Safety Data Sheet

SECTION 1: Identification of the Substance/Mixture and of the Company/Undertaking

1.1. Product identifier

Solder sticks, bars, ingots, pellets and solid wire of alloys:
95A(1), 96SC(2)(3), 97Cu3(2), 97SC(2)(3), 99C(2), SAC 0307(2)(3), SAC 305(2)(3), SAC 405(2)(3), Sn70Zn30(4), Sn90Zn10(4), Sn95Ag5(3),Sn95Sb5(1), Sn96,5Ag3,5(3), Sn96,5Ag3Cu0,5(2)(3), Sn97Ag3(3), Sn98Cu1Ag(2)(3), Sn99Cu1(2), Sn99,5Cu0,4(2), Sn99,5Cu0,5(2), SnAg3(3), SnAg3,5(3), SnCu0,5(2), SnCu0,7(2), SnCu3(2).

(1) contains antimony

(2) contains copper.

(3) contains silver

(4) contains zinc

This data sheet does not apply to powders or other finely divided forms of the product.

1.2. Relevant identified uses of the substance or mixture and uses advised against

Soldering and surface coating for electronic, electrical and engineering applications at temperatures up to 500°C.
Manufacture of solder powder.

Exposure Scenario details are given in section 16.

1.3. Details of the supplier of the safety data sheet

Premier Farnell plc
150 Armley Road
Leeds
LS12 2QQ
+44 (0) 870 129 8608

1.4. Emergency telephone number

+44 1865 407333

SECTION 2: Hazards Identification

2.1. Classification of the substance or mixture

The components of the product are not classified as hazardous under the Classification Labelling and Packaging Regulation (EC) 1272/2008.
The product is not classified as dangerous under the Classification Labelling and Packaging Regulation (EC) 1272/2008.

2.2. Label elements

Classification Labelling and Packaging Regulation (EC) 1272/2008 - none required.

2.3. Other hazards

Burns from contact with molten product; inhalation of fine powder, dust or fumes.

SECTION 3: Composition/Information on Ingredients

3.1. Mixtures

Declarable components: none

Other components:

Substance:	Weight (%)	EC No:	CAS No:	Registration No:
Tin	>60	231-141-8	7440-31-5	01-2119486474-28-0024 Some of this substance is exempted from the registration requirements in accordance with Article 2.7(d), as it is a recovered substance.
Antimony (products marked (1))	1-8	231-146-5		01-2119475609-24-0006 Some of this substance is exempted from the registration requirements in accordance with Article 2.7(d), as it is a recovered substance, and some is a phase-in substance and the transition period for its registration has not yet expired.
Copper (products marked (2))	0.1-5	231-159-6	7440-50-8	No registration number is given for this substance, because it is exempted from the registration requirements in accordance with Article 2.7(d), as it is a recovered substance.
Silver (products marked (3))	1-8	231-131-3	7440-22-4	05-2114130135-65
Zinc (products marked (4))	20-40	231-175-3	7440-66-6	

SECTION 4: First Aid Measures

4.1. Description of first aid measures

Inhalation	Inhalation of metals in massive form is not expected. However, if use or processes produce dust or fume, and inhalation of these is suspected, remove exposed person to fresh air, give rest, and get medical attention. If flux fumes are inhaled, consult the safety data sheet for the flux concerned.
Ingestion	Rinse out mouth and give plenty of water to drink. Get medical attention.
Eye contact	Check for contact lenses and remove if present. Wash the eyes thoroughly with water. Get medical advice if irritation or other symptoms occur.
Skin contact	Remove contaminated clothing. Wash affected area with soap and water. Get medical attention if irritation occurs. In case of contact with molten metal, cool skin rapidly with cold water.

4.2. Most important symptoms and effects, both acute and delayed

For antimony, acute or delayed effects are not anticipated.

For high oral intakes of soluble copper compounds, the first symptoms are gastro-intestinal. Vomiting may occur. The most critical organ for delayed effects from “copper” excess is the liver. Nose-lung irritation may be a symptom occurring after inhalation of copper containing fumes/dusts/mists.

Symptoms of acute silver poisoning:

Direct contact may cause mild local irritation of the skin or eyes. Inhalation of fumes or dusts of silver may be irritating to mucous membranes and upper respiratory tract. Exposure to high concentrations of smoke or dust may cause lung damage and pulmonary oedema. ingestion of silver compounds can cause irritation of the gastrointestinal tract.

Symptoms of chronic silver poisoning:

Prolonged exposure to the smoke or dust causes a metallic taste in the mouth, loss of appetite, headache and general infirmity. It can also cause a bluish or grayish discoloration of the skin, eyes and mucous membranes (Argyria). It may take several years before it develops. The stains are permanent.

4.3. Indication of any immediate medical attention and special treatment needed

Not applicable.

SECTION 5: Firefighting Measures

5.1. Extinguishing media

Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Suitable extinguishing agents: CO_2, dry powder, sand or water spray. Do not use full water jets or foam.

5.2. Special hazards arising from the substance or mixture

This product is not flammable but may combust at high temperatures. No explosive properties have been identified for the components of this product.

5.3. Advice for fire fighters

Remove containers or product away from fire or cool with water.

SECTION 6: Accidental Release Measures

The product as supplied in solid form is not hazardous if spilled or released, although normal hygiene measures should be taken if the product is manually handled. This section relates to accidental release of materials, such as dross, dust or fume, arising from use of the product, as a result of fire or from other causes.

6.1. Personal precautions, protective equipment and emergency procedures

Keep unauthorised personnel from the spillage area. Wear personal protection (see Section 8).

6.2. Environmental precautions

Do not discharge into drains, surface waters or groundwater. In case of entry into waterways, soil or drains, inform the responsible authorities.

6.3. Methods and materials for containment and clearing up

Pieces can be picked up. Collect spilled material by vacuum cleaning or by sweeping in damped condition and keep in closed containers. Avoid raising dust. Label containers and send for recovery or disposal (see section 13).

6.4. Reference to Other Sections

See section 8: Exposure Controls/Personal Protection.
See section 13: Disposal Considerations.

SECTION 7: Handling and Storage

7.1. Precautions for safe handling

Wear protective clothing (see Section 8). If use or processes produce dust or fume, wear respiratory protection. Product is dense, so take care when carrying heavy loads. Do not let molten metal contact water. Ensure that product and any tools are dry before contact with molten metal. W ash hands after handling the product. See section 16 for relevant Exposure Scenarios.

7.2. Conditions for safe storage, including any incompatibilities

Do not store with acids or alkalis. Do not allow contamination with other chemicals.

7.3. Specific end uses(s)

See section 16 for specific Exposure Scenarios.

