SAFETY DATA SHEET

Creation Date 25-Jan-2011 **Revision Date** 10-Sep-2015 **Revision Number** 8

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. Product identification

Product Description:	**Iron pentacarbonyl**
Cat No. :	**412600000; 412600010; 412600250; 412601000**
Synonyms	Pentacarbonyl iron
CAS-No	13463-40-6
EC-No.	236-670-8
Molecular Formula	C5 Fe O5

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

Recommended Use	Laboratory chemicals.
Uses advised against	No Information available

1.3. Details of the supplier of the safety data sheet

Company	Acros Organics BVBA Janssen Pharmaceuticalaan 3a 2440 Geel, Belgium
E-mail address	begel.sdsdesk@thermofisher.com

1.4. Emergency telephone number

For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US:**001-201-796-7100 / **Europe:** +32 14 57 52 99
CHEMTREC Tel. No.**US:**001-800-424-9300 / **Europe:**001-703-527-3887

SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture

CLP Classification - Regulation (EC) No 1272/2008

Physical hazards

Flammable liquids	Category 2

Health hazards

Acute oral toxicity	Category 2
Acute dermal toxicity	Category 2
Acute Inhalation Toxicity - Vapors	Category 1
Specific target organ toxicity - (repeated exposure)	Category 1

Environmental hazards

Based on available data, the classification criteria are not met

2.2. Label elements

Signal Word **Danger**

Hazard Statements

H225 - Highly flammable liquid and vapor
H330 - Fatal if inhaled
H300 - Fatal if swallowed
H310 - Fatal in contact with skin
H372 - Causes damage to organs through prolonged or repeated exposure if inhaled

Precautionary Statements

P280 - Wear protective gloves/ protective clothing/ eye protection/ face protection
P302 + P350 - IF ON SKIN: Gently wash with plenty of soap and water
P310 - Immediately call a POISON CENTER or doctor/ physician
P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking
P330 - Rinse mouth
P304 + P340 - IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing

2.3. Other hazards

No information available

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1. Substances

Component	CAS-No	EC-No.	Weight %	CLP Classification - Regulation (EC) No 1272/2008
Iron, pentacarbonyl-	13463-40-6	EEC No. 236-670-8	>95	Acute Tox. 2 (H300) Acute Tox. 2 (H310) Acute Tox. 1 (H330) Flam. Liq. 2 (H225) STOT RE 1 (H372)

Full text of Hazard Statements: see section 16

SECTION 4: FIRST AID MEASURES

4.1. Description of first aid measures

General Advice Immediate medical attention is required. Show this safety data sheet to the doctor in attendance.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.

Ingestion Do not induce vomiting. Call a physician or Poison Control Center immediately.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth

resuscitation if victim ingested or inhaled the substance; induce artificial respiration with a respiratory medical device. Immediate medical attention is required.

Protection of First-aiders Remove all sources of ignition.

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

Breathing difficulties. . Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

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

Notes to Physician Treat symptomatically.

SECTION 5: FIREFIGHTING MEASURES

5.1. Extinguishing media

Suitable Extinguishing Media
Cool closed containers exposed to fire with water spray.

Extinguishing media which must not be used for safety reasons
No information available.

5.2. Special hazards arising from the substance or mixture

Containers may explode when heated. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Extremely flammable.

Hazardous Combustion Products
None under normal use conditions.

5.3. Advice for firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Keep people away from and upwind of spill/leak. Evacuate personnel to safe areas. Ensure adequate ventilation. Remove all sources of ignition. Take precautionary measures against static discharges.

6.2. Environmental precautions

Should not be released into the environment. See Section 12 for additional ecological information.

6.3. Methods and material for containment and cleaning up

Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

6.4. Reference to other sections

Refer to protective measures listed in Sections 8 and 13.

SECTION 7: HANDLING AND STORAGE

7.1. Precautions for safe handling

Use only under a chemical fume hood. Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Do not ingest. Do not breathe vapors or spray mist. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded. Take precautionary measures against static discharges.

