SAFETY DATA SHEET

Based upon Regulation (EC) No 1907/2006, as amended by Regulation (EU) No 2020/878

zinc nickel bismuth alloys for hot dip galvanizing

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product name : zinc nickel bismuth alloys for hot dip galvanizing
Synonyms : Technigalva; Technigalva plus; zinc bismuth alloy; zinc nickel alloy; zinc nickel bismuth alloys; ZnBi; ZnNi; ZnNiBi
Registration number REACH : Not applicable (mixture)
Product type REACH : Mixture/alloy

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

1.2.1 Relevant identified uses

Metal industry: hot dip galvanizing

1.2.2 Uses advised against

No uses advised against known

1.3. Details of the supplier of the safety data sheet

Supplier of the safety data sheet

Nyrstar Belgium N.V. on behalf of Nyrstar Sales & Marketing A.G.
Zinkstraat 1
B-2490 Balen
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Rue Jean Jacques Rousseau
F-59950 Auby
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infoSDS@nyrstar.com

Manufacturer of the product

Nyrstar Sales & Marketing SA
1 Rue de Jargonnant
CH-1207 Geneva
infoSDS@nyrstar.com

1.4. Emergency telephone number

24h/24h (Telephone advice: English, French, German, Dutch) :
+32 14 58 45 45 (BIG)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Not classified as dangerous according to the criteria of Regulation (EC) No 1272/2008

2.2. Label elements

Not classified as dangerous according to the criteria of Regulation (EC) No 1272/2008

Supplemental information

EUH208 Contains: nickel. May produce an allergic reaction.

2.3. Other hazards

The criteria of PBT and vPvB as listed in Annex XIII of Regulation (EC) No 1907/2006 do not apply to inorganic substances
The melting down of moist metal leads to explosion risk
Heated product causes burns
Caution! Substance is absorbed through the skin

SECTION 3: Composition/information on ingredients

3.1. Substances

Not applicable

3.2. Mixtures

Name REACH Registration No	CAS No EC No	Conc. (C)	Classification according to CLP	Note	Remark	M-factors and ATE
zinc 01-2119467174-37	7440-66-6 231-175-3	99.5%< C< 99.8%		(2)(10)	Constituent	
bismuth	7440-69-9 231-177-4	0.00% =<C<2.45%			Constituent	
nickel	7440-02-0 231-111-4	0.00% =<C<0.55%	Carc. 2; H351 Skin Sens. 1; H317 STOT RE 1; H372	(1)(2)(10)	Constituent	
tin	7440-31-5 231-141-8	0.0% =<C<0.2 %		(2)(10)	Constituent	

(1) For H- and EUH-statements in full: see section 16
(2) Substance with a Community workplace exposure limit
(10) Subject to restrictions of Annex XVII of Regulation (EC) No. 1907/2006

SECTION 4: First aid measures

4.1. Description of first aid measures

General:
Check the vital functions. Unconscious: maintain adequate airway and respiration. Respiratory arrest: artificial respiration or oxygen. Cardiac arrest: perform resuscitation. Victim conscious with laboured breathing: half-seated. Victim in shock: on his back with legs slightly raised. Vomiting: prevent asphyxia/aspiration pneumonia. Prevent cooling by covering the victim (no warming up). Keep watching the victim. Give psychological aid. Keep the victim calm, avoid physical strain. Depending on the victim's condition: doctor/hospital.

After inhalation:
After inhalation of fume: Remove the victim into fresh air. Respiratory problems: consult a doctor/medical service.

After skin contact:
In case of burns: Wash immediately with lots of water (15 minutes)/shower. Remove clothing while washing. Do not tear off solidified product from the skin. Do not remove clothing if it sticks to the skin. Cover wounds with sterile bandage. Consult a doctor/medical service. If burned surface > 10%: take victim to hospital.

After eye contact:
Rinse immediately with plenty of water for 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Take victim to an ophthalmologist.

After ingestion:
Not applicable.

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

4.2.1 Acute symptoms

After inhalation:
AFTER INHALATION OF DUST: Irritation of the nasal mucous membranes. Dry/sore throat. Coughing. AFTER INHALATION OF FUME: Feeling of weakness. Metal fume fever. Vomiting. Nausea.

After skin contact:
IF MELTING: Burns.

After eye contact:
IF MELTING: Burns.

After ingestion:
Not applicable.

4.2.2 Delayed symptoms
No effects known.

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

If applicable and available it will be listed below.

SECTION 5: Firefighting measures

5.1. Extinguishing media

5.1.1 Suitable extinguishing media:
Small fire: Dry sand, Quick-acting D powder extinguisher.

5.1.2 Unsuitable extinguishing media:
Small fire: Quick-acting CO2 extinguisher, Water, Foam, Quick-acting ABC powder extinguisher, Quick-acting BC powder extinguisher.
Major fire: Water, Foam.

5.2. Special hazards arising from the substance or mixture

On burning: formation of metal oxides (nickel oxides, zinc oxide). In molten state: violent to explosive reaction with water (moisture).

5.3. Advice for firefighters

5.3.1 Instructions:
Dilute toxic gases with water spray. In case of metal bath fire: add metal blocks. When cooling/extinguishing: no water in the substance.

5.3.2 Special protective equipment for fire-fighters:
Gloves (EN 374). Protective clothing (EN 14605 or EN 13034). Heat/fire exposure: self-contained breathing apparatus (EN 136 + EN 137).

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

No naked flames.

6.1.1 Protective equipment for non-emergency personnel
See section 8.2

6.1.2 Protective equipment for emergency responders
Gloves (EN 374). Protective clothing (EN 14605 or EN 13034).

Suitable protective clothing
See section 8.2

6.2. Environmental precautions

No data available

6.3. Methods and material for containment and cleaning up

If melted: allow liquid to solidify before taking it up. Pick-up the material. Wash clothing and equipment after handling.

6.4. Reference to other sections

See section 13.

SECTION 7: Handling and storage

The information in this section is a general description. If applicable and available, exposure scenarios are attached in annex. Always use the relevant exposure scenarios that correspond to your identified use.