SECTION 8: Exposure Controls/Personal Protection

8.1. Control parameters

Occupational exposure standards:

UK EH40	Tin (inorganic compounds)	2mg/m^3 8hr TWA, 4mg/m^3 15min STEL
	Antimony (metal & compounds)	0.5mg/m^3 8hr TWA
	Silver (metallic)	0.1mg/m^3 8hr TWA
	Copper (dust)	1mg/m^3 8hr TWA, 2mg/m^3 15min STEL
	(fume)	0.2mg/m^3 8hr TWA
France ED 984	Etain	pas catalogué
	Antimoine et ses compos en Sb	0.5mg/m^3 VME
	Argent (métallique)	0.1mg/m^3 VME
	Cuivre (poussière)	1mg/m^3 VME, 2mg/m^3 VLCT (ou VLE)
	(fumé)	0.2mg/m^3 VME
Germany	Zinn(IV) Verbindungen, anorganische (einetembare Fraktion) 2mg/m^3 Grenzwert Zinn(II) Verbindungen, anorganische (einetembare Fraktion) 8mg/m^3 Grenzwert Silber 0.1mg/m^3 Grenzwert Spitzenbegrenzung, Überschreitungsfaktor 8 Kupfer und seine Verbindungen (einetembare Fraktion) (DFG) 0.01mg/m^3 Grenzwert Spitzenbegrenzung, Überschreitungsfaktor 2 Kupfer-Rauch (alveolengängige Fraktion) (DFG) 0.01mg/m^3 Grenzwert Spitzenbegrenzung, Überschreitungsfaktor 2 Zink und seine Verbindungen, anorganische (einetembare Fraktion) (DFG) 0.1mg/m^3 Grenzwert Spitzenbegrenzung, Überschreitungsfaktor 4	

In countries other than the UK, France and Germany, different exposure limits may apply.

PNECs and DNELs - antimony:

Exposure pattern	Route	Descriptor	DNEL/PNEC
Long-term - systemic effects	Dermal	DNEL	281 mg/kg bw/day
Long-term - local effects	Inhalation	DNEL	0.5 mg/m^3
	Freshwater	PNEC	0.113 mg Sb/L
	Marine	PNEC	0.0113 mg Sb/L
	Sediment - freshwater	PNEC	7.8 mg Sb/kg wwt
	Sediment - marine	PNEC	1.56 mg Sb/kg wwt
	Soil	PNEC	37 mg Sb/kg dwt (32.6 mg Sb/kg ww)
	STP	PNEC	2.55 mg Sb/L

PNECs and DNELs - copper

Exposure pattern	Route	Descriptors	DNEL/PNEC
Human long-term systemic effects	Oral, dermal and inhalation	Internal dose DNEL using absorption factors of 25% for oral, 100% for inhalation (respirable) and 0.03% for dermal exposure routes	0.041mg Cu/kg B wt/day
Human short-term systemic effects	Oral, dermal and inhalation	Internal dose DNEL using absorption factors of 25% for oral, 100% for inhalation (respirable) and 0.03% for dermal exposure routes	0.082mg Cu/kg B wt/day
Human short-term effects - drinking water	Oral	NOAEL for drinking water	4mg/L
Environmental	Fresh water	PNEC. Includes a default bio-availability correction	7.8 µg dissolved Cu/L(1)
Environmental	Marine water	PNEC. Includes a default bio-availability correction	5.2 µg dissolved Cu/L(1)
Environmental	Sediment - fresh water	PNEC. Includes a default bio-availability correction	87 mg Cu/kg dry wt(1)
Environmental	Sediment - estuarine	PNEC	288 mg Cu/kg dry wt(1)
Environmental	Sediment - marine	PNEC	676 mg Cu/kg dry wt(1)
Environmental	Soil	PNEC. Includes a default bio-availability correction	65.5 mg Cu/kg dry wt(1)
Environmental	STP	PNEC	230 g dissolved Cu/L

(1) Default PNEC values are given. These can be refined if information on local environment is available (see section 12.1)

PNEC and DNELs - silver

DNELs (derived from the levels causing changes in the body - by inhalation, exposure to prolonged and severe):

Employees:

soluble silver compounds	0.01mg Ag/m3*
Poorly soluble / insoluble silver compounds	0.1mg Ag/m3**

General Public:

soluble silver compounds	0.004mg Ag/m3*
Poorly soluble / insoluble silver compounds	0.04mg Ag/m3**

DNELs (derived from the levels causing changes in the body - after ingestion, exposure to long-term):

Employees:

soluble silver compounds	0.02mg Ag/kg body weight/day*
Poorly soluble / insoluble silver compounds	0.12mg Ag/kg body weight/day**

General Public:

soluble silver compounds	0.002mg Ag/kg body weight/day*
Poorly soluble / insoluble silver compounds	0.12mg Ag/kg body weight/day**

* value only for calculations

** value appropriate for the metallic silver

PNEC freshwater: 0.04µg Ag/L (Soluble Ag)
PNEC marine: 0.86µg Ag/L (Soluble Ag)
PNEC sediment freshwater: 438mg Ag/kg dw
PNEC sediment marine: 438mg Ag/kg dw
PNEC soil: 0.794mg Ag/kg ww
PNEC STP: 0.025mg Ag/L (Soluble Ag)

PNECs and DNELs - zinc

DN(M)ELS for employees
Inhalation exposure
DNEL = 2.5 mg/m3 (inhalation exposure to water-soluble salts of zinc)
DNEL = 5 mg/m3 (inhalation exposure to poorly soluble or insoluble zinc salts).

Oral Exposure
DNEL = 50 mg Zn / day (ie, 0.63 mg Zn / kg body weight) (exposure to oral water-soluble salts of zinc)
DNEL. = 50 mg Zn / day (ie 0.83 mg Zn / kg body weight) (exposure to oral slightly soluble or insoluble zinc salts)

Dermal exposure
DNEL = 500 mg Zn / day (ie 8.3 mg Zn / kg body weight) (Dermal exposure to water-soluble salts of zinc)
DNEL = 5000 mg Zn / day (ie, 83 mg Zn / kg body weight) (Dermal exposure to poorly soluble or insoluble zinc salts)

DN (M) ELS for the general population
DNEL = 1.3 mg/m3 (inhalation exposure to water-soluble salts of zinc)
DNEL = 2.5 mg/m3 (inhalation exposure to poorly soluble or insoluble zinc salts)

PNEC for aquatic organisms

	Value	Assessment factor
PNEC in fresh water	20.6µg dissolved Zn/L	1
PNEC in sea water	6.1µg dissolved Zn/L	3

PNEC for organisms inhabiting the sediment

	Value	Assessment factor
PNEC for freshwater sediment	117.8mg/kg dry weight	1
PNEC for marine sediment	56.5mg/kg dry weight	1

PNEC for organisms inhabiting the soil

	Value	Assessment factor
PNEC for soil	35.6mg/kg dry weight	1

PNEC for organisms of biological waste water treatment plant

	Value	Assessment factor
PNEC for biological organisms from sewage treatment plants	52mg/L	100

8.2. Exposure controls

The need for personal protective equipment should be based on a workplace risk assessment for the particular use.

8.2.1 Organisational measures

No special measures required. However, if use or processes produce dust or fume, then local exhaust ventilation may be required.

8.2.2 Personal Protection Equipment

PPE should be to European (EN) standards.

Respiratory protection

Wear suitable respiratory protective equipment if exposure to dust or fume is likely.

