Trade name: TIMREX® HSAG, TIMREX® CyPbrid 1, TIMREX® CyPbrid 2,

Current version : 2.0.0, issued: 03.06.2021 **Replaced version:** 1.0.1, issued: 29.06.2020 **Region:** GB

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

1.1 Product identifier

Trade name

TIMREX® HSAG, TIMREX® CyPbrid 1, TIMREX® CyPbrid 2, TIMREX® CyPbrid 3

Substance name	Graphite (> 95 %)
REACH registration no.	01-2119486977-12

Identification numbers

CAS no.	7782-42-5
EC no.	231-955-3

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

Relevant identified uses of the substance or mixture

Professional use
Industrial use
Electrical and thermal conductive additive
Friction modifier
Carbon carrier
Lubricant
Refractories

Uses advised against

None known

1.3 Details of the supplier of the safety data sheet

Address

Imerys Graphite & Carbon Switzerland Ltd.
Strada Industriale 12
6743 Bodio (Switzerland)

Telephone no.	+41 91 873 20 10
Fax no.	+41 91 873 20 19
e-mail	graphiteandcarbon.ch@imerys.com

Information provided by / telephone

Research and Development

Advice on Safety Data Sheet

sdb_info@umco.de

1.4 Emergency telephone number

For Hazardous Materials [or Dangerous Goods] Incident
Spill, Leak, Fire, Exposure, or Accident
Call CHEMTREC Day or Night
International Number: +1 703-741-5970 (collect calls accepted)
Local number: +(44)-870-8200418

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Classification information

This product does not meet the classification and labelling criteria given in the Regulation (EC) No 1272/2008 (CLP).

2.2 Label elements

Not relevant

2.3 Other hazards

PBT assessment
The product is not considered to be a PBT.

vPvB assessment

The product is not considered to be a vPvB.

SECTION 3: Composition/information on ingredients

3.1 Substances

Chemical characterization

Substance name	Graphite (> 95 %)

Identification numbers

CAS no.	7782-42-5
EC no.	231-955-3

3.2 Mixtures

Not applicable. The product is not a mixture.

SECTION 4: First aid measures

4.1 Description of first aid measures

General information
In case of persisting adverse effects, consult a physician. Remove contaminated clothing and shoes and launder thoroughly before reusing.

After inhalation
Remove affected person from the immediate area. Ensure supply of fresh air.

After skin contact
When in contact with the skin, clean with soap and water.

After eye contact
Remove contact lenses. Rinse eye thoroughly under running water keeping eyelids wide open and protecting the unaffected eye (at least 10 to 15 minutes).

After ingestion
Rinse out mouth and give plenty of water to drink. Never give anything by mouth to an unconscious person.

4.2 Most important symptoms and effects, both acute and delayed

Symptoms
headaches; Nausea; Dizziness; Irritating to eyes, respiratory system and skin.

4.3 Indication of any immediate medical attention and special treatment needed

Treat symptomatically.

SECTION 5: Firefighting measures

5.1 Extinguishing media

Suitable extinguishing media
Foam; Carbon dioxide; Extinguishing powder; Water spray jet; Sand

Unsuitable extinguishing media
High power water jet

5.2 Special hazards arising from the substance or mixture

In the event of fire, the following can be released: Carbon monoxide (CO); Carbon dioxide (CO2)

5.3 Advice for firefighters

Use self-contained breathing apparatus. Wear protective clothing. Fire residues and contaminated firefighting water must be disposed of in accordance with the local regulations. Cool endangered containers with water spray jet.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel
Refer to protective measures listed in sections 7 and 8. Avoid contact with skin, eyes and clothing. Ensure adequate ventilation. Avoid dust formation. High risk of slipping due to leakage/spillage of product.

For emergency responders

Personal protective equipment (PPE) - see section 8. In case of emergency, use of personal protective equipment [DIN EN 469, EN 12021].

6.2 Environmental precautions

Do not discharge into the drains/surface waters/groundwater. If the product contaminates lakes, rivers or sewage, inform appropriate authorities in accordance with local regulations.

6.3 Methods and material for containment and cleaning up

Take up with dust−binding material or using a suitable vacuum cleaner. When collected, handle material as described under the section heading "Disposal considerations".

6.4 Reference to other sections

Information regarding safe handling, see section 7. Information regarding personal protective measures, see section 8. Information regarding waste disposal, see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Advice on safe handling

Provide adequate ventilation. Use personal protective equipment as required. Concerning personal protective equipment to use, see section 8. Do not breathe dust. Avoid contact with skin, eyes and clothing. Take any precaution to avoid mixing with Incompatible materials, Refer to Section 10 on Incompatible Materials. Ensure proper process control to avoid excess waste discharge (temperature, concentration, pH, time). Avoid release to the environment. Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Avoid dust formation. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Take precautionary measures against static charges. Personal monitoring. Enter closed rooms only if they are sufficiently ventilated. Define the storage area and vehicle traffic routes clearly. Put up clear signs. Carbon monoxide.

General protective and hygiene measures

Keep good industrial hygiene. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Do not eat, drink or smoke when using this product. Keep away from food, drink and animal feedingstuffs. Remove contaminated clothes. Separate working clothes from town clothes.

Advice on protection against fire and explosion

Under certain circumstances fine dust clouds may form explosive mixtures with air. Take precautionary measures against static charges. Keep away from sources of heat and ignition. Dust should be aspirated immediately on-the-spot. Use explosion-proof equipment/fittings and non-sparking tools.