7.1. Precautions for safe handling

Avoid raising dust. Keep away from naked flames/heat. Observe strict hygiene. On (re)melting down: dry and preheat installation before use. Add only dry material to the metal bath.

7.2. Conditions for safe storage, including any incompatibilities

7.2.1 Safe storage requirements:
Storage temperature: Temperature above dew point. Store in a dry area. Store at ambient temperature. Meet the legal requirements.

7.2.2 Keep away from:
Heat sources, (strong) acids.

7.2.3 Suitable packaging material:
No data available

7.2.4 Non suitable packaging material:
No data available

7.3. Specific end use(s)

If applicable and available, exposure scenarios are attached in annex. See information supplied by the manufacturer.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

8.1.1 Occupational exposure

a) Occupational exposure limit values

If limit values are applicable and available these will be listed below.

EU

Nickel compounds *shall apply from 2025-01-18*	Time-weighted average exposure limit 8 h (Limit value for occupational exposure)	0.01 mg/m³ (2)
	Time-weighted average exposure limit 8 h (Limit value for occupational exposure)	0.05 mg/m³ (1)
Nickel compounds *shall apply until 2025-01-17*	Time-weighted average exposure limit 8 h (Limit value for occupational exposure)	0.1 mg/m³ (1)
Tin (inorganic compounds as Sn)	Time-weighted average exposure limit 8 h (Indicative occupational exposure limit value)	2 mg/m³

(2): Respirable fraction
(1): Inhalable fraction

Belgium

Etain (métal)	Time-weighted average exposure limit 8 h	2 mg/m³
Nickel (composés insolubles inorganiques) (en Ni)	Time-weighted average exposure limit 8 h	0.2 mg/m³
Nickel (métal)	Time-weighted average exposure limit 8 h	1 mg/m³
Zinc (oxyde de) (fraction alvéolaire)	Time-weighted average exposure limit 8 h	2 mg/m³
	Short time value	10 mg/m³

The Netherlands

Tin (anorganische verbindingen als Sn)	Time-weighted average exposure limit 8 h (Public occupational exposure limit value)	0.41 ppm
	Time-weighted average exposure limit 8 h (Public occupational exposure limit value)	2 mg/m³

France

Nickel (métal)	Time-weighted average exposure limit 8 h (VL: Valeur non réglementaire indicative)	1 mg/m³
Nickel (oxyde de), en Ni	Time-weighted average exposure limit 8 h (VL: Valeur non réglementaire indicative)	1 mg/m³
Zinc (oxyde de, fumées)	Time-weighted average exposure limit 8 h (VL: Valeur non réglementaire indicative)	5 mg/m³
Zinc (oxyde de, poussières)	Time-weighted average exposure limit 8 h (VL: Valeur non réglementaire indicative)	10 mg/m³

Germany

Nickelmetall	Time-weighted average exposure limit 8 h (TRGS 900)	0.006 mg/m³

Austria

Nickel (Stäube von Nickelmetall, Nickelsulfid und sulfidischen Erzen, Nickeloxide, Nickelchromat und Nickel- carbonat) und Stäube von Nickelverbindungen und Nickellegierungen	Tagesmittelwert (TRK)	0.5 mg/m³
	Kurzzeitwert 15(Miw) 4x (TRK)	2 mg/m³
Zinkoxid-Rauch	Tagesmittelwert (MAK)	5 mg/m³
Zinn	Tagesmittelwert (MAK)	2 mg/m³
	Kurzzeitwert 15(Miw) 4x (MAK)	4 mg/m³

UK

Nickel metal	Time-weighted average exposure limit 8 h (Workplace exposure limit (EH40/2005))	0.5 mg/m³
Nickel, insoluble inorganic compounds (as Ni)(except nickel tetracarbonyl)	Time-weighted average exposure limit 8 h (Workplace exposure limit (EH40/2005))	0.5 mg/m³

USA (TLV-ACGIH)

Nickel and inorganic compounds including Nickel subsulfide, as Ni: Elemental	Time-weighted average exposure limit 8 h (TLV - Adopted Value)	1.5 mg/m³ (I)
Nickel and inorganic compounds including Nickel subsulfide, as Ni: Insoluble inorganic compounds (NOS)	Time-weighted average exposure limit 8 h (TLV - Adopted Value)	0.2 mg/m³ (I)
Tin and inorganic compounds, excluding Tin hydride and Indium tin oxide, as Sn	Time-weighted average exposure limit 8 h (TLV - Adopted Value)	2 mg/m³ (I)
Zinc oxide	Time-weighted average exposure limit 8 h (TLV - Adopted Value)	2 mg/m³ (R)
	Short time value (TLV - Adopted Value)	10 mg/m³ (R)

(I): Inhalable fraction
(R): Respirable fraction

b) National biological limit values

If limit values are applicable and available these will be listed below.

USA (BEI-ACGIH)

Nickel and inorganic compounds; after exposure to elemental Nickel and poorly soluble compounds (Nickel)	Urine: post-shift at end of workweek	5 µg/L	Background
Nickel and inorganic compounds; after exposure to soluble compounds (Nickel)	Urine: post-shift at end of workweek	30 µg/L	

8.1.2 Sampling methods

Product name	Test	Number
Bismuth	OSHA	ID 121
Nickel (Elements on wipes)	NIOSH	9102
Nickel (Elements)	NIOSH	7300
Nickel (Elements, aqua regia ashing)	NIOSH	7301
Nickel (Elements, hot block/HCl/HNO3 digestion)	NIOSH	7303