Hand protection

Protective gloves. Material of gloves: neoprene or leather. Insulating gloves should be worn when handling molten or hot metal. Consult manufacturers concerning breakthrough times.

Eye protection

A face shield, safety goggles or safety glasses should be worn when handling molten metal.

Skin and body Protection

Wear protective work clothing. For processing involving hot or molten metal, use heat-resistant safety clothing.

Hygiene measures

Wash hands after handling product.

SECTION 9: Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Appearance	: Grey or silvery metallic solid
Odour	: None
Odour threshold	: Not applicable
pH	: Not applicable
Melting point	: 217°C to 310°C, depending on grade.
Boiling point	: >600°C
Flashpoint	: Not applicable
Evaporation rate	: Not applicable
Flammability	: Not flammable
Upper/lower flammability limits	: Not applicable
Vapour pressure	: Not applicable
Vapour density	: Not applicable
Relative density	: 7.2g/mL to 7.5g/mL, depending on grade.
Solubility in water	: Tin - insoluble (<0.1 g/L) Antimony - 18.2 mg/L at T° 20°C (ISO 6341 medium – loading 2 g Sb/L-pH 4.6) Copper - insoluble, needs to be transformed into a copper compound to become soluble Silver - 0.03 mg / L
Solubility in other solvents	: Not applicable
Partition coefficient (log Kow)	: Not applicable
Autoignition temperature	: Not below 400°C
Decomposition temperature	: Not applicable
Viscosity	: Not applicable
Explosive properties	: Not explosive
Oxidising properties	: Not oxidising

9.2. Other information

Prolonged storage at low temperatures may cause a change in the allotrope of tin, which affects the physical properties of the substance.

SECTION 10: Stability and Reactivity

10.1. Reactivity

Stable under recommended storage and handling conditions.

10.2. Chemical stability

Stable under recommended storage and handling conditions.

10.3. Possibility of hazardous reactions

No hazardous reactions are expected under normal conditions of use.

Combustion or hot processes can result in the formation of dross or ashes containing antimony trioxide. Inhalation of these should be avoided.

10.4. Conditions to avoid

Avoid dust formation. See section 7.2 Conditions for safe storage.

10.5. Incompatible materials

Acids, alkalis, strong oxidizing agents, chlorine. Tin reacts strongly with cupric nitrate and with fused ammonium nitrate below 200°C. Reactions with acids or bases can liberate hydrogen, which is extremely flammable.

10.6. Hazardous decomposition products

No decomposition if used as directed.

SECTION 11: Toxicological Information

11.1. Information on toxicological effects

For antimony, the application of read-across from diantimony trioxide (CAS#1309-64-4: “ATO”) to antimony metal has been verified based on the relative bioaccessibility of antimony ions specific to each endpoint and route of exposure. This read-across approach is applied to the following endpoints:

Adsorption/desorption
Acute toxicity
Irritation (skin, eye, respiratory tract) Corrosivity
Sensitisation
Repeated dose toxicity (oral, inhalation, dermal, other routes)
Mutagenicity
Carcinogenicity (oral, inhalation, dermal, other routes)
Toxicity for reproduction

For copper, most of the available hazard data are related to exposure of soluble copper compounds (e.g. copper sulphate) and fine copper flakes, coated with zinc stearates (particle size around 5µm). For the hazard profile of copper in massive forms, information on solubility, bioaccessibility and bioavailability is combined with the hazard profile of soluble copper compounds in a read-across approach to assess its potential hazards.

Absorption	Antimony Oral = 1% (ECB, 2008) Dermal = 0.26% (negligible) (ECB, 2008) inhalation = 6.82 % (ECB, 2008)

The absorption data are based on read-across from diantimony trioxide (CAS# 1309-64-4).

Copper

Copper is an essential element and therefore the concentration of copper in the body is strictly and efficiently regulated by homeostatic mechanisms. The major control mechanism is gastrointestinal absorption and biliary excretion into faeces. Liver has an important role in the maintenance of the copper homeostasis. The failure to maintain homeostasis may lead to adverse effects resulting either from deficiency or excess.

INHALATION: Copper massive and its marketed downstream use products have a d50 particle size >10 µm and therefore do not meet the criteria for acute inhalation classification. In specific cases (e.g. during production), dusts, mists and fumes may be produced. The absorption of the respirable fraction (fumes) is considered to be complete (100%). Absorption of the “inhalable” fraction depends on the particle size and the Multiple Path Model of Particle Deposition (MPPD)) can be used to quantify the particle dependent absorption.

ORAL: The solubility of copper massive forms in gastric fluid is low. In- vitro bio-accessibility of soluble copper compounds, copper powders and copper massive forms (various sizes) in gastric fluid (in accordance with ASTM D5517-07), demonstrated that, for massive forms, the release of copper ions in gastric fluids was only <0.1% of its total potential release (Rodriguez et al., 2010).

Following administration of soluble copper compounds, a dose dependent adsorption of copper ions has been drawn from true pooled fitted data (exposure-specific absorption). The essential nutritive value of copper-ions drives this homeostasis with a copper absorption ranging between 20% (high copper intake - near toxicity) and 80% (low copper intake - near deficiency) for soluble copper compounds. Considering the most reliable human data currently available (Turnlund et al,1989; 1998; 2005 and Harvey et al, 2003; 2005), for a given soluble copper dose in the Gastro Intestinal Tract, oral absorption of copper in humans can be calculated based on the mean result for two functions:

Equation 1 - oral absorption% = $-15.0 \ln(x) + 63.2$

Equation 2 - oral absorption% = $72.9\, e^{-0.1167x}$

x = copper intake (mg/day)

DERMAL: A dermal absorption of 0.3% for soluble and insoluble copper substances in solution or suspension is observed from in- vitro percutaneous tests on human skin (Roper 2003; Cage 2003). For the dry exposure scenarios applicable to copper powders, the dermal absorption value of 0.03% applies.

Acute toxicity

Tin

Acute toxicity oral LC50: >2000mg/kg (rat) – OECD 423.
Acute toxicity inhalation LC50: >5mg/L (rat) – OECD 403.
Acute toxicity dermal LC50: >2000mg/kg (rat) – OECD 402.

Antimony

Based on available data, the classification criteria for acute toxicity are not met for antimony trioxide. Based on read-across from ATO, antimony does not require a classification for acute toxicity.

Oral LD50 rat > 20,000 mg/kg bw (Fleming, 1938; Gross et al, 1955; Myers et al, 1978) Dermal LD50 rabbit > 8,300 mg/kg bw (Gross et al, 1955) Inhalation LC50 rat > 5.2 mg/m3 (Leuschner, 2006)

Copper

ORAL: At high levels, solubilised copper-ions may induce gastro- Intestinal effects. Acute oral effects, assessed from animal studies using CuO (Sanders, 2002a), copper sulphate (Lheritier, 1994) and coated copper flakes (Sanders, 2001a) are available. Comparison of the toxicity profiles demonstrates the importance of solubility/bio-accessibility for read-across of toxicity data among copper-bearing substances. The available animal data combined with in-vitro bio-accessibility data permitted the assessment of the acute toxicity of copper in powder and massive form.