Dust explosion class

ST1 (slightly dust explosive)

7.2 Conditions for safe storage, including any incompatibilities

Technical measures and storage conditions

Containers which are opened must be carefully resealed and kept upright to prevent leakage. Ensure adequate ventilation of the storage area. May form hazardous gas/vapour mixtures (CO2, CO). Toxic fumes or dust could accumulate in confined areas. Vapours are heavier than air and may spread along floors. With good ventilation however, it dissipates to very low levels. Room air monitoring (O2, CO, CO2). Ensure adequate ventilation, especially in confined areas. Provide sufficient air exchange and/or exhaust. Additional information: Annex to Safety Data Sheet.

Requirements for storage rooms and vessels

Containers which are opened must be carefully closed and kept upright to prevent leakage. Keep only in the original container.

Incompatible products

Do not store together with: Substances to be avoided, see section 10.

7.3 Specific end use(s)

No data available.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Occupational exposure limit values

No	Substance name	CAS no.	EC no.
1	**Dust**		
	List of approved workplace exposure limits (WELs) / EH40		
	Dust respirable		
	WEL long-term (8-hr TWA reference period)	4 mg/m³	
	Comments	see Definition 44 "Dust"	
	List of approved workplace exposure limits (WELs) / EH40		
	Dust inhalable		
	WEL long-term (8-hr TWA reference period)	10 mg/m³	
	Comments	see Definition 44 "Dust"	

DNEL, DMEL and PNEC values

DNEL values (worker)

No	Substance name			CAS / EC no	
	Route of exposure	Exposure time	Effect	Value	
1	**Graphite**			**7782-42-5 231-955-3**	
	inhalative	Long term (chronic)	local	1.2	mg/m³

DNEL value (consumer)

No	Substance name			CAS / EC no	
	Route of exposure	Exposure time	Effect	Value	
1	**Graphite**			**7782-42-5 231-955-3**	
	oral	Long term (chronic)	systemic	813	mg/kg/day
	inhalative	Long term (chronic)	local	0.3	mg/m³

Other information
The DNEL value (inhalation) is applicable for respirable fractions of graphite dust that can reach the alveolar regions of the lung.

8.2 Exposure controls

Appropriate engineering controls
Ensure adequate ventilation, local exhaust at the work station if necessary.

Personal protective equipment

Respiratory protection
If workplace exposure limits are exceeded, a respiration protection approved for this particular job must be worn. In case of dust formation, take appropriate measures for breathing protection in the event that workplace threshold values are not specified. Dust mask
Respirator FFP2 (EN 149)

Eye / face protection
Safety glasses with side protection shield (EN 166)

Hand protection
Sufficient protection is given wearing suitable protective gloves checked according to i.e. EN 374, in the event of risk of skin contact with the product. Before use, the protective gloves should be tested in any case for its specific work-station suitability (i.e. mechanical resistance, product compatibility and antistatic properties). Adhere to the manufacturer's instructions and information relating to the use, storage, care and replacement of protective gloves. Protective gloves shall be replaced immediately when physically damaged or worn. Design operations thus to avoid permanent use of protective gloves.

Other
Normal chemical work clothing.

Environmental exposure controls
No data available.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

State of aggregation
liquid

Form/Colour
Powder
grey to black

Odour
odourless

pH value
Not applicable

Boiling point / boiling range
No data available

Melting point/freezing point			
Value	>	3000	°C
Method	OECD 102		

Decomposition temperature
No data available

Flash point
Not applicable

Ignition temperature			
Value	>	500	°C

Oxidising properties
Inorganic substance not containing oxygen or halogen atoms.

Explosive properties
Non-combustible. Contains no chemical groups associated with explosive properties. The minimum ignition energy of fine dusts is >1 J.

Flammability
The product is NOT highly flammable according to Regulation (EG) Nr. 440/2008 , method EC A.10 (flammability, solids)

Lower explosion limit
No data available

Upper explosion limit
No data available

Vapour pressure	
Comments	Solid whose melting point is > 3000°C.

Relative vapour density
No data available

Relative density
No data available

Density			
Value	appr.	2.2	g/cm³
Method	DIN 51901		

Solubility in water			
Value	<	0.001	g/l

Solubility	
Comments	Graphite/ carbon is however considered being insoluble in water. The relative solubility corresponds to the solubility of impurities contained in the test substance.

Partition coefficient n-octanol/water (log value)
No data available

Viscosity
Not applicable

Particle characteristics
No data available

9.2 Other information

Other information
Dust explosion class 1. Minimum ignition temperature of a 5 mm dust layer (glowing temperature) >500°C. Minimum ignition energy (MIE) >1J. Maximum explosion pressure 7,6 bar. Maximum rate of pressure rise (bar/s) 270. Additional information: Annex to Safety Data Sheet.

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available.

10.2 Chemical stability
Unstable on exposure to air.

10.3 Possibility of hazardous reactions
Air contact may form hazardous compounds. Release of: CO, CO2.

10.4 Conditions to avoid
Avoid formation of dust. Static discharges.

10.5 Incompatible materials
Fluorine; Chlorine trifluoride

10.6 Hazardous decomposition products
No hazardous decomposition products known. In case of fire: see section 5.

SECTION 11: Toxicological information

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

Acute oral toxicity				
No	**Substance name**	**CAS no.**		**EC no.**
1	**Graphite**	**7782-42-5**		**231-955-3**
LD50	>	2000		mg/kg bodyweight
Species	rat			
Method	OECD 423			
Source	CSR			
Evaluation/classification	Based on available data, the classification criteria are not met.			