Product name	Test	Number
Nickel (Ni)	NIOSH	7302
Nickel (Ni)	NIOSH	7304
Nickel (Ni)	NIOSH	7306
Nickel (Ni)	NIOSH	8005
Nickel (Ni)	NIOSH	8200
Nickel (Ni)	NIOSH	8310
Nickel	OSHA	1006
Nickel	OSHA	ID 121
Nickel	OSHA	ID 125G
Tin (Elements)	NIOSH	7300
Tin (Elements, aqua regia ashing)	NIOSH	7301
Tin (Elements, hot block/HCl/HNO3 digestion)	NIOSH	7303
Tin (Sn)	NIOSH	7302
Tin (Sn)	NIOSH	7306
Tin (Sn)	NIOSH	8310
Tin	OSHA	ID 121
Tin	OSHA	ID 206
Zinc & Cpds (as Zn)	NIOSH	7030
Zinc (Elements on wipes)	NIOSH	9102
Zinc (Elements)	NIOSH	7300
Zinc (Elements, aqua regia ashing)	NIOSH	7301
Zinc (Elements, hot block/HCl/HNO3 digestion)	NIOSH	7303
Zinc (Zn)	NIOSH	7306
Zinc (Zn)	NIOSH	8005
Zinc (Zn)	NIOSH	8200
Zinc (Zn)	NIOSH	8310
Zinc Oxide	NIOSH	7030
Zinc Oxide	NIOSH	7502
Zinc Oxide	OSHA	ID 121
Zinc Oxide	OSHA	ID 143
Zinc	NIOSH	7030
Zinc	OSHA	1006
Zinc	OSHA	ID 121
Zinc	OSHA	ID 125G

8.1.3 Applicable limit values when using the substance or mixture as intended

If limit values are applicable and available these will be listed below.

8.1.4 Threshold values

DNEL/DMEL - Workers

bismuth

Effect level (DNEL/DMEL)	Type	Value	Remark
DNEL	Long-term systemic effects inhalation	13.1 mg/m³	

nickel

Effect level (DNEL/DMEL)	Type	Value	Remark
DNEL	Long-term systemic effects inhalation	0.05 mg/m³	
	Long-term local effects inhalation	0.05 mg/m³	
	Acute local effects inhalation	11.9 mg/m³	
	Long-term local effects dermal	0.035 mg/cm²	

tin

Effect level (DNEL/DMEL)	Type	Value	Remark
DNEL	Long-term systemic effects inhalation	71 mg/m³	
	Long-term systemic effects dermal	10 mg/kg bw/day	

DNEL/DMEL - General population

bismuth

Effect level (DNEL/DMEL)	Type	Value	Remark
DNEL	Long-term systemic effects oral	13.3 mg/m³	

nickel

Effect level (DNEL/DMEL)	Type	Value	Remark
DNEL	Long-term systemic effects inhalation	60 ng/m³	
	Long-term local effects inhalation	60 ng/m³	
	Acute local effects inhalation	0.8 mg/m³	
	Long-term local effects dermal	0.035 mg/cm²	
	Long-term systemic effects oral	0.011 mg/kg bw/day	
	Acute systemic effects oral	0.37 mg/kg bw/day	

tin

Effect level (DNEL/DMEL)	Type	Value	Remark
DNEL	Long-term systemic effects inhalation	17 mg/m³	
	Long-term systemic effects dermal	80 mg/kg bw/day	
	Long-term systemic effects oral	5 mg/kg bw/day	

PNEC

zinc

Compartments	Value	Remark
Fresh water	14.4 µg/l	Zinc ion
Marine water	7.2 µg/l	Zinc ion
STP	100 µg/l	Zinc ion
Fresh water sediment	146.9 mg/kg sediment dw	Zinc ion
Marine water sediment	162.2 mg/kg sediment dw	Zinc ion
Soil	83.1 mg/kg soil dw	Zinc ion

bismuth

Compartments	Value	Remark
STP	17.5 mg/l	

nickel

Compartments	Value	Remark
Fresh water	7.1 µg/l	
Marine water	8.6 µg/l	
Fresh water (intermittent releases)	< 0.01 µg/l	
Marine water (intermittent releases)	< 0.01 µg/l	
STP	0.33 mg/l	
Fresh water sediment	109 mg/kg sediment dw	
Marine water sediment	109 mg/kg sediment dw	
Soil	29.9 mg/kg soil dw	
Oral	0.12 mg/kg food	

8.1.5 Control banding

If applicable and available it will be listed below.

8.2. Exposure controls

The information in this section is a general description. If applicable and available, exposure scenarios are attached in annex. Always use the relevant exposure scenarios that correspond to your identified use.

8.2.1 Appropriate engineering controls

Avoid raising dust. Keep away from naked flames/heat. Measure the concentration in the air regularly. Carry operations in the open/under local exhaust/ventilation or with respiratory protection.

8.2.2 Individual protection measures, such as personal protective equipment

Observe strict hygiene. Do not eat, drink or smoke during work.

a) Respiratory protection:

Dust production: dust mask with filter type P2.

b) Hand protection:

Gloves, On heating: heat insulating gloves (EN 407).

Materials	Remark
leather	Good resistance

c) Eye protection:

On (re)melting down: face shield.

d) Skin protection:

Protective clothing (EN 14605 or EN 13034). Protective clothing against molten metal splash (EN 9185). Protective clothing for workers exposed to heat (EN 11612). On (re)melting down: heatproof clothing (EN 11612).

8.2.3 Environmental exposure controls:

See sections 6.2, 6.3 and 13

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical form	Solid
	Metal
	Physical state depending on the production process
Odour	Odourless
Odour threshold	Not applicable
Colour	Metallic blue-grey
Particle size	No data available (test not performed)
Explosion limits	No data available (test not performed)
Flammability	Not classified as flammable
Log Kow	Not applicable (inorganic)
Dynamic viscosity	No data available (test not performed)
Kinematic viscosity	No data available (test not performed)
Melting point	No data available (test not performed)
Boiling point	No data available (test not performed)

Relative vapour density	Not applicable (solid)
Vapour pressure	No data available (test not performed)
Solubility	Water ; insoluble
Relative density	No data available (test not performed)
Absolute density	No data available (test not performed)
Decomposition temperature	No data available (test not performed)
Auto-ignition temperature	No data available (test not performed)
Flash point	Not applicable (solid)
pH	Not applicable (non-soluble in water)

9.2. Other information

No data available

SECTION 10: Stability and reactivity

10.1. Reactivity

No data available.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

In molten state: violent to explosive reaction with water (moisture). Oxidizes slowly in moist air.