7.2. Conditions for safe storage, including any incompatibilities

Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat and sources of ignition.

7.3. Specific end use(s)

Use in laboratories

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

Exposure limits
List source(s): **UK** - EH40/2005 Containing the workplace exposure limits (WELs) for use with the Control of Substances Hazardous to Health Regulations (COSHH) 2002 (as amended). Updated by September 2006 official press release and October 2007 Supplement. **IRE -** 2010 Code of Practice for the Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001. Published by the Health and Safety Authority.

Component	European Union	The United Kingdom	France	Belgium	Spain
Iron, pentacarbonyl-		STEL: 0.03 ppm 15 min STEL: 0.24 mg/m³ 15 min TWA: 0.01 ppm 8 hr TWA: 0.08 mg/m³ 8 hr	TWA / VME: 0.1 ppm (8 heures). TWA / VME: 0.8 mg/m³ (8 heures).	TWA: 0.1 ppm 8 uren TWA: 0.23 mg/m³ 8 uren STEL: 0.2 ppm 15 minuten STEL: 0.46 mg/m³ 15 minuten	STEL / VLA-EC: 0.2 ppm (15 minutos). STEL / VLA-EC: 1.6 mg/m³ (15 minutos). TWA / VLA-ED: 0.1 ppm (8 horas) TWA / VLA-ED: 0.8 mg/m³ (8 horas) TWA / VLA-ED: 1 mg/m³ (8 horas)

Component	Italy	Germany	Portugal	The Netherlands	Finland
Iron, pentacarbonyl-		TWA: 0.1 ppm (8 Stunden). AGW - exposure factor 2 TWA: 0.81 mg/m³ (8 Stunden). AGW - exposure factor 2 TWA: 0.1 ppm (8 Stunden). MAK TWA: 0.81 mg/m³ (8 Stunden). MAK Höhepunkt: 0.2 ppm Höhepunkt: 1.62 mg/m³ Haut	STEL: 0.2 ppm 15 minutos TWA: 0.1 ppm 8 horas TWA: 1 mg/m³ 8 horas		STEL: 0.01 ppm 15 minuutteina STEL: 0.081 mg/m³ 15 minuutteina

Component	Austria	Denmark	Switzerland	Poland	Norway
Iron, pentacarbonyl-	MAK-KZW: 0.4 ppm 15 Minuten MAK-KZW: 3.2 mg/m³ 15 Minuten MAK-TMW: 0.1 ppm 8 Stunden MAK-TMW: 0.8 mg/m³ 8 Stunden	TWA: 0.1 ppm 8 timer TWA: 0.8 mg/m³ 8 timer	Haut/Peau STEL: 0.2 ppm 15 Minuten STEL: 1.6 mg/m³ 15 Minuten TWA: 0.1 ppm 8 Stunden TWA: 0.8 mg/m³ 8 Stunden TWA: 1 mg/m³ 8 Stunden		TWA: 0.01 ppm 8 timer TWA: 0.08 mg/m³ 8 timer STEL: 0.01 ppm 15 minutter. STEL: 0.08 mg/m³ 15 minutter.

Component	Bulgaria	Croatia	Ireland	Cyprus	Czech Republic
Iron, pentacarbonyl-		TWA-GVI: 0.01 ppm 8 satima. Fe TWA-GVI: 0.08 mg/m³ 8	TWA: 0.01 ppm 8 hr. Fe TWA: 0.08 mg/m³ 8 hr.		TWA: 0.2 mg/m³ 8 hodinách. Fe Ceiling: 0.5 mg/m³ Fe

		satima. Fe	Fe STEL: 0.03 ppm 15 min STEL: 0.24 mg/m³ 15 min		

Component	Estonia	Gibraltar	Greece	Hungary	Iceland
Iron, pentacarbonyl-			STEL: 1.6 mg/m³ TWA: 0.8 mg/m³		TWA: 0.1 ppm 8 klukkustundum. TWA: 0.8 mg/m³ 8 klukkustundum. Ceiling: 0.2 ppm Ceiling: 1.6 mg/m³