Acute dermal toxicity
No data available

Acute inhalational toxicity				
No	**Substance name**	**CAS no.**		**EC no.**
1	**Graphite**	**7782-42-5**		**231-955-3**
LC50	>	2000		mg/l
Duration of exposure		4		h
State of aggregation	Dust			
Species	rat			
Method	OECD 403			
Source	CSR			
Evaluation/classification	Based on available data, the classification criteria are not met.			

Skin corrosion/irritation			
No	**Substance name**	**CAS no.**	**EC no.**

1	Graphite	7782-42-5	231-955-3
Species		rabbit	
Method		OECD 404	
Source		CSR	
Evaluation		non-irritant	

Serious eye damage/irritation			
No	**Substance name**	**CAS no.**	**EC no.**
1	**Graphite**	**7782-42-5**	**231-955-3**
Species		rabbit	
Method		OECD 405	
Source		CSR	
Evaluation		non-irritant	

Respiratory or skin sensitisation			
No	**Substance name**	**CAS no.**	**EC no.**
1	**Graphite**	**7782-42-5**	**231-955-3**
Route of exposure		respiratory tract	
Species		mouse	
Method		OECD 429	
Source		CSR	
Evaluation		non-sensitizing	
Evaluation/classification		Based on available data, the classification criteria are not met.	
Route of exposure		Skin	
Species		mouse	
Method		OECD 429	
Source		CSR	
Evaluation		non-sensitizing	
Evaluation/classification		Based on available data, the classification criteria are not met.	

Germ cell mutagenicity			
No	**Substance name**	**CAS no.**	**EC no.**
1	**Graphite**	**7782-42-5**	**231-955-3**
Type of examination		Bacterial Reverse Mutation Test	
Method		OECD 471	
Source		CSR	
Evaluation/classification		Based on available data, the classification criteria are not met.	
Type of examination		Mammalian cell gene mutation assay	
Method		OECD 476	
Source		CSR	
Evaluation/classification		Based on available data, the classification criteria are not met.	
Type of examination		Mammalian chromosome aberration test	
Method		OECD 473	
Source		CSR	
Evaluation/classification		Based on available data, the classification criteria are not met.	

Reproduction toxicity			
No	**Substance name**	**CAS no.**	**EC no.**
1	**Graphite**	**7782-42-5**	**231-955-3**
Method		OECD 422	
Source		CSR	
Evaluation/classification		Based on available data, the classification criteria are not met.	

Carcinogenicity			
No	**Substance name**	**CAS no.**	**EC no.**
1	**Graphite**	**7782-42-5**	**231-955-3**
Method		Waiving	
Source		CSR	
Evaluation/classification		Based on available data, the classification criteria are not met.	

STOT - single exposure
No data available

STOT - repeated exposure				
No	**Substance name**	**CAS no.**		**EC no.**
1	**Graphite**	**7782-42-5**		**231-955-3**
Route of exposure	oral			
NOAEL		813		mg/kg
Species	rat			
Method	OECD 422			
Source	CSR			
Evaluation/classification	Based on available data, the classification criteria are not met.			
Route of exposure	inhalational			
NOAEC		12		mg/m³
Species	rat			
Method	OECD 412			
Source	CSR			
Evaluation/classification	Based on available data, the classification criteria are not met.			

Aspiration hazard
No data available

Delayed and immediate effects as well as chronic effects from short and long-term exposure
Contact with the skin and eyes may cause mechanical irritation. Inhalation of dusts may irritate the respiratory tract.

11.2 Information on other hazards

Endocrine disrupting properties
No data available.

Other information
No data available.

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish (acute)				
No	**Substance name**	**CAS no.**		**EC no.**
1	**Graphite**	**7782-42-5**		**231-955-3**
LC50	>	100		mg/l
Duration of exposure		96		h
Species	Danio rerio			
Method	OECD 203			
Source	CSR			
Evaluation/classification	Based on available data, the classification criteria are not met.			

Toxicity to fish (chronic)
No data available

Toxicity to Daphnia (acute)				
No	**Substance name**	**CAS no.**		**EC no.**
1	**Graphite**	**7782-42-5**		**231-955-3**
EC50	>	100		mg/l
Duration of exposure		48		h
Species	Daphnia magna			
Method	OECD 202			
Source	CSR			
Evaluation/classification	Based on available data, the classification criteria are not met.			

Toxicity to Daphnia (chronic)
No data available

Toxicity to algae (acute)				
No	**Substance name**	**CAS no.**		**EC no.**
1	**Graphite**	**7782-42-5**		**231-955-3**
EC50	>	100		mg/l
Duration of exposure		72		h

Species	Pseudokirchneriella subcapitata
Method	OECD 201
Source	CSR
Evaluation/classification	Based on available data, the classification criteria are not met.

Toxicity to algae (chronic)
No data available

Bacteria toxicity
No data available

12.2 Persistence and degradability
No data available.

12.3 Bioaccumulative potential
No data available.

12.4 Mobility in soil
No data available.

12.5 Results of PBT and vPvB assessment

Results of PBT and vPvB assessment	
PBT assessment	The product is not considered to be a PBT.
vPvB assessment	The product is not considered to be a vPvB.