10.4. Conditions to avoid

Precautionary measures

Avoid raising dust. Keep away from naked flames/heat.

10.5. Incompatible materials

(strong) acids.

10.6. Hazardous decomposition products

Reacts with (some) acids: release of highly flammable gases/vapours (hydrogen). On burning: formation of metal oxides (nickel oxides, zinc oxide).

SECTION 11: Toxicological information

11.1. Information on hazard classes as defined in Regulation (EC) No 1272/2008

11.1.1 Test results

Acute toxicity

zinc nickel bismuth alloys for hot dip galvanizing

No (test)data on the mixture available

zinc

Route of exposure	Parameter	Method	Value	Exposure time	Species	Value determination	Remark
Oral	LD50	OECD 401	> 2000 mg/kg bw		Rat (male / female)	Experimental value	
Dermal						Data waiving	
Inhalation (dust)	LC50	OECD 403	> 5.41 mg/l	4 weeks (daily, 5 days / week)	Rat (male / female)	Experimental value	

bismuth

Route of exposure	Parameter	Method	Value	Exposure time	Species	Value determination	Remark
Oral	LD50	OECD 401	> 2000 mg/kg bw		Rat (male / female)	Experimental value	
Dermal						Data waiving	
Inhalation						Data waiving	

nickel

Route of exposure	Parameter	Method	Value	Exposure time	Species	Value determination	Remark
Oral	LD50	Equivalent to OECD 401	> 9000 mg/kg		Rat (male / female)	Experimental value	
Dermal						Data waiving	
Inhalation (aerosol)	NOAEC		≥ 10.2 mg/l	1 h	Rat (male / female)	Experimental value	

tin

Route of exposure	Parameter	Method	Value	Exposure time	Species	Value determination	Remark
Oral	LD50	Equivalent to OECD 423	> 2000 mg/kg bw		Rat (male / female)	Experimental value	
Skin	LD50	OECD 402	> 2000 mg/kg bw		Rat (male / female)	Experimental value	
Inhalation (dust)	LC50	OECD 403	> 4.75 mg/l air	4 h	Rat (male / female)	Experimental value	

Conclusion

Not classified for acute toxicity

Corrosion/irritation

zinc nickel bismuth alloys for hot dip galvanizing

No (test)data on the mixture available

zinc

Route of exposure	Result	Method	Exposure time	Time point	Species	Value determination	Remark
Eye	Not irritating				Rabbit	Literature study	
Not applicable (in vitro test)	Not irritating				In vitro: SkinEthic Reconstituted epithelium model	Experimental value	
Inhalation (ZnO, metal oxides)	Not irritating					Literature study	

bismuth

Route of exposure	Result	Method	Exposure time	Time point	Species	Value determination	Remark
Eye	Not irritating	OECD 405		1; 24; 48; 72 hours	Rabbit	Read-across	
Not applicable (in vitro test)	Not irritating	RHE-model test	15 minutes		Reconstructed human epidermis	Read-across	

nickel

Route of exposure	Result	Method	Exposure time	Time point	Species	Value determination	Remark
Eye	Not irritating	OECD 405	168 h	48 hours	Rabbit	Experimental value	
Skin	Slightly irritating	OECD 404	4 h		Rabbit	Experimental value	

tin

Route of exposure	Result	Method	Exposure time	Time point	Species	Value determination	Remark
Eye	Not irritating	OECD 405		24; 48; 72 hours	Rabbit	Experimental value	
Skin	Not irritating	OECD 404	4 h	24; 72 hours	Rabbit	Experimental value	

Conclusion

Not classified as irritating to the skin

Not classified as irritating to the eyes

Not classified as irritating to the respiratory system

Respiratory or skin sensitisation

zinc nickel bismuth alloys for hot dip galvanizing

No (test)data on the mixture available

zinc

Route of exposure	Result	Method	Exposure time	Observation time point	Species	Value determination	Remark
Dermal (on the ears)	Sensitizing	Equivalent to OECD 429			Mouse (female)	Experimental value	
Skin	Not sensitizing	OECD 406			Guinea pig (male / female)	Experimental value	

bismuth

Route of exposure	Result	Method	Exposure time	Observation time point	Species	Value determination	Remark
Skin	Not sensitizing	OECD 429			Mouse (female)	Read-across	

nickel

Route of exposure	Result	Method	Exposure time	Observation time point	Species	Value determination	Remark
Skin	Sensitizing	Patch test			Human	Experimental value	

Conclusion

Not classified as sensitizing for skin

Not classified as sensitizing for inhalation

Specific target organ toxicity

zinc nickel bismuth alloys for hot dip galvanizing

No (test)data on the mixture available

zinc

Route of exposure	Parameter	Method	Value	Organ	Effect	Exposure time	Species	Value determination
Oral (stomach tube)	NOAEL	OECD 408	31.25 mg/kg bw/day	Blood	No effect	90 day(s)	Rat (male / female)	Experimental value
Dermal		OECD 411			No effect	90 day(s)	Rat (male / female)	Experimental value
Inhalation (aerosol)	NOAEC	OECD 412	0.47 mg/m³ air		No effect	4 weeks (6h / day, 5 days / week)	Rat (male / female)	Experimental value
Inhalation (ZnO, metal oxides)		Human observation			No effect		Human	Literature study

bismuth

Route of exposure	Parameter	Method	Value	Organ	Effect	Exposure time	Species	Value determination
Oral (stomach tube)	NOAEL	Subacute toxicity test	1000 mg/kg bw/day		No effect	28 days (1x / day)	Rat (male / female)	Experimental value
Dermal								Data waiving
Inhalation								Data waiving

nickel

Route of exposure	Parameter	Method	Value	Organ	Effect	Exposure time	Species	Value determination
Oral (stomach tube)	NOAEL	OECD 451	2.2 mg/kg bw/day		No effect	104 weeks (daily)	Rat (male / female)	Experimental value of similar product
Oral (stomach tube)	LOAEL	OECD 451	6.7 mg/kg bw/day	General	Body weight reduction	104 weeks (daily)	Rat (male / female)	Experimental value of similar product
Dermal								Data waiving
Inhalation (aerosol)	LOAEC	Equivalent to OECD 451	0.1 mg/m³ air	Respiratory tract	Respiratory difficulties	2 year(s) (6h / day, 5 days / week)	Rat (male / female)	Experimental value

tin

Route of exposure	Parameter	Method	Value	Organ	Effect	Exposure time	Species	Value determination
Oral	NOEL	OECD 407	> 1000 mg/kg bw/day			28 day(s)	Rat (male / female)	Experimental value