The assessment concluded that, according to the Regulations (EC) No 1272/2008 and 67/548/EEC, copper sulphate and coated copper flakes meet the criteria as acute harmful by oral intake (LD_{50} rats>300 mg/kg body weight). The assessment further concluded that, according to Regulations (EC) No 1272/2008 and 67/548/EEC, copper (massive and powder forms) and CuO do not meet the criteria for classification after oral intake (LD_{50}>2000 mg/kg body weight).

Acute gastrointestinal effects associated with copper sulphate additions to drinking water were investigated in humans (Araya et al, 2001 and 2003) and a NOAEL of 4mg Cu/L was derived. At higher doses (6 to 8 mg Cu as $CuSO_4$/L, administered as a bolus on an empty stomach) nausea was the most frequently reported symptom (10% at 6 mg/L and 18% at 8 mg/L) and generally occurred within 15 minutes of administration. Other gastrointestinal symptoms (vomiting, diarrhoea and abdominal pain) were reported less frequently and abdominal pain showed no relationship to concentration.

Acute toxicity inhalation: copper massive has a particle size >10 μm and down-stream uses do not lead to particles with d_{50} <10μm. Therefore, according to Regulations (EC) No 1272 and 67/548/EEC, these do not meet the criteria for classification as harmful by inhalation.

INHALATION: Available acute inhalation toxicity data on coated copper flakes (Wesson, 2001) and copper oxychloride (W esson, 2003) demonstrate that these soluble materials need to be classified as “harmful by inhalation” (LD_{50} rats 1-5 g/m3 air). The inhalation toxicity was characterized by local damage at the site of predominant deposition of particles (effect on respiratory tract and in lungs).

Copper massive has a particle size >10 μm and down-stream uses do not lead to particles with d_{50} <10μm. Therefore, according to Regulations (EC) No 1272 and 67/548/EEC, these do not meet the criteria for classification as harmful by inhalation.

DERMAL: Consideration of available acute dermal toxicity data on copper (coated copper flakes (Sanders, 2001b)) and copper compounds (copper sulphate (Lheritier, 1993) and copper oxide (Sanders, 2002b)) (LD50>2000 mg/kg body weight) against EU classification criteria, according to Regulations (EC) No 1272/2008 and 67/548/EEC, leads to the conclusion that copper nor any of the tested copper compounds require classification for acute lethal effects after dermal exposure.

The classification criteria, for very fine and soluble “copper” bearing substances, according to the regulations (EC) No 1272/2008 and 67/548/EEC on acute toxicity, lead to a classification as “harmful if swallowed and if inhaled”.

The classification criteria, for copper in massive form and copper powder, according to Regulations (EC) No 1272/2008 and 67/548/EEC on acute toxicity, are therefore not met.

Silver

Toxic concentrations and doses:

- LD_{50} (rat):> 2 000 mg / kg body weight (silver);
- LD_{50} (rat, oral): 3702 mg / kg body weight (Ag2O);
- LC_{50} (rat, inhalation): no data;
- LD_{50} (rat skin): no data.

Zinc

Ingestion:

Harmful. May cause gastrointestinal tract irritation with nausea, vomiting, diarrhea, loss of appetite, abdominal pain, fever and chills. May affect central and autonomic nervous system, with ataxia, drowsiness impaired motor coordination, dizziness, irritation, aching muscles. Can cause changes in the blood.

Inhalation:

Exposure to zinc dust or fumes may cause respiratory irritation. Exposure to inhalation of zinc fumes may cause the so-called foundry fever with a sweet taste in the mouth, fever chills, headache, weakness, excessive sweating, strong thirst, leg pain, and chest, breathing problems and vomiting.

Skin corrosion/irritation

Tin

Not irritating (rabbit) – OECD 404.

Antimony

Based on available data, the classification criteria as skin irritant are not met for antimony trioxide. Antimony trioxide is not a corrosive agent.
Based on read-across from ATO, antimony is not a skin irritant.
Based on read-across from ATO, antimony is not corrosive to skin.

Copper

Animal data (coated copper flakes (Sanders, 2001c) and CuO (Sanders, 2002c)) have demonstrated that, according to Regulation (EC) No 1272 and Directive 67/548/EEC, “copper” is not a skin irritant.

Silver

Direct contact may cause mild local skin irritation.

Zinc

The substance is not classified as hazardous in this class.
May cause skin irritation. After prolonged exposure, may cause dermatitis.

Serious eye damage/irritation

Tin

Not irritating (rabbit) – OECD 405.

Antimony

Based on available data, the classification criteria for eye irritation are not met for antimony trioxide (Leuschner, 2005). Based on read-across from ATO, antimony is not irritating to eyes.

Copper

Animal studies with coated copper flakes (Sanders 2001d) and CuO (Sanders, 2002d) induced slight reversible eye irritation effects. Following the criteria, according to the Regulations (EC) No 1272 and 67/548/EEC, the coated copper flakes and CuO are not considered as an eye irritant.

Silver

Direct contact may cause mild local eye irritation.

Zinc

May cause irritation on exposure to fumes and dust.

Sensitisation

There is no evidence that tin, antimony or zinc cause respiratory or skin sensitisation.

Copper

Animal data (coated copper flakes (Sanders 2001e) and CuO (Sanders 2002e)) have demonstrated that, according to Regulations (EC) No 1272/2008 and 67/548/EEC, “copper” is not a skin sensitizer.

Silver

There have been a few cases of allergic skin inflammation on contact with powdered silver, silver solutions or dental amalgams.

Carcinogenicity

Tin

Not carcoinogenic. Both the Ames test and in vitro chromosome aberration test (CHO cells) are negative.