12.6 Endocrine disrupting properties
No data available.

12.7 Other adverse effects
No data available.

12.8 Other information

Other information
Do not discharge product unmonitored into the environment.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Disposal of the product should be carried out in accordance with all applicable regulations following consultation with the responsible local authority and the disposal company in an authorised and suitable disposal facility.
Allocation of a waste code number, according to the European Waste Catalogue, should be carried out in agreement with the regional waste disposal company.

Packaging
Residues must be removed from packaging and when emptied completely disposed of in accordance with the regulations for waste removal. Incompletely emptied packaging must be disposed of in the form of disposal specified by the regional disposer.

SECTION 14: Transport information

14.1 Transport ADR/RID/ADN
The product is not subject to ADR/RID/ADN regulations.

14.2 Transport IMDG
The product is not subject to IMDG regulations.

14.3 Transport ICAO-TI / IATA
The product is not subject to ICAO-TI / IATA regulations.

14.4 Other information
The product is NOT highly flammable according to Regulation (EG) Nr. 440/2008 , method EC A.10 (flammability, solids)

14.5 Environmental hazards
Information on environmental hazards, if relevant, please see 14.1 - 14.3.

14.6 Special precautions for user
No data available.

14.7 Maritime transport in bulk according to IMO instruments
Not relevant

SECTION 15: Regulatory information

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

EU regulations

Regulation (EC) No 1907/2006 (REACH) Annex XIV (List of substances subject to authorisation)
In accordance with the REACH regulation (EC) 1907/2006, the product does not contain any substances that are considered as subject to listing in annex XIV, inventory of substances requiring authorisation.

REACH candidate list of substances of very high concern (SVHC) for authorisation
In accordance with article 57 and article 59 of the Reach regulation (EC) 1907/2006, this substance is not considered as subject to listing in annex XIV, inventory of substances requiring authorisation ("Authorization list").

Regulation (EC) No 1907/2006 (REACH) Annex XVII: RESTRICTIONS ON THE MANUFACTURE, PLACING ON THE MARKET AND USE OF CERTAIN DANGEROUS SUBSTANCES, MIXTURES AND ARTICLES
The substance is not subject to the provisions of annex XVII (restriction entries) of the Reach regulation (EC) 1907/2006.

Directive 2012/18/EU on the control of major-accident hazards involving dangerous substances
This substance is not subject to Part 1 or 2 of Annex I

National regulations

National chemical inventories

EINECS/ELINCS (European Community)	listed	
USA (TSCA)	listed	
DSL/NDSL (Canada)	DSL listed	
ENCS (Japan)	Exempted from listing	
ECL (Korea)	listed	KE-18101
AICS (Australia)	listed	
IECSC / NEPA (China)	listed	
PICCS (Philippines)	listed	
NZIoC (New Zealand)	New Zealand: not subject to the provisions of the HSNO Act.	
CSNN (Taiwan)	listed	

15.2 Chemical safety assessment
A chemical safety assessment has been carried out for this substance.

SECTION 16: Other information

Sources of key data used to compile the data sheet:
Regulation (EC) No 1907/2006 (REACH), 1272/2008 (CLP) as amended in each case.
Directives 2000/39/EC, 2006/15/EC, 2009/161/EU, (EU) 2017/164.
National Threshold Limit Values of the corresponding countries as amended in each case.
Transport regulations according to ADR, RID, IMDG, IATA as amended in each case.
The data sources used to determine physical, toxic and ecotoxic data, are indicated directly in the corresponding section.

Creation of the safety data sheet
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This information is based on our present knowledge and experience.
The safety data sheet describes products with a view to safety requirements.
It does not however, constitute a guarantee for any specific product properties and shall not establish a legally valid

contractual relationship.

Prod-ID 767761

ADDITIONAL INFORMATION TO THE STABILITY AND REACTIVITY PROPERTIES

1. Emission of gaseous substances in an open/permeable container.

This product can generate emissions of CO and CO2. The emission rate as - *gram/ton*$_{graphite}$*/day* - given below (Tab 1) are from measurements of gas generated within a sealed container filled with graphite, with an initial atmospheric pressure of air in both constant volume or constant pressure condition over a period of 28 days.

Table 1. Maximal CO and CO_2 release during the storage test of CyPbrid and HSAG at 22 ±2°C.

	Non-ventilated, constant volume (no additional supply of oxygen)	Non ventilated, constant pressure (no additional supply of oxygen)	Ventilated, atmospheric pressure (constant supply oxygen)
CyPbrid and HSAG			
• CO	Max 0.60 g/ton/d	Max 0.56 g/ton/d	No data available
• CO_2	Max 5 g/ton/d	Max 30 g/ton/d	No data available

The CO and CO_2 release from CyPbrid and HSAG are measured during a long lasting (over 28 days) real life experiment. The CO and CO_2 data are shown in Table 2.

Table 2. Maximal CO and CO_2 concentration released during the storage test measured in a real life experiment.

	Non-ventilated, constant volume (no additional supply of oxygen)	Non ventilated, constant pressure (no additional supply of oxygen)	Ventilated, atmospheric pressure (constant supply oxygen)
CyPbrid and HSAG			
• CO	2300 ppmv	1000 ppmv	< 1 ppmv
• CO_2	17000 ppmv	10500 ppmv	No data available

To conclude: the limit value (MAC) is generally around 25-30 ppmv which means a person shall not be exposed to the atmosphere in the non-ventilated containment. To keep the concentration below the limit value (MAC), a typical minimal industrial ventilation rate exchange of 5 - 10 air exchanges per hour of the containment is recommended.

