECTION 16. OTHER INFORMATION
References

- TLVs and BEIs (2011). Based on the Documentation of the Threshold Limit Values for Chemical Substances and Physical Agents & Biological Exposure Indices. ACGIH, Cincinnati, OH – <http://www.acgih.org>
- CCOHS (2011) - Canadian Centre for Occupational Health and Safety - <http://www.ccohs.ca/>
- CSST (2011) - Commission de la Santé et de la Sécurité du Travail (Québec). Service du répertoire toxicologique <http://www.reptox.csst.qc.ca/>
- ESIS : C&L (Classification and Labelling), substances ou préparations selon la Directive 67/548/EEC (substances) et 1999/45/EC (préparations).
- ESIS : EINECS (European Inventory of Existing Commercial chemical Substances) O.J. C 146A, 15.6.1990
- ESIS : EINECS corrections publiées dans O.J. C 54/13 01.03.2002, 2002/C54/08.
- Guidance on the Application of the CLP Criteria. Guidance to Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging (CLP) of substances and mixtures. 25/08/2009. ECHA Reference : ECHA-09-G-02-EN. © European Chemicals Agency, 2009.
- ERG (2008). Emergency Response Guidebook, U.S. Department of Transportation, Transport Canada, et le Secretariat of Communications and Transportation of Mexico
- Guidance on the Application of the CLP Criteria. Guidance to Regulation (EC) No 1272/2008 on Classification, Labelling and Packaging (CLP) of substances and mixtures. 25/08/2009. ECHA Reference : ECHA-09-G-02-EN. © European Chemicals Agency, 2009.
- HSDB (2011) - Hazardous Substances Data Bank. TOXNET® Network of databases on toxicology, hazardous chemicals, and environmental health. NLM Databases & Electronic Resources, U.S. National Library of Medicine, NHI, 8600 Rockville Pike, Bethesda, MD 20894 <http://toxnet.nlm.nih.gov/cgi-bin/sis/htmlgen?HSDB>
- IARC - Monographs on the Evaluation of Carcinogenic Risks to Humans (collection) - <http://www.cie.iarc.fr/>
- Merck Index (1999). Merck & CO., Inc, 12th edition
- NIOSH U.S. (2011) - Pocket Guide to Chemical Hazards - <http://www.cdc.gov/niosh/npg/>
- Patty's Industrial Hygiene and Toxicology, 3rd Revised Edition
- Règlement sur les produits contrôlés (Canada)
- REGULATION (EC) No 1272/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing. Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006. (Text with EEA relevance). Official Journal of the European Union. L353 p1-1355, 1.12.2008.
- RTECS (2011). Registry of Toxic Effects of Chemical Substances, NIOSH, CDC

- Toxicologie industrielle & intoxication professionnelle, 3e édition, Lauwerys
- TSCA (2011) - U.S. EPA Toxic Substance Control Act, Chemical Inventory. System of Registries (SoR), Substance Registry Services, http://iaspub.epa.gov/sor_internet/registry/substreg/searchandretrieve/substancesearch/search.do

Glossary	CSST	: Commission de la Santé et de la Sécurité du Travail (Québec).
	HSDB	: Hazardous Substances Data Bank.
	IARC	: International Agency for Research on Cancer.
	NIOSH	: National Institute of Occupational Safety and Health.
	NTP	: U.S. National Toxicology Program.
	RTECS	: Registry of Toxic Effects of Chemical Substances
	STOT	: Specific target organ toxicity

Note No specific studies have been performed on this mixture. For your protection, we suggest that you test it before using in your process.

Written by : Groupe STEM Consultants / Xstrata Zinc Canada

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Partial review : None

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Request Gino De Nobile Tel. : (514) 637-3591 Fax : (514) 637-1294
Xstrata Zinc Canada, General Smelting Company of Canada, 1400 Norman Street, Lachine (Québec), Canada H8S 1A8

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