	Antimony Based on available data, the classification criteria according to regulation (EC) 1272/2008 as carcinogen are not met for antimony metal. However, as a consequence of the read across from ATO to antimony metal, antimony metal powder (and only the powder as ATO is an inhalation carcinogen) requires the same inhalation carcinogenicity classification (inhalation carcinogen cat 2). NOAEC: 0.51 mg/m³ / Target organ: respiratory: lung. **Copper** All available studies on the carcinogenicity of copper are public domain studies but study qualities are limited due to shorter exposure periods (<2 years) and small group sizes (Carlton et al., 1973; Burki and Okita, 1969 and Harrison et al., 1954). However, using these studies in a weight of evidence approach, it was concluded that copper compounds do not raise concerns with respect to carcinogenic activity. **Zinc** The substance is not classified as hazardous in this class.
Mutagenicity	**Tin** Ames test: Not mutagenic – OECD 471. In vitro mammalian cytogenicity: Not mutagenic – OECD 473. In vitro gene mutation in mammalian cells: Not mutagenic – OECD 476. **Antimony** ATO does not cause systemic mutagenicity in vivo after oral administration. Negative in vivo results on chromosome aberrations and micronuclei were obtained in two different species via oral application – mouse (Elliot et al., 1998) and rat (W hitwell, 2006), (Kirkland et al., 2007). An in vivo UDS assay in rats was also negative (Elliot et al., 1998). Based on available data, the classification criteria according to regulation (EC) 1272/2008 as germ cell mutagen are not met. Based on read-across from ATO, antimony is not expected to be a germ cell mutagen. **Copper** Public domain data indicate that copper sulphate is negative in vitro in bacterial cell reverse mutation assays, and in several other bacterial cell assays up to and including cytotoxic doses (1000-~3000 µg/plate). Similar negative findings have also been reported for copper chloride. Results from in vitro mammalian cell tests show that copper sulphate is genotoxic only at high, cytotoxic concentrations (up to 250 mg/L). Two in vivo genotoxicity studies performed on a soluble copper compound (copper sulphate), in accordance to respectively OECD 486 and EU B.12 were negative (Ward, 1994 and Riley, 1994). The classification criteria for copper in massive form and copper powder, according to Regulation (EC) No 1272/2008 and Directive 67/548/EEC on germ cell mutagen are therefore not met. **Zinc** The substance is not classified as hazardous in this class.
Toxicity for reproduction	**Tin** For tin, both the Ames test and in vitro chromosome aberration test (CHO cells) are negative. **Antimony** Based on the available long-term toxicity studies in rodents (Omura et al, 2002) and the relevant information on the toxicokinetic behaviour in rats, it is concluded that the classification criteria for reproductive toxicity are not met because of the lack of absorption and systemic distribution, and a correspondingly negligible exposure of reproductive organs in male and female mammalian species to ATO. For the reasons presented above, no classification for reproductive toxicity is required.

The reference Schroeder R.E. (2003) was identified as key study for developmental toxicity and will be used for classification and labelling. This study suggests that the NOAEC for developmental toxicity is >6.3 mg ATO/m³. Thus, based on available data, the classification criteria as developmental toxicant according to regulation (EC) 1272/2008 are not met for ATO. Based on read-across from ATO, antimony is not expected to be toxic for reproduction.

Copper

A high quality study (Mylchreest, 2005) indicates that the NOAEL for reproductive toxicity of a soluble copper compound (copper sulphate pent hydrate) in rats is > 1500 mg/kg food or >24 mg Cu/kg bw/d, the highest dose tested. At the highest dose, slight non-reproductive toxicity effects (transient effect on spleen weight) were observed.

The classification criteria for copper in massive form and copper powder, according to Regulation (EC) No 1272/2008 and Directive 67/548/EEC on reproductive toxicity are therefore not met.

Zinc

The substance is not classified as hazardous in this class.

STOT-single exposure

Tin

No effects.

Antimony

Based on available data, the classification criteria as STOT-single exposure, oral and inhalation are not met for antimony trioxide since no reversible or irreversible adverse health effects were observed immediately or delayed after exposure. Based on read-across from ATO, antimony does not require classification as STOT-single exposure, oral and inhalation

Copper

The effects following acute toxicity (oral and inhalation – see above) have been used for the classification as harmful. The local oral and inhalation effects resulted in mortality.

The classification criteria, for copper in massive form and copper powder, according to Regulations (EC) No 1272/2008 and 67/548/EEC on STOT- SE are not met.

Silver

Inhalation of silver smoke and dust may irritate mucous membranes and upper respiratory tract. Exposure to high concentration of smoke/dust may damage the lungs and cause pneumothorax.

Ingesting silver compounds may irritate the stomach.

STOT-repeated exposure

Tin

Repeated dose toxicity (oral gavage) NOEL >1000 mg/kg/day (rat). 28 day subacute study – OECD 407.

Antimony

NOAECinhalation = 0.51 mg/m³ (Newton et al, 1994)
NOAELoral = 1686 mg/kg/d (Hext et al, 1999)

The NOAEC was determined in a study with a high background incidence of lung inflammation in controls, therefore there is considerable uncertainty regarding the reliability of this numerical value. The NOAEC is based on impaired lung clearance that was observed at 4.50 mg/m³.

Based on available data, the classification criteria as STOT-repeated exposure, oral are not met for antimony trioxide since no reversible or irreversible adverse health effects were observed immediately or delayed after exposure (NOAEL is above the guidance value). Based on read- across from ATO, antimony does not require classification as STOT-repeated exposure, oral.

Based on available data, the classification criteria as STOT-repeated exposure, inhalation are not met for antimony trioxide since there is an absence of consistent identifiable toxic effects other than the non-specific PSP overload, which is an adaptive response not triggering a STOT classification. Based on read-across from ATO, antimony does not require classification as STOT-repeated exposure, inhalation

Copper

NOAELoral rat = 16mg Cu /kg body weight/day (Hebert C.D., 1993). Following repeated administration of $CuSO_4$ in the feed for 13 weeks produced effects in the forestomach, liver and kidney. Inflammation of the liver occurred in male and female animals at 260 mg $CuSO_4$/kgBW /day and above. The incidence and severity of the effects were dose-dependent. This study was used in the subsequent calculation of an oral and systemic DNEL (including a Safety factor of 100 and an oral absorption of 25%) of 0.041mg Cu/kg body weight/day.

The classification criteria, for copper in massive form and copper powder, according to Regulations (EC) No 1272/2008 on Specific Target Organ Toxicity are therefore not met.

Silver

Prolonged exposure to silver smoke/dust may cause blue or grey discolouration on eyes, nose, lips, throat and skin. This occurs over time and it may take several years before such discolouration occurs. It is irreversible.

Aspiration hazard The product is a solid and aspiration hazards are not expected to occur.

SECTION 12: Ecological Information

For copper, most of the available hazard data are related to exposure of soluble copper compounds (e.g. copper sulphate). For the hazard profile of copper massive forms (assessed from a sphere of 1mm diameter), information on solubility and bioavailability are combined with the hazard profile of soluble copper compounds in a read-across approach to assess its potential hazards.

12.1. Toxicity

12.1.1 Tin

Short term toxicity to fish 96 h LC50: >12.4µg/L (NOEC 12.4µg/L) Pimephales promelas (total tin from aged solutions of tin) – OECD 203.

Long term toxicity to aquatic invertebrates 7 days: LC50 (mortality) >3200µg/L, EC50 (reproduction) 1303µg/L (total tin from aged tin solutions) – Daphnia magna – EPA 1002.0.

Toxicity to algae EC50 (72 h): >19.2µg/L (total tin from aged tin solutions) - Pseudokirchnerella subcapitata – OECD 201.

12.1.2 Antimony

Antimony metal and antimony containing compounds will dissolve and generate antimony ions (Vangheluwe et al., 2001). The environmental section will therefore discuss the fate of antimony in general.