Table 3. Exposure limits for CO and CO_2 (EU and US)

Carbon monoxide (630-08-0)		
Austria	MAK (mg/m³)	33 mg/m³
Austria	MAK (ppm)	30 ppm
Austria	MAK Short time value (mg/m³)	66 mg/m³
Austria	MAK Short time value (ppm)	60 ppm
Belgium	Limit value (mg/m³)	29 mg/m³
Belgium	Limit value (ppm)	25 ppm
Bulgaria	OEL TWA (mg/m³)	40 mg/m³
Bulgaria	OEL STEL (mg/m³)	200 mg/m³
Croatia	GVI (granična vrijednost izloženosti) (mg/m³)	35 mg/m³
Croatia	GVI (granična vrijednost izloženosti) (ppm)	30 ppm
Croatia	KGVI (kratkotrajna granična vrijednost izloženosti) (mg/m³)	232 mg/m³
Croatia	KGVI (kratkotrajna granična vrijednost izloženosti) (ppm)	200 ppm
Czech Republic	Expoziční limity (PEL) (mg/m³)	30 mg/m³
Denmark	Grænseværdie (langvarig) (mg/m³)	29 mg/m³
Denmark	Grænseværdie (langvarig) (ppm)	25 ppm
Estonia	OEL TWA (mg/m³)	40 mg/m³ 25 mg/m³ (in exhaust)
Estonia	OEL TWA (ppm)	35 ppm 20 ppm (in exhaust)
Estonia	OEL STEL (mg/m³)	120 mg/m³
Estonia	OEL STEL (ppm)	100 ppm
Finland	HTP-arvo (8h) (mg/m³)	35 mg/m³
Finland	HTP-arvo (8h) (ppm)	30 ppm
Finland	HTP-arvo (15 min)	87 mg/m³
Finland	HTP-arvo (15 min) (ppm)	75 ppm
France	VME (mg/m³)	55 mg/m³

Carbon monoxide (630-08-0)		
France	VME (ppm)	50 ppm
Germany	TRGS 900 Occupational exposure limit value (mg/m³)	35 mg/m³ (The risk of damage to the embryo or foetus cannot be excluded even when AGW and BGW values are observed)
Germany	TRGS 900 Occupational exposure limit value (ppm)	30 ppm (The risk of damage to the embryo or foetus cannot be excluded even when AGW and BGW values are observed)
Germany	TRGS 903 (BGW)	5 % (Medium: whole blood - Time: end of shift - Parameter: CO-Hb (derivation of biological threshold limit due to acute toxic effects)
Greece	OEL TWA (mg/m³)	55 mg/m³
Greece	OEL TWA (ppm)	50 ppm
Greece	OEL STEL (mg/m³)	330 mg/m³
Greece	OEL STEL (ppm)	300 ppm
Hungary	AK-érték	33 mg/m³
Hungary	CK-érték	66 mg/m³
Ireland	OEL (8 hours ref) (mg/m³)	23 mg/m³
Ireland	OEL (8 hours ref) (ppm)	20 ppm
Ireland	OEL (15 min ref) (mg/m3)	115 mg/m³
Ireland	OEL (15 min ref) (ppm)	100 ppm
Latvia	OEL TWA (mg/m³)	20 mg/m³
Lithuania	IPRV (mg/m³)	40 mg/m³ 25 mg/m³ (if the sources are from engines exhaust gases)
Lithuania	IPRV (ppm)	35 ppm 20 ppm (if the sources are from engines exhaust gases)
Lithuania	TPRV (mg/m³)	120 mg/m³ (including if the sources are from engines exhaust gases)
Lithuania	TPRV (ppm)	100 ppm (including if the sources are from engines exhaust gases)
Netherlands	Grenswaarde TGG 8H (mg/m³)	29 mg/m³
Poland	NDS (mg/m³)	23 mg/m³
Poland	NDSCh (mg/m³)	117 mg/m³
Portugal	OEL TWA (ppm)	25 ppm
Romania	OEL TWA (mg/m³)	20 mg/m³
Romania	OEL TWA (ppm)	17,5 ppm

Carbon monoxide (630-08-0)		
Romania	OEL STEL (mg/m³)	30 mg/m³
Romania	OEL STEL (ppm)	26 ppm
Slovakia	NPHV (priemerná) (mg/m³)	35 mg/m³
Slovakia	NPHV (priemerná) (ppm)	30 ppm
Slovakia	NPHV (Hraničná) (mg/m³)	70 mg/m³
Slovenia	OEL TWA (mg/m³)	35 mg/m³
Slovenia	OEL TWA (ppm)	30 ppm
Slovenia	OEL STEL (mg/m³)	70 mg/m³
Slovenia	OEL STEL (ppm)	60 ppm
Spain	VLA-ED (mg/m³)	29 mg/m³
Spain	VLA-ED (ppm)	25 ppm
Sweden	nivågränsvärde (NVG) (mg/m³)	25 mg/m³ (total of CO) 40 mg/m³
Sweden	nivågränsvärde (NVG) (ppm)	35 ppm 20 ppm (total of CO)
Sweden	kortidsvärde (KTV) (mg/m³)	120 mg/m³
Sweden	kortidsvärde (KTV) (ppm)	100 ppm
United Kingdom	WEL TWA (mg/m³)	35 mg/m³
United Kingdom	WEL TWA (ppm)	30 ppm
United Kingdom	WEL STEL (mg/m³)	232 mg/m³
United Kingdom	WEL STEL (ppm)	200 ppm
Norway	Grenseverdier (AN) (mg/m³)	29 mg/m³
Norway	Grenseverdier (AN) (ppm)	25 ppm
Norway	Grenseverdier (Korttidsverdi) (mg/m3)	29 mg/m³ (listed in the List of Administrative Norms. Written instructions shall be prepared for work in CO atmosphere if the STEL limit is exceeded)
Norway	Grenseverdier (Korttidsverdi) (ppm)	25 ppm (listed in the List of Administrative Norms. Written instructions shall be prepared for work in CO atmosphere if the STEL limit is exceeded)
Switzerland	VME (mg/m³)	35 mg/m³
Switzerland	VME (ppm)	30 ppm
Switzerland	VLE (mg/m³)	70 mg/m³
Switzerland	VLE (ppm)	60 ppm
Australia	TWA (mg/m³)	34 mg/m³
Australia	TWA (ppm)	30 ppm