Conclusion

Not classified for subchronic toxicity

Mutagenicity (in vitro)

zinc nickel bismuth alloys for hot dip galvanizing

No (test)data on the mixture available

The chronic toxicity of the component(s) relates only to the substance in finely divided state and/or in molten state

zinc

Result	Method	Test substrate	Effect	Value determination	Remark
Negative with metabolic activation, negative without metabolic activation	OECD 471	Bacteria (S. typhimurium and E. coli)		Experimental value	
Negative with metabolic activation, negative without metabolic activation	OECD 473	Chinese hamster lung fibroblasts (V79)		Experimental value	

bismuth

Result	Method	Test substrate	Effect	Value determination	Remark
Negative with metabolic activation, negative without metabolic activation	OECD 476	Mouse (lymphoma L5178Y cells)		Read-across	
Negative with metabolic activation, negative without metabolic activation	Equivalent to OECD 471	Bacteria (S.typhimurium)		Read-across	

nickel

Result	Method	Test substrate	Effect	Value determination	Remark
Negative with metabolic activation, negative without metabolic activation	OECD 476	Chinese hamster lung fibroblasts (V79)		Experimental value	
Negative with metabolic activation, negative without metabolic activation	OECD 487	Chinese hamster lung fibroblasts (V79)		Experimental value	

tin

Result	Method	Test substrate	Effect	Value determination	Remark
Negative	OECD 471	Bacteria (S.typhimurium)		Experimental value	

Mutagenicity (in vivo)

zinc nickel bismuth alloys for hot dip galvanizing

No (test)data on the mixture available

The chronic toxicity of the component(s) relates only to the substance in finely divided state and/or in molten state

zinc

Result	Method	Exposure time	Test substrate	Organ	Value determination
Negative (Inhalation (aerosol))	OECD 474	2 weeks (6h / day, 5 days / week)	Rat (male / female)	Bone marrow	Experimental value

The chronic toxicity of the component(s) relates only to the substance in finely divided state and/or in molten state

Conclusion

Not classified for mutagenic or genotoxic toxicity

Carcinogenicity

zinc nickel bismuth alloys for hot dip galvanizing

No (test)data on the mixture available

The chronic toxicity of the component(s) relates only to the substance in finely divided state and/or in molten state

zinc

Route of exposure	Parameter	Method	Value	Exposure time	Species	Effect	Organ	Value determination
Oral (drinking water)	NOAEL	Carcinogenic toxicity study	> 22000 mg/l	52 week(s)	Mouse (male / female)	No carcinogenic effect		Experimental value

The chronic toxicity of the component(s) relates only to the substance in finely divided state and/or in molten state

bismuth

Route of exposure	Parameter	Method	Value	Exposure time	Species	Effect	Organ	Value determination
Inhalation								Data waiving
Dermal								Data waiving
Oral								Data waiving

nickel

Route of exposure	Parameter	Method	Value	Exposure time	Species	Effect	Organ	Value determination
Inhalation (aerosol)	NOAEC	OECD 451	0.4 mg/m³ air	2 year(s) (6h / day, 5 days / week)	Rat (male / female)	No carcinogenic effect	Respiratory tract	Experimental value
Oral (stomach tube)	NOAEL	OECD 451	11 mg/kg bw/day	104 weeks (daily)	Rat (male / female)	No carcinogenic effect		Read-across

Conclusion

Not classified for carcinogenicity

Reproductive toxicity

zinc nickel bismuth alloys for hot dip galvanizing

No (test)data on the mixture available

The chronic toxicity of the component(s) relates only to the substance in finely divided state and/or in molten state

zinc

	Parameter	Method	Value	Exposure time	Species	Effect	Organ	Value determination
Developmental toxicity (Inhalation (aerosol))	NOAEC	OECD 414	7.5 mg/m³ air	14 days (6h / day)	Rat	No effect		Experimental value
Maternal toxicity (Inhalation (aerosol))	NOAEC	OECD 414	1.5 mg/m³ air	14 days (6h / day)	Rat	No effect		Experimental value
Effects on fertility (Oral (stomach tube))	LOAEL	Equivalent to OECD 416	7.5 mg/kg bw/day		Rat (male / female)	Adverse effects on fertility		Experimental value

The chronic toxicity of the component(s) relates only to the substance in finely divided state and/or in molten state

bismuth

	Parameter	Method	Value	Exposure time	Species	Effect	Organ	Value determination
Developmental toxicity								Data waiving
Effects on fertility								Data waiving

nickel

	Parameter	Method	Value	Exposure time	Species	Effect	Organ	Value determination
Developmental toxicity (Oral (stomach tube))	NOAEL	Equivalent to OECD 416	≥ 1.1 mg/kg bw/day		Rat	No effect		Experimental value
Maternal toxicity (Oral (stomach tube))	NOAEL	Equivalent to OECD 416	10 mg/kg bw/day		Rat	No effect		Experimental value
Effects on fertility (Oral (stomach tube))	NOAEL	Equivalent to OECD 416	10 mg/kg bw/day		Rat (male / female)	No effect		Experimental value

tin

	Parameter	Method	Value	Exposure time	Species	Effect	Organ	Value determination
Developmental toxicity (Oral (stomach tube))	NOAEL	OECD 414	1000 mg/kg bw/day		Rat	No effect		Experimental value
Effects on fertility (Oral (stomach tube))	NOEL	OECD 421	> 1000 mg/kg bw/day	54 day(s)	Rat (male / female)			Experimental value

Conclusion

Not classified for reprotoxic or developmental toxicity

Toxicity other effects

zinc nickel bismuth alloys for hot dip galvanizing

No (test)data on the mixture available

Chronic effects from short and long-term exposure

zinc nickel bismuth alloys for hot dip galvanizing

ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Skin rash/inflammation.