Acute aquatic toxicity test results:		
Marine fish [Pagrus major]	96 h LC_{50}	6.9 mg Sb/L (Takayanagi, 2001)
Freshwater fish [Pimephales promelas]	96 h LC_{50}	14.4 mg Sb/L (Brooke et al, 1986)
Invertebrates [Chlorohydra viridissima]	96 h LC_{50}	1.77 mg Sb/L (TAI, 1990)
Algae [Pseudokirchneriella subcapitata]	72 h ErC_{50} (growth rate)	> 36.6 mg Sb/L (Heijerick et al, 2004)
Plants [Lemna minor]	4 d EC_{50}	> 25.5 mg Sb/L (Brooke et al, 1986)

Chronic aquatic toxicity test results:		
Fish [Pimephales promelas]	28 d NOEC/LOEC (growth; length)	1.13/2.31 mg Sb/L (Kimball, 1978)
Invertebrates [Daphnia magna]	21 d NOEC/LOEC (reproduction)	1.74/3.13 mg Sb/L (Heijerick et al, 2003)
Algae [Pseudokirchneriella subcapitata]	72 h NOEC/LOEC (growth rate)	2.11/4.00 mg Sb/L (Heijerick et al, 2004)
Chronic sediment toxicity test results:		
Midge [Chironomus riparius]	14-d NOEC (growth)	78 mg Sb/kg ww (Heijerick et al, 2005)
Chronic terrestrial toxicity test results (values were determined in a soil spiked with Sb_2O_3 and aged for 31 weeks before testing):		
Soil invertebrates	NOEC	999 mg Sb/kg dw (Moser, 2007)
Plants	NOEC	999 mg Sb/kg dw (Smolders et al., 2007)
Soil microorganisms	NOEC	2930 mg Sb/kg dw (Smolders et al., 2007)
Toxicity tests for microorganisms (for STP):		
Aquatic microorganisms	NOEC	2.55 mg Sb/L (EPAS, 2005)
Inhibition of nitrification	NOEC	27 mg Sb/L (EPAS, 2005)

12.1.3 Copper

Environmental bioavailability: In accordance to the CLP guidance (2009), the environmental bio-availability of a copper massive form (1 mm sphere) in freshwater environments was assessed from transformation/dissolution tests (OECD 29). The data demonstrate higher release at lower pH. The data also demonstrate a linear relationship between the releases and the exposed surface area. The non-abrasive release of dissolved copper ions to the aqueous transformation/dissolution medium (7 days, 100 mg/L loading, pH6), was 6.7µg Cu/L corresponding to a surface–specific release of 0.15µg Cu/mm^2 (Rodriguez et al., 2007).

Acute aquatic toxicity test results and environmental classification: The acute toxicity of soluble copper ions was assessed from studies on soluble copper compounds. From a literature search 451 high quality $L(E)C_{50}$ values were retained. For the algae 66 individual data points were selected for 3 standard species (Pseudokirchnerella subcapitata, Chamydomonas reinhardtii and Chlorella vulgaris). For the invertebrates 123 individual data points were selected for 2 standard species(Ceriodaphnia dubia and Daphnia magna) and for the fish 262 individual data points were selected for 5 standard species (Oncorhynchus mykiss, Pimephales promelas, Lepomis macrochirus, Brachydanio rerio and Cyprinus carpio). The data were treated and summarized in accordance with the CLP guidance (2009) to derive the pH dependent acute reference value. The lowest species-specific geometric mean $L(E)C_{50}$ reference was obtained for an invertebrate (Ceriodaphnia dubia) at pH 5.5-6.5 with an acute $L(E)C_{50}$ of 25.0µg Cu/L (Van Sprang et al., 2010).

To assess the environmental classification of copper in massive form, the copper release from the 7 days transformation/ dissolution data of copper in massive forms (6.7µg Cu/L at 100mg/L, pH6) was combined with the acute reference value for the copper ions (25µg Cu/L) (Van Sprang et al., 2010).

The assessment demonstrates that, according to Regulations (EC) No 1272/2008 and 67/548/EEC, copper massive forms do not need to be classified for acute environmental hazards.

In accordance with the EU CLP guidelines (2009), chronic classification applies if the substance is persistent or bio-accumulative. For "copper" it has been be demonstrated that the bio-available copper-ions are rapidly removed from the water column (Rader, 2010) – see also section 12.2. Copper is an essential nutrient, copper concentrations are very strongly regulated and copper is not bio-magnified across the food-web – see also section 12.3. The "bio-accumulation" criteria therefore do not apply the "copper".

Based on the assessment (see section 12.2 and 12.3), according to Regulations (EC) No 1272/2008 and 67/548/EEC, Copper massive does not meet the classification for chronic aquatic toxicity.

Chronic freshwater toxicity test results and PNEC derivation: The chronic toxicity of soluble copper ions was assessed from studies on soluble copper compounds. 139 individual NOEC/EC10 values resulting in 27 different species-specific soluble Cu-ions NOEC values, covering different trophic levels (fish, invertebrates and algae) were used for the PNEC derivation. The large intra-species variability in the reported single species NOECs was related to the influence of test media characteristics (e.g., pH, dissolved organic carbon (DOC), hardness) on the bioavailability and thus toxicity of copper. Species-specific NOECs were therefore calculated after normalizing the NOECs towards a series of realistic environmental conditions in Europe (typical EU scenarios, with well-defined pH, hardness and DOC). Such normalization was done by using chronic copper bioavailability models (Biotic Ligand Models), developed and validated for three taxonomic groups (fish, invertebrates and algae) and additional demonstration of the applicability of the models to a range of other species. The species-specific BLM-normalized NOECs were used for the derivation of log- normal Species Sensitivity Distributions (SSD) and HC5 values (the median fifth percentile of the SSD), using statistical extrapolation methods to derive a PNEC. The data allow the derivation of PNECs for the typical EU scenario ranging between 7.8 and 22.1µg dissolved Cu/L. Additional BLM scenario calculations for a wide range of surface waters across Europe further demonstrated that the HC5 of 7.8 µg dissolved Cu/L, is protective for 90% of the EU surface waters and can thus be considered as a reasonable worst case for Europe in a generic context.

Copper threshold values were also derived for three high quality mesocosm studies, representing lentic and lotic systems. The mesocosm studies included the assessment of direct and indirect effects to large variety of taxonomic group and integrate potential effects from uptake from water as well as from food. The results confirm the BLM normalized single species threshold values.

Conclusion: a value of 7.8µg dissolved Cu/L is the default chronic freshwater PNEC, to be used to assess local risks. The assessment can be refined if information on local water chemistry (dissolved organic carbon, pH, calcium, magnesium, sodium and alkalinity) is available.

Chronic marine waters toxicity test results and PNEC derivation: The chronic toxicity of soluble copper ions was assessed from studies on soluble copper compounds. 51 high-quality chronic NOEC/EC10 values, resulting in 24 different species-specific soluble Cu-ions NOEC values covering different trophic levels (fish, invertebrates, algae), were retained for the PNEC derivation. NOEC values were related to the Dissolved Organic Carbon (DOC) concentrations of the marine test media. Species-specific NOECs were therefore calculated after DOC normalizing of the NOECs. These species-specific NOECs were used for the derivation of species sensitivity distributions (SSD) and HC5 values, using statistical extrapolation methods. The organic carbon normalisation was carried out at a DOC level typical for coastal areas (2mg/L) and resulted in an HC5 value of 5.2µg Cu/L.