Carbon monoxide (630-08-0)		
Canada (Quebec)	VECD (mg/m³)	230 mg/m³
Canada (Quebec)	VECD (ppm)	200 ppm
Canada (Quebec)	VEMP (mg/m³)	40 mg/m³
Canada (Quebec)	VEMP (ppm)	35 ppm
USA - ACGIH	ACGIH TWA (ppm)	25 ppm
USA - IDLH	US IDLH (ppm)	1200 ppm
USA - NIOSH	NIOSH REL (TWA) (mg/m³)	40 mg/m³
USA - NIOSH	NIOSH REL (TWA) (ppm)	35 ppm
USA - NIOSH	NIOSH REL (ceiling) (mg/m³)	229 mg/m³
USA - NIOSH	NIOSH REL (ceiling) (ppm)	200 ppm
USA - OSHA	OSHA PEL (TWA) (mg/m³)	55 mg/m³
USA - OSHA	OSHA PEL (TWA) (ppm)	50 ppm

carbon dioxide (124-38-9)		
EU	IOELV TWA (mg/m³)	9000 mg/m³
EU	IOELV TWA (ppm)	5000 ppm
Austria	MAK (mg/m³)	9000 mg/m³
Austria	MAK (ppm)	5000 ppm
Austria	MAK Short time value (mg/m³)	18000 mg/m³
Austria	MAK Short time value (ppm)	10000 ppm
Belgium	Limit value (mg/m³)	9131 mg/m³
Belgium	Limit value (ppm)	5000 ppm
Belgium	Short time value (mg/m³)	54784 mg/m³
Belgium	Short time value	30000 ppm
Bulgaria	OEL TWA (mg/m³)	9000 mg/m³
Bulgaria	OEL TWA (ppm)	5000 ppm
Croatia	GVI (granična vrijednost izloženosti) (mg/m³)	9000 mg/m³
Croatia	GVI (granična vrijednost izloženosti) (ppm)	5000 ppm
Cyprus	OEL TWA (mg/m³)	9000 mg/m³
Cyprus	OEL TWA (ppm)	5000 ppm
Czech Republic	Expoziční limity (PEL) (mg/m³)	9000 mg/m³
Denmark	Grænseværdie (langvarig) (mg/m³)	9000 mg/m³
Denmark	Grænseværdie (langvarig) (ppm)	5000 ppm
Estonia	OEL TWA (mg/m³)	9000 mg/m³

carbon dioxide (124-38-9)		
Estonia	OEL TWA (ppm)	5000 ppm
Finland	HTP-arvo (8h) (mg/m³)	9100 mg/m³
Finland	HTP-arvo (8h) (ppm)	5000 ppm
France	VME (mg/m³)	9000 mg/m³ (indicative limit)
France	VME (ppm)	5000 ppm (indicative limit)
Germany	TRGS 900 Occupational exposure limit value (mg/m³)	9100 mg/m³
Germany	TRGS 900 Occupational exposure limit value (ppm)	5000 ppm
Gibraltar	OEL TWA (mg/m³)	9000 mg/m³
Gibraltar	OEL TWA (ppm)	5000 ppm
Greece	OEL TWA (mg/m³)	9000 mg/m³
Greece	OEL TWA (ppm)	5000 ppm
Greece	OEL STEL (mg/m³)	54000 mg/m³
Greece	OEL STEL (ppm)	5000 ppm
Hungary	AK-érték	9000 mg/m³
Ireland	OEL (8 hours ref) (mg/m³)	9000 mg/m³
Ireland	OEL (8 hours ref) (ppm)	5000 ppm
Ireland	OEL (15 min ref) (mg/m3)	27000 mg/m³
Ireland	OEL (15 min ref) (ppm)	15000 ppm
Italy	OEL TWA (mg/m³)	9000 mg/m³
Italy	OEL TWA (ppm)	5000 ppm
Latvia	OEL TWA (mg/m³)	9000 mg/m³
Latvia	OEL TWA (ppm)	5000 ppm
Lithuania	IPRV (mg/m³)	9000 mg/m³ (Carbon dioxide is often regarded as an indicator of the work rooms, where air pollution is due to human presence there)
Lithuania	IPRV (ppm)	5000 ppm (Carbon dioxide is often regarded as an indicator of the work rooms, where air pollution is due to human presence there)
Luxembourg	OEL TWA (mg/m³)	9000 mg/m³
Luxembourg	OEL TWA (ppm)	5000 ppm
Malta	OEL TWA (mg/m³)	9000 mg/m³
Malta	OEL TWA (ppm)	5000 ppm
Netherlands	Grenswaarde TGG 8H (mg/m³)	9000 mg/m³