11.2. Information on other hazards

No evidence of endocrine disrupting properties

SECTION 12: Ecological information

12.1. Toxicity

zinc nickel bismuth alloys for hot dip galvanizing

No (test)data on the mixture available

Judgement of the mixture is based on the relevant ingredients

zinc

	Parameter	Method	Value	Duration	Species	Test design	Fresh/salt water	Value determination
Acute toxicity crustacea	NOEC		154 µg/l		Daphnia magna			Literature study; Zinc ion
Toxicity algae and other aquatic plants	NOEC		41 µg/l		Pseudokirchneriella subcapitata			Literature study; Acute
	NOEC		11 µg/l - 99 µg/l		Pseudokirchneriella subcapitata			Literature study; Chronic
Toxicity sediment organisms	NOEC		218 µg/l - 1101 µg/l					Literature study; Zinc ion

	Parameter	Method	Value	Duration	Species	Value determination
Toxicity soil micro-organisms	NOEC		31.2 mg/kg soil dw - 8003.5 mg/kg soil dw			Literature study
Toxicity terrestrial plants	NOEC		31.2 mg/kg soil dw - 8003.5 mg/kg soil dw			Literature study

bismuth

	Parameter	Method	Value	Duration	Species	Test design	Fresh/salt water	Value determination
Acute toxicity fishes	LC50	OECD 203	> 100 mg/l	96 h	Danio rerio	Static system	Fresh water	Read-across; GLP
Acute toxicity crustacea	EC50	OECD 202	> 100 mg/l	48 h	Daphnia magna	Static system	Fresh water	Experimental value; GLP
Toxicity algae and other aquatic plants	ErC50	OECD 201	> 100 mg/l	72 h	Pseudokirchneriella subcapitata	Static system	Fresh water	Read-across; GLP
Toxicity aquatic micro-organisms	NOEC	OECD 209	≥ 300 mg/l	3 h	Activated sludge	Static system	Fresh water	Read-across; GLP

Conclusion

Not classified as dangerous for the environment according to the criteria of Regulation (EC) No 1272/2008

12.2. Persistence and degradability

Water

Biodegradability: not applicable

12.3. Bioaccumulative potential

zinc nickel bismuth alloys for hot dip galvanizing

Log Kow

Method	Remark	Value	Temperature	Value determination
	Not applicable (inorganic)			

zinc

Log Kow

Method	Remark	Value	Temperature	Value determination
	Not applicable (inorganic)			

bismuth

Log Kow

Method	Remark	Value	Temperature	Value determination
	No data available			

nickel

BCF other aquatic organisms

Parameter	Method	Value	Duration	Species	Value determination
BCF		8 - 45; Fresh weight	≤ 4 week(s)	Cambarus sp.	Experimental value

Log Kow

Method	Remark	Value	Temperature	Value determination
	Not applicable (inorganic)			

tin

Log Kow

Method	Remark	Value	Temperature	Value determination
	Not applicable (inorganic)			

Conclusion

Does not contain bioaccumulative component(s)

12.4. Mobility in soil

zinc

(log) Koc

Parameter	Method	Value	Value determination
	OECD 106	3.24	Literature study

Conclusion

No (test)data on mobility of the component(s) available

12.5. Results of PBT and vPvB assessment

The criteria of PBT and vPvB as listed in Annex XIII of Regulation (EC) No 1907/2006 do not apply to inorganic substances.

12.6. Endocrine disrupting properties

No evidence of endocrine disrupting properties

12.7. Other adverse effects

zinc nickel bismuth alloys for hot dip galvanizing

Greenhouse gases

None of the known components is included in the list of fluorinated greenhouse gases (Regulation (EU) No 517/2014)

Ozone-depleting potential (ODP)

Not classified as dangerous for the ozone layer (Regulation (EC) No 1005/2009)

nickel

Groundwater

Groundwater pollutant

SECTION 13: Disposal considerations

The information in this section is a general description. If applicable and available, exposure scenarios are attached in annex. Always use the relevant exposure scenarios that correspond to your identified use.

13.1. Waste treatment methods

13.1.1 Provisions relating to waste

European Union

Can be considered as non hazardous waste according to Directive 2008/98/EC, as amended by Regulation (EU) No 1357/2014 and Regulation (EU) No 2017/997.

Waste material code (Directive 2008/98/EC, Decision 2000/0532/EC).

11 01 99 (wastes from chemical surface treatment and coating of metals and other materials (for example galvanic processes, zinc coating processes, pickling processes, etching, phosphating, alkaline degreasing, anodising): wastes not otherwise specified). Depending on branch of industry and production process, also other waste codes may be applicable.

13.1.2 Disposal methods

Recycle/reuse. Remove waste in accordance with local and/or national regulations. Do not discharge into surface water (Directive 2000/60/EC, Council Decision 2455/2001/EC).

13.1.3 Packaging/Container

No data available

SECTION 14: Transport information

Road (ADR), Rail (RID), Inland waterways (ADN), Sea (IMDG/IMSBC), Air (ICAO-TI/IATA-DGR)

14.1. UN number/ID number

Transport	Not subject

14.2. UN proper shipping name

14.3. Transport hazard class(es)

Hazard identification number	
Class	
Classification code	

14.4. Packing group

Packing group	
Labels	

14.5. Environmental hazards

Environmentally hazardous substance mark	no

14.6. Special precautions for user

Special provisions	
Limited quantities	

14.7. Maritime transport in bulk according to IMO instruments

Annex II of MARPOL 73/78	Not applicable

SECTION 15: Regulatory information

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

European legislation:

VOC content Directive 2010/75/EU

VOC content	Remark
	Not applicable (inorganic)

Directive 2012/18/EU (Seveso III)

Not subject to registration according to Directive 2012/18/EU (Seveso III)

REACH Annex XVII - Restriction

Contains component(s) subject to restrictions of Annex XVII of Regulation (EC) No 1907/2006: restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles.