A Copper threshold value was also recently derived from a high quality marine mesocosm study (Foekema et al., 2010). The mesocosm studies included the assessment of direct and indirect effects to large variety of taxonomic group and integrate potential effects from uptake from water as well as from food. The results confirm the DOC normalized single species threshold values.

Conclusion: a value of 5.2µg dissolved Cu/L is the default chronic marine water PNEC, to be used to assess local risks. The assessment can be refined if the dissolved organic carbon concentration of the local environment is available.

Chronic freshwater sediment toxicity test results and PNEC derivation: The sediment PNEC included using a weight of evidence approach considering different sources and tiered approaches of information: (1) sediment ecotoxicity data from spiking sediments with soluble copper compound, (2) pelagic ecotoxicity data in combination with water-sediment partitioning coefficients (Kd values) derived through different approaches and (3) mesocosm/field ecotoxicity.

High-quality chronic benthic NOECs for six benthic species, representing 62 NOEC values were retained for the PNEC derivation. NOEC values were related to sediment characteristics (e.g., Organic Carbon (OC) and Acid Volatile Sulphides (AVS)), influencing the bioavailability and thus toxicity of copper to benthic organisms. The derivation of the freshwater HC5 sediment for copper was therefore based on the OC-normalized dataset, containing only low-AVS sediments.

An HC-5 of 1741mg Cu/kg OC, corresponding to 87 mg Cu/kg dry weight for a sediment with 5% O.C. (TGD default value) is used.

Conclusion: a value of 87 mg Cu/kg dry weight is the default chronic freshwater sediment PNEC, to be used to assess local risks. The assessment can be refined if the organic carbon concentration and the Acid Volatile Sulphide concentrations of the local sediment is available.

Chronic terrestrial toxicity test results and PNEC derivation: Chronic terrestrial toxicity is derived from spiking of soils with soluble copper compounds. A high-quality dataset of 252 individual chronic NOEC/EC10 values from 28 different species and processes representing different trophic levels (i.e., decomposers, primary producers, primary consumers) has been retained for the PNEC derivation. The observed intra-species differences in toxicity data were related to differences in bioavailability: the latter related to differences in soil properties and to differences in ageing and application mode and rate.

The soil property best explaining the variability in toxicity for most of the endpoints was the eCEC (effective Cation Exchange Capacity). To account for the observed difference between lab-spiked soils and field- contaminated soils, a conservative leaching-ageing factor of 2 was agreed based on test data from the mechanistic research on ageing and ionic strength (leaching) effects. For the normalisation of the ecotoxicity data, first the leaching-ageing factor was applied on all added NOEC/EC10 values. These adjusted values, after addition of the respective Cu background concentrations, were subsequently normalised to a wide range of EU soils using the relevant regression (bio)availability models, generating soil-type specific HC_5 values and a derivation of the PNEC. Species Sensitivity Distributions were constructed using the normalised NOEC/EC10 data. HC5 values from log-normal distributions ranging between 65.5 and 150mg Cu/kg dry weight were obtained (Oorts et al., 2010).

A total of eight single species studies were available in which the toxicity of Cu to micro-organisms, invertebrates and plants in field-contaminated aged soils was investigated for a wide range of European soil types (peaty, sandy, clay). A total of five multi-species studies were available, three of which studied the effects of copper in freshly spiked soils and two in field contaminated aged soils. Invertebrates, plants and micro-organisms were studied. Single-species and multi-species field studies indicate that effects did not occur at an exposure level at the HC5 value. See Copper Risk assessment Report

Conclusion: a value of 65.5mg Cu/kg dry weight is the default chronic soil PNEC, to be used to assess local risks. The assessment can be refined if the pH and Cation Exchange Capacity of the local soil is available.

12.1.4 Silver

Based on available data, the classification criteria regarding toxicity of silver to the environment are not met. Data on acute and chronic toxicity of silver ions in the aquatic environment are available for a wide range of freshwater and saltwater species. In most studies, the toxicity of silver ions as the test material was used very well soluble in water, silver nitrate.

Fish:

Acute toxicity:

LC_{50} (96h), Pimephales promelas: 1.2g Ag/L LC_{50}

(96h), Oncorhynchus mykiss: 1.48mg Ag/L LC_{50}

(96h), Salmo gairdneri: 6.5g Ag/L (soft water)

LC_{50} (96h), Salmo gairdneri: 13mg Ag/L (hard water)

Chronic toxicity:

EC_{10} (217d), Salmo trutta: 0.19mg Ag/L

EC_{10} (217d), Salmo trutta: 1.23mg Ag/ L

EC_{10} (196d), Oncorhynchus mykiss: 0.17mg Ag/L

NOEC (32d), Pimephales promelas: 0.351mg Ag/L (stunting)

EC_{10} (32d), Pimephales promelas: 0.39mg Ag/L (stunting)

EC_{10} (32d), Pimephales promelas: 0.44mg Ag/L (mortality)

Crustaceans:

Acute toxicity

LC_{50} (48 h), Daphnia magna: 0.22mg Ag/L

LC_{50} (48 h), Ceriodaphnia dubia: 0.76mg Ag/L

Chronic Toxicity

EC_{10} (7d), Ceriodaphnia dubia: 2.48mg Ag/L (for reproduction)

EC_{10} (21d), Daphnia magna: 2.14mg Ag/L (stunting)

NOEC (7d), Ceriodaphnia reticulata: 1mg Ag/L (for reproduction)

Algae:

Acute toxicity:

EC_{10} (24h), Chlamydomonas reinhardtii: 0.54mg Ag/L (growth inhibition) EC_{10}

(24h), Pseudokirchneriella subcapitata: 0.41mg Ag/L (growth inhibition)

Chronic Toxicity
NOEC (14 d), Champi parvula: 1.2gAg/L
Predicted concentrations of silver do not cause changes in the environment:
PNEC (surface water): 0.04mg/ L
PNEC (sea water): 0.86mg/L
PNEC (sediment surface): 1.2mg/kg of sludge (dry weight)
PNEC (marine sediments): 1.2mg/kg of sludge (dry weight)

12.1.5 Zinc
Acute toxicity to aquatic environment
The effect on freshwater organisms depends on pH:
For water with low pH: 0.413 mg Zn/L (based on the lowest value for Ceriodaphnia dubia);
For water and a neutral / high pH: 0.136 mg Zn/L (based on the lowest value for Selenastrum capricornutum). See also Section 8.
Chronic toxicity to aquatic environment
The effect on freshwater organisms depends on pH:
For water at pH 8.0: 19 mg Zn/L (based on data for Pseudokircherniella subcapitata)
For water at pH 6.0, 82 mg Zn/L (based on data for Daphnia magna).

12.2. Persistence and degradability

12.2.1 Tin
Not applicable.

12.2.2 Antimony
Antimony cannot be degraded, but may be transformed between different phases, chemical species, and oxidation states. Antimony is therefore considered to be persistent (P) and very persistent (vP) like any other metal.