carbon dioxide (124-38-9)		
Poland	NDS (mg/m³)	9000 mg/m³ (except underground coal mining)
Poland	NDSCh (mg/m³)	27000 mg/m³ (except underground coal mining)
Portugal	OEL TWA (mg/m³)	9000 mg/m³ (indicative limit value)
Portugal	OEL TWA (ppm)	5000 ppm (indicative limit value)
Portugal	OEL STEL (ppm)	30000 ppm
Romania	OEL TWA (mg/m³)	9000 mg/m³
Romania	OEL TWA (ppm)	5000 ppm
Romania	OEL STEL (mg/m³)	30 mg/m³
Romania	OEL STEL (ppm)	26 ppm
Slovakia	NPHV (priemerná) (mg/m³)	9000 mg/m³
Slovakia	NPHV (priemerná) (ppm)	5000 ppm
Slovenia	OEL TWA (mg/m³)	9000 mg/m³
Slovenia	OEL TWA (ppm)	5000 ppm
Spain	VLA-ED (mg/m³)	9150 mg/m³ (indicative limit value)
Spain	VLA-ED (ppm)	5000 ppm (indicative limit value)
Sweden	nivågränsvärde (NVG) (mg/m³)	9000 mg/m³
Sweden	nivågränsvärde (NVG) (ppm)	5000 ppm
Sweden	kortidsvärde (KTV) (mg/m³)	18000 mg/m³
Sweden	kortidsvärde (KTV) (ppm)	10000 ppm
United Kingdom	WEL TWA (mg/m³)	9150 mg/m³
United Kingdom	WEL TWA (ppm)	5000 ppm
United Kingdom	WEL STEL (mg/m³)	27400 mg/m³
United Kingdom	WEL STEL (ppm)	15000 ppm
Norway	Grenseverdier (AN) (mg/m³)	9000 mg/m³
Norway	Grenseverdier (AN) (ppm)	5000 ppm
Norway	Grenseverdier (Korttidsverdi) (mg/m3)	9000 mg/m³
Norway	Grenseverdier (Korttidsverdi) (ppm)	5000 ppm
Switzerland	VME (mg/m³)	9000 mg/m³
Switzerland	VME (ppm)	5000 ppm
Australia	TWA (mg/m³)	9000 mg/m³ 22500 mg/m³ (in coal mines)
Australia	TWA (ppm)	5000 ppm 12500 ppm (in coal mines)
Australia	STEL (mg/m³)	54000 mg/m³

carbon dioxide (124-38-9)		
Australia	STEL (ppm)	30000 ppm
Canada (Quebec)	VECD (mg/m³)	54000 mg/m³
Canada (Quebec)	VECD (ppm)	30000 ppm
Canada (Quebec)	VEMP (mg/m³)	9000 mg/m³
Canada (Quebec)	VEMP (ppm)	5000 ppm
USA - ACGIH	ACGIH TWA (ppm)	5000 ppm
USA - ACGIH	ACGIH STEL (ppm)	30000 ppm
USA - IDLH	US IDLH (ppm)	40000 ppm
USA - NIOSH	NIOSH REL (TWA) (mg/m³)	9000 mg/m³
USA - NIOSH	NIOSH REL (TWA) (ppm)	5000 ppm
USA - NIOSH	NIOSH REL (STEL) (mg/m³)	54000 mg/m³
USA - NIOSH	NIOSH REL (STEL) (ppm)	30000 ppm
USA - OSHA	OSHA PEL (TWA) (mg/m³)	9000 mg/m³
USA - OSHA	OSHA PEL (TWA) (ppm)	5000 ppm

More accurate estimation of gas concentrations in containment is available at the manufacturer Imerys, upon request.

2. Precautions

2.1. Storage precautions

HSAG and CyPbrid can emit gaseous invisible substances and ambient oxygen is typically depleted.
Emitted gases are immediately diluted by the air in the containment and are eliminated with ventilation air. The gases emitted at normal indoor temperature include carbon-monoxide (CO), carbon-dioxide (CO_2) and negligible amounts of other gases like methane and nitrogen oxide, typically below the normal air content.

If HSAG or CyPbrid are stored in bulk, or in bags in an unventilated space with less than 5 - 10 air exchange per hour, the concentration of emitted gases, or the oxygen depletion, may pose a health threat for humans present in the containment and precautions should be taken.

For large enclosed storages, entry should be prohibited by means of secured lock and a well established written approval process for entry. Entry shall be allowed only AFTER ventilation has been concluded, and measurement with gas meter has confirmed safe atmosphere in the space. Alternatively, use self-contained breathing apparatus when entering space. In this case, always make sure backup personnel are in the immediate vicinity monitoring the entry.
Label points of entry to enclosed storage areas containing HSAG or CyPbrid with “Carbon monoxide Risk Area, Ventilate thoroughly before Entry”.

2.1.1. Non-ventilated warehouse

In all cases a non-ventilated storage room is not recommended. Even in the case of non permeable packaging, the risk of rupture by incidents is present. If a ventilated storage is not possible, both room monitoring and personal monitoring for oxygen and carbon monoxide are mandatory. In case of alarm, people can enter only using adequate PPE (Personal Protective Equipment) for carbon monoxide.