	Designation of the substance, of the group of substances or of the mixture	Conditions of restriction
· nickel	Nickel and its compounds	1. Shall not be used: (a) in any post assemblies which are inserted into pierced ears and other pierced parts of the human body unless the rate of nickel release from such post assemblies is less than 0,2 µg/cm 2 /week (migration limit); (b) in articles intended to come into direct and prolonged contact with the skin such as: — earrings, — necklaces, bracelets and chains, anklets, finger rings, — wrist-watch cases, watch straps and tighteners, — rivet buttons, tighteners, rivets, zippers and metal marks, when these are used in garments, if the rate of nickel release from the parts of these articles coming into direct and prolonged contact with the skin is greater than 0,5 µg/cm 2 / week. (c) in articles referred to in point (b) where these have a non-nickel coating unless such coating is sufficient to ensure that the rate of nickel release from those parts of such

		articles coming into direct and prolonged contact with the skin will not exceed 0,5 µg/cm 2 / week for a period of at least two years of normal use of the article. 2. Articles which are the subject of paragraph 1 shall not be placed on the market unless they conform to the requirements set out in that paragraph. 3. The standards adopted by the European Committee for Standardisation (CEN) shall be used as the test methods for demonstrating the conformity of articles to paragraphs 1 and 2. Titles and references of harmonised standards under entry 27 of Annex XVII to REACH (see Commission communication (EU) No 2017/C 011/02)
· nickel	Substances falling within one or more of the following points: (a) substances classified as any of the following in Part 3 of Annex VI to Regulation (EC) No 1272/2008: — carcinogen category 1A, 1B or 2, or germ cell mutagen category 1A, 1B or 2, but excluding any such substances classified due to effects only following exposure by inhalation — reproductive toxicant category 1A, 1B or 2 but excluding any such substances classified due to effects only following exposure by inhalation — skin sensitiser category 1, 1A or 1B — skin corrosive category 1, 1A, 1B or 1C or skin irritant category 2 — serious eye damage category 1 or eye irritant category 2 (b) substances listed in Annex II to Regulation (EC) No 1223/2009 of the European Parliament and of the Council (c) substances listed in Annex IV to Regulation (EC) No 1223/2009 for which a condition is specified in at least one of the columns g, h and i of the table in that Annex (d) substances listed in Appendix 13 to this Annex. The ancillary requirements in paragraphs 7 and 8 of column 2 of this entry apply to all mixtures for use for tattooing purposes, whether or not they contain a substance falling within points (a) to (d) of this column of this entry.	Mixtures for tattooing purposes are subject to the restrictions of Regulation (EU) 2020/2081
· tin	Substances falling within one or more of the following points: (a) substances classified as any of the following in Part 3 of Annex VI to Regulation (EC) No 1272/2008: — carcinogen category 1A, 1B or 2, or germ cell mutagen category 1A, 1B or 2, but excluding any such substances classified due to effects only following exposure by inhalation — reproductive toxicant category 1A, 1B or 2 but excluding any such substances classified due to effects only following exposure by inhalation — skin sensitiser category 1, 1A or 1B — skin corrosive category 1, 1A, 1B or 1C or skin irritant category 2 — serious eye damage category 1 or eye irritant category 2 (b) substances listed in Annex II to Regulation (EC) No 1223/2009 of the European Parliament and of the Council (c) substances listed in Annex IV to Regulation (EC) No 1223/2009 for which a condition is specified in at least one of the columns g, h and i of the table in that Annex (d) substances listed in Appendix 13 to this Annex. The ancillary requirements in paragraphs 7 and 8 of column 2 of this entry apply to all mixtures for use for tattooing purposes, whether or not they contain a substance falling within points (a) to (d) of this column of this entry.	Mixtures for tattooing purposes are subject to the restrictions of Regulation (EU) 2020/2081
· zinc	Substances falling within one or more of the following points: (a) substances classified as any of the following in Part 3 of Annex VI to Regulation (EC) No 1272/2008: — carcinogen category 1A, 1B or 2, or germ cell mutagen category 1A, 1B or 2, but excluding any such substances	Mixtures for tattooing purposes are subject to the restrictions of Regulation (EU) 2020/2081

	classified due to effects only following exposure by inhalation — reproductive toxicant category 1A, 1B or 2 but excluding any such substances classified due to effects only following exposure by inhalation — skin sensitiser category 1, 1A or 1B — skin corrosive category 1, 1A, 1B or 1C or skin irritant category 2 — serious eye damage category 1 or eye irritant category 2 (b) substances listed in Annex II to Regulation (EC) No 1223/2009 of the European Parliament and of the Council (c) substances listed in Annex IV to Regulation (EC) No 1223/2009 for which a condition is specified in at least one of the columns g, h and i of the table in that Annex (d) substances listed in Appendix 13 to this Annex. The ancillary requirements in paragraphs 7 and 8 of column 2 of this entry apply to all mixtures for use for tattooing purposes, whether or not they contain a substance falling within points (a) to (d) of this column of this entry.	

National legislation Belgium

zinc nickel bismuth alloys for hot dip galvanizing

No data available

nickel

Agents cancérigènes, mutagènes et reprotoxiques (Code du bien-être au travail, Livre VI, titre 2)	Nickel; VI.2.3.; Liste non limitative de substances, mélanges et procédés visés à l'article VI.2-1, alinéa 3

tin

Résorption peau	Etain (métal); D; La mention "D" signifie que la résorption de l'agent, via la peau, les muqueuses ou les yeux, constitue une partie importante de l'exposition totale. Cette résorption peut se faire tant par contact direct que par présence de l'agent dans l'air.