12.2.3 Copper
"Copper" cannot be degraded, but may be transformed between different phases, chemical species, and oxidation states.
In accordance with the EU 2009 CLP guidance, the fate of the copper ion under "environmentally relevant" conditions was modelled, using the Ticket Unit World Model. Rapid removal from the water column was also assessed using data from one mesocosm and three field studies (Rader et al., 2010). The assessment demonstrated the rapid removal of copper-ions, delivered as soluble copper compounds, from the water column under "normal environmental conditions". Rapid removal of a substance from the water column is defined as 70% removal within 28 days. Literature data demonstrates the strong binding of copper-ions to sediment materials and especially the anaerobic CuS complexes are very stable (Simpson et al., 1998; Sundelin and Erickson, 2001). The remobilisation of Cu-ions to the water column is therefore not expected. The assessment therefore demonstrates that "copper" does not meet the criterion as "persistent".

12.2.4 Silver
Silver is a persistent substance.

12.2.5 Zinc
Not applicable.

12.3. Bioaccumulative potential
12.3.1 Tin
The potential for bioaccumulation of tin is low.

12.3.2 Antimony

Bioaccumulation of antimony by both aquatic and terrestrial organisms is low. A BCF of 40 has been determined for aquatic organisms and a BSAF of 1 for earthworms. Therefore, antimony is not considered bioaccumulative (B) or very bioaccumulative (vB) based on the definitive criteria.

12.3.3 Copper

The Guidance states the following on Bioaccumulation: "Metals that are essential nutrients are actively regulated: removal and sequestration processes that minimise toxicity are complemented by an ability to up- regulate concentrations for essentiality. As a result, the "bioaccumulative" criterion is not applicable to these metals".

12.3.4 Silver

According to the Chemical Safety Report for silver, there are several studies on various organisms. To develop a safety assessment for silver account was taken of the study carried out on carps (Cyprinus carpio), in which fish were exposed to 0.2mg Ag/L for 30 days. The bioconcentration factor (BCF) or coefficient of concentration in the body in relation to its concentration in the ambient aquatic environment for carp was 70.

The value of BCF in fish ≥ 500 indicates a capacity for bioconcentration.

12.3.5 Zinc

Because of the homeostatic mechanisms of absorption and excretion, it is estimated that zinc does not bioaccumulate.

12.4. Mobility in soil

12.4.1 Tin

Log Kd: 2.1 - 4.3L/kg.

12.4.2 Antimony

For antimony, a log Kp of 2.07 has been determined for soil.

12.4.3 Copper

Copper ions bind strongly to the soil matrix. The binding depends on the soil properties. A median water-soil partitioning coefficient (Kp) of 2120L/kg has been derived for soils (more details see Copper Risk Assessment Report, 2008 and Copper Chemical Safety Report, 2010).

12.4.4 Silver

Silver ions react in the soil with $CO3^{2-}$, S^{2-}, $SO3^{2-}$ and Cl^{-} to form extremely sparingly soluble compounds, which therefore remain in the upper layer of soil.

12.4.5 Zinc

No data available.

12.5. Results of PBT and vPvB assessment

The PBT and vPvB criteria of Annex XIII to the Regulation do not apply to inorganic substances.

12.6. Other adverse effects

Silver is one of the most toxic metals for bacteria.

SECTION 13: Disposal Considerations

13.1. Waste treatment methods

Whatever cannot be saved for recovery or recycling should be disposed of according to national legislation complying with the European Waste Directive 2008/98/EC. Do not allow waste to reach drains, ground water, soil or sewage system. Do not send to landfill.

SECTION 14: Transport information

14.1	**UN Number:**	Not classified as dangerous goods.
14.2	**UN Proper shipping name:**	Not classified as dangerous goods.
14.3	**Transport hazard class(es):**	Not classified as dangerous goods.
14.4	**Packing group:**	Not classified as dangerous goods.
14.5	**Environmental hazards:**	Not classified as dangerous goods.
14.6	**Special precautions for user:**	None.
14.7	**Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code:**	Not transported in bulk.

SECTION 15: Regulatory Information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

The components of this product are not subject to authorisation or restriction.

15.2. Chemical Safety Assessment

Chemical safety assessments have been carried out for the components of this product.

SECTION 16: Other Information

Revision information

Changes from the previous major revision are indicated by a vertical line at the left margin.

Exposure Scenarios

The following Exposure Scenarios are provided in the annex to this safety data sheet:

Exposure Scenario Sb No. 7:	Professional use of antimony metal mixtures (including solder, explosives)
Exposure Scenario Ag No. 2:	Use of silver metal in re-melting and alloying.
Exposure Scenario Ag No. 4: Ag No. 7:	Use of silver metal in electronics, contact materials and electroplating. Exposure Scenario Professional uses of silver metal, silver alloys or silver containing articles.

List of Abbreviations

APF	Assigned Protection Factor	
ATO	Antimony Trioxide	
AVS	Acid volatile sulphides BCF Bioconcentration factor BLM	Biotic ligand model
BSAF	Biota-Sediment Accumulation Factor	
bw	Body weight	
B wt	Body weight	
CAS No.	Chemical Abstract Service registry number	
CLP	Classification Labelling and Packaging Regulation EC 1272/2008	

d_{50}	Median diameter
DMEL	Derived Minimal Effect Level
DNEL	Derived No-Effect Level
DOC	Dissolved Organic Carbon
DU	Downstream User
dwt	Dry weight
EC No.	European Community number
EC_{10}	Concentration giving 10% of maximal response
EC_{50}	Concentration giving half maximal response
ECB	European Chemicals Bureau
EUSES	European Union System for the Evaluation of Substance
HC_5	5th percentile of the SSD (Species Sensitivity Distribution)
IBC Code	International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk
Kd	Sorption coefficient
Kp	Sorption coefficient
LC_{50}	Lethal concentration to 50% of the test organisms
LD_{50}	Lethal dose to 50% of the test organisms
LOEC	Lowest observed effect concentratio
MARPOL 73/78	International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978
MEASE	Model for Estimation and Assessment of Substance Exposure
NOAEC	No Observed Adverse Effect Concentration
NOAEL	No Observed Adverse Effect Level
NOEC	No Observed Effect Concentration
NOEL	No Observed Effect Level
PBT	Persistent, bioaccumulative and toxic
PNEC	Predicted No-Effect Level
PPE	Personal Protection Equipment
PSP	Postsynaptic Potential
RCR	Risk Characterisation Ratio
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation EC 1907/2006
RPE	Respiratory Protective Equipment
SDS	Safety Data Sheet
STEL	Short Term Exposure Limit
STOT	Specific Target Organ Toxicity
STP	Sewage Treatment Plant
TDL_0	Lowest dose with toxic effect
TGD	Technical Guidance Document
TWA	Time W eighted Average
VLCT	Valeur Limite Courte Terme
VLE	Valeur Limite d’Exposition
VME	Valeur Moyenne d’Exposition
vPvB	Very Persistent Very Bio-accumulative
wwt	Wet weight

Method of evaluation

This product has not been tested. Data for the components of this product are conclusive and insufficient for classification. Based on available data, the classification criteria are not met

Classification according to CLP Regulation

Classification Labelling and Packaging Regulation (EC) 1272/2008 - Not classified as hazardous.

Part Number
GMC307