In case of depleted oxygen levels, a self contained breathing apparatus must be worn before entering the storage. Alternatively the door can be maintained open until the oxygen level will be back to the normal level.

To conclude: the use of a non-ventilated room is discouraged.

2.1.2. Ventilated warehouse

In the case of continuously ventilation, at a rate of 5-10 air exchange per hour of the empty volume, no risk should be detected. In any case, personal monitoring is recommended, in the case of ventilation failure. This is valid for any kind of packaging, including bulk open container.

2.2. Transportation precautions

2.2.1. Surface transport

Small amounts in pallet by truck

There is a short turnover term and small amount of CyPbrid product from the factory to the client. Due to the factors of short delivery time and small amount, the risk of release of significant concentrations of carbon monoxide is minimal, excluding the cases of using paper bags or ruptured of bags. In the latter the

concentrations of carbon monoxide/carbon dioxide might be significant and personal monitoring for CO and an effective PPE is required when opening the truck, e.g. inspection purposes.

Opening of the truck doors is allowed only after reading this MSDS, including the annex.

Opening the truck doors requires a person, equipped with a personal CO monitoring and suitable PPE available in case of alarm. In any case the opening of the doors without staying exposed at the entrance for at least 10 minutes should be sufficient to exchange the internal air and to allow a safe emptying of the truck.

Only the use of paper bags cannot be recommended for the transport of small amounts of CyPbrid by truck.

Container by truck

Container transport by truck is usually over a longer period of time, with a considerable amount of CyPbrid product.

Due to the high amount of product transported in a sealed container, the risks of release of significant amounts of carbon monoxide and/or carbon dioxide are minimal, except when using paper bags or in the case of a ruptured packaging. In the latter the concentrations of carbon monoxide/carbon dioxide might be significant and personal monitoring for CO and an effective PPE is required when opening the container e.g. inspection purposes.

Opening of the container doors is allowed only after reading this MSDS, including the annex.

Opening the container doors requires a person, equipped with a personal CO monitoring and suitable PPE available in case of alarm. In any case the opening of the doors without staying exposed at the entrance for at least 10 minutes should be sufficient to exchange the internal air and to allow a safe emptying of the container.

Container by ship

The transport time can be very long (weeks to months), with potential high fluctuations in temperature.

Due to the high amount of product transported in a sealed container, the risks of release of significant amounts of carbon monoxide and/or carbon dioxide are minimal, except when using paper bags or in the case of a ruptured packaging. In the latter the concentrations of carbon monoxide/carbon dioxide might be significant and personal monitoring for CO and effective PPE are required when opening the container e.g. for inspection purposes.

Opening of the container doors is allowed only after reading this SDS, including the annex.

Opening the container doors requires a person, equipped with a personal CO monitoring and suitable PPE available in case of alarm. In any case the opening of the doors without staying exposed at the entrance for at least 10 minutes should be sufficient to exchange the internal air and to allow a safe emptying of the container.

2.2.2. Air transport (Small amounts)

Both the risks of rupturing the packaging and gas generation are high in the air transportation mitigated only by the short time (less 24h). For this reason we strictly recommend to use only the composite bag (PE-Al-PE) and the HDPE drum to reduce the risk to a minimal level

2.3. Handling precautions

2.3.1. Opening of the container at arrival

Opening of the container doors is allowed only after reading this MSDS, including the annex.

Opening the container doors requires a person, equipped with a personal CO monitoring and suitable PPE available in case of alarm. In any case the opening of the doors without staying exposed at the entrance for at least 10 minutes should be sufficient to exchange the internal air and to allow a safe emptying of the container.

2.3.2. Internal logistic

Internal logistic is linked with the room ventilation. If there is no ventilation present in the storage or even temporary storage rooms, see section 2.1.1. Non-ventilated warehouse for precaution guidelines. In all the cases of loading the warehouse, picking up the product of the warehouse, reorganizing the available space in the warehouse or in any other case like cleaning, inspection, pest control, ... personal monitoring is mandatory, while the appropriate PPE's should be available.

2.4. Use

Considering the short time required to open the bags and to transfer the products the risk is minimal.

2.5. CO-intoxication and prevention

Carbon monoxide: carbon monoxide is highly toxic gas, by means of binding with the hemoglobin in the blood to form carboxyhemoglobin which cannot take part in normal oxygen transport, greatly reducing the blood's capability to transport oxygen to vital organs such as the brain. In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation.
Carbon dioxide: carbon dioxide is primarily hazardous by means of replacing the air and thereby depriving the space of oxygen.

In case HSAG or CyPbrid are not handled or stored in accordance with recommendations in Section 7.2 the risk of harmful exposure increases, particularly exposure to concentration of CO higher than the limit values (MAC) (Table 3). In case of exposure it is important to quickly remove the victim from the contaminated area. Unconscious persons should immediately be given oxygen and artificial respiration.
The administration of oxygen at an elevated pressure has shown to be beneficial, as has treatment in a hyperbaric chamber. If unconscious, place in recovery position and seek medical advice. Artificial respiration and/or oxygen may be necessary.
Oxygen detectors should be used when asphyxiating gases may be released.

3. Emission of gaseous substances from sealed, not permeable containers

In case the product is received in a sealed non permeable packaging (plastic, or multilayer plastic-aluminum), no risk of CO or CO_2 emission is expected, excluding the risk of ruptured or defect containers (see 1.1).
Ventilation is not longer a requirement, on the condition that concentration levels are monitored using a standard room gas analyser.