National legislation The Netherlands

zinc nickel bismuth alloys for hot dip galvanizing

Waterbezwaarlijkheid	Z (2); Algemene Beoordelingsmethodiek (ABM)
SZW - Lijst van kankerverwekkende stoffen	nikkeldioxide; Opgenomen in SZW-lijst van kankerverwekkende stoffen

National legislation France

zinc nickel bismuth alloys for hot dip galvanizing

Catégorie cancérogène	Nickel (oxyde de), en Ni

nickel

Catégorie cancérogène	Nickel (métal); C2

National legislation Germany

zinc nickel bismuth alloys for hot dip galvanizing

WGK	nwg; Verordnung über Anlagen zum Umgang mit wassergefährdenden Stoffen (AwSV) - 18. April 2017

bismuth

TA-Luft	5.2.1

nickel

TA-Luft	5.2.7.1.1/II
TRGS900 - Risiko der Fruchtschädigung	Nickelmetall; Y; Risiko der Fruchtschädigung braucht bei Einhaltung des Arbeitsplatzgrenzwertes und des biologischen Grenzwertes nicht befürchtet zu werden
Sensibilisierende Stoffe	Nickelmetall; Sh; Hautsensibilisierende Stoffe

tin

TA-Luft	5.2.1

National legislation Austria

zinc nickel bismuth alloys for hot dip galvanizing

No data available

nickel

Krebserzeugend	Nickel (Stäube von Nickelmetall, Nickelsulfid und sulfidischen Erzen, Nickeloxide, Nickelchromat und Nickel- carbonat) und Stäube von Nickelverbindungen und Nickellegierungen; III A1
Gefahr der Sensibilisierung der Haut	Nickel (Stäube von Nickelmetall, Nickelsulfid und sulfidischen Erzen, Nickeloxide, Nickelchromat und Nickel- carbonat) und Stäube von Nickelverbindungen und Nickellegierungen; Sh
Gefahr der Sensibilisierung der Atemwege	Nickel (Stäube von Nickelmetall, Nickelsulfid und sulfidischen Erzen, Nickeloxide, Nickelchromat und Nickel- carbonat) und Stäube von Nickelverbindungen und Nickellegierungen; Sa

National legislation United Kingdom

zinc nickel bismuth alloys for hot dip galvanizing

Carcinogen	Nickel, insoluble inorganic compounds (as Ni)(except nickel tetracarbonyl); Carc
Skin absorption	Nickel, insoluble inorganic compounds (as Ni)(except nickel tetracarbonyl); Sk

nickel

Skin absorption	Nickel metal; Sk

Other relevant data

zinc nickel bismuth alloys for hot dip galvanizing

TLV - Carcinogen	Nickel and inorganic compounds including Nickel subsulfide, as Ni: Insoluble inorganic compounds (NOS); A1

nickel

IARC - classification	2B; Nickel and nickel compounds
TLV - Carcinogen	Nickel and inorganic compounds including Nickel subsulfide, as Ni: Elemental; A5

15.2. Chemical safety assessment

No chemical safety assessment has been conducted for the mixture.

zinc

A chemical safety assessment has been performed.

SECTION 16: Other information

Full text of any H- and EUH-statements referred to under section 3:

H317 May cause an allergic skin reaction.
H351 Suspected of causing cancer.
H372 Causes damage to organs (lungs) through prolonged or repeated exposure if inhaled.
EUH208 Contains a sensitising substance. May produce an allergic reaction.

(*)	INTERNAL CLASSIFICATION BY BIG
ADI	Acceptable daily intake
AOEL	Acceptable operator exposure level
ATE	Acute Toxicity Estimate
BCF	Bioconcentration Factor
BEI	Biological Exposure Indices
CLP (EU-GHS)	Classification, labelling and packaging (Globally Harmonised System in Europe)
DMEL	Derived Minimal Effect Level
DNEL	Derived No Effect Level
EC10	Effect Concentration 10 %
EC50	Effect Concentration 50 %
ErC50	EC50 in terms of reduction of growth rate
GLP	Good Laboratory Practice
LC0	Lethal Concentration 0 %
LC50	Lethal Concentration 50 %
LD50	Lethal Dose 50 %
LOAEC/LOAEL	Lowest Observed Adverse Effect Concentration/Lowest Observed Adverse Effect Level
NOAEC/NOAEL	No Observed Adverse Effect Concentration/No Observed Adverse Effect Level
NOEC/NOEL	No Observed Effect Concentration/No Observed Effect Level
OECD	Organisation for Economic Co-operation and Development
PBT	Persistent, Bioaccumulative & Toxic
PNEC	Predicted No Effect Concentration
STP	Sludge Treatment Process
vPvB	very Persistent & very Bioaccumulative

The information in this safety data sheet is based on data and samples provided to BIG. The sheet was written to the best of our ability and according to the state of knowledge at that time. The safety data sheet only constitutes a guideline for the safe handling, use, consumption, storage, transport and disposal of the substances/preparations/mixtures mentioned under point 1. New safety data sheets are written from time to time. Only the most recent versions may be used. Unless indicated otherwise word for word on the safety data sheet, the information does not apply to substances/preparations/mixtures in purer form, mixed with other substances or in processes. The safety data sheet offers no quality specification for the substances/preparations/mixtures in question. Compliance with the instructions in this safety data sheet does not release the user from the obligation to take all measures dictated by common sense, regulations and recommendations or which are necessary and/or useful based on the real applicable circumstances. BIG does not guarantee the accuracy or exhaustiveness of the information provided and cannot be held liable for any changes by third parties. This safety data sheet is only to be used within the European Union, Switzerland, Iceland, Norway and Liechtenstein. Any use outside of this area is at your own risk. Use of this safety data sheet is subject to the licence and liability limiting conditions as stated in your BIG licence agreement or when this is failing the general conditions of BIG. All intellectual property rights to this sheet are the property of BIG and its distribution and reproduction are limited. Consult the mentioned agreement/conditions for details.