Component	Latvia	Lithuania	Luxembourg	Malta	Romania
Iron, pentacarbonyl-	TWA: 0.1 mg/m³				

Component	Russia	Slovak Republic	Slovenia	Sweden	Turkey
Iron, pentacarbonyl-	Skin notation MAC: 0.1 mg/m³	Ceiling: 1.62 mg/m³ TWA: 0.1 ppm TWA: 0.81 mg/m³	TWA: 0.1 ppm 8 urah TWA: 0.81 mg/m³ 8 urah STEL: 0.4 ppm 15 minutah STEL: 3.24 mg/m³ 15 minutah		

Biological limit values
This product, as supplied, does not contain any hazardous materials with biological limits established by the region specific regulatory bodies.

Monitoring methods
BS EN 14042:2003 Title Identifier: Workplace atmospheres. Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents.
MDHS70 General methods for sampling airborne gases and vapours
MDHS 88 Volatile organic compounds in air. Laboratory method using diffusive samplers, solvent desorption and gas chromatography
MDHS 96 Volatile organic compounds in air - Laboratory method using pumped solid sorbent tubes, solvent desorption and gas chromatography

Derived No Effect Level (DNEL) No information available

Route of exposure	Acute effects (local)	Acute effects (systemic)	Chronic effects (local)	Chronic effects (systemic)
Oral				
Dermal				
Inhalation				

Predicted No Effect Concentration (PNEC) No information available.

8.2. Exposure controls

Engineering Measures
Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location. Use explosion-proof electrical/ventilating/lighting/equipment. Ensure adequate ventilation, especially in confined areas.
Wherever possible, engineering control measures such as the isolation or enclosure of the process, the introduction of process or equipment changes to minimise release or contact, and the use of properly designed ventilation systems, should be adopted to control hazardous materials at source

Personal protective equipment

Eye Protection Goggles (European standard - EN 166)
Hand Protection Protective gloves

Glove material	Breakthrough time	Glove thickness	EU standard	Glove comments
Natural rubber Nitrile rubber Neoprene PVC	See manufacturers recommendations	-	EN 374	(minimum requirement)

Skin and body protection Long sleeved clothing

Inspect gloves before use.
Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. (Refer to manufacturer/supplier for information)
Ensure gloves are suitable for the task: Chemical compatability, Dexterity, Operational conditions, User susceptibility, e.g. sensitisation effects, also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion.
Remove gloves with care avoiding skin contamination.

Respiratory Protection When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.
To protect the wearer, respiratory protective equipment must be the correct fit and be used and maintained properly

Large scale/emergency use Use a NIOSH/MSHA or European Standard EN 136 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced
Recommended Filter type: Particulates filter conforming to EN 143 Inorganic gases and vapours filter Type B Grey conforming to EN14387

Small scale/Laboratory use Use a NIOSH/MSHA or European Standard EN 149:2001 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.
Recommended half mask:- Particle filtering: EN149:2001
When RPE is used a face piece Fit Test should be conducted

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

Environmental exposure controls No information available.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

Appearance	Brown	
Physical State	Liquid	
Odor	No information available	
Odor Threshold	No data available	
pH	No information available	
Melting Point/Range	-20 °C / -4 °F	
Softening Point	No data available	
Boiling Point/Range	103 °C / 217.4 °F	@ 760 mmHg
Flash Point	-15 °C / 5 °F	**Method -** No information available
Evaporation Rate	No data available	
Flammability (solid,gas)	Not applicable	Liquid
Explosion Limits	No data available	
Vapor Pressure	35 hPa (20°C)	
Vapor Density	6.74 (Air = 1.0)	(Air = 1.0)
Specific Gravity / Density	1.490	
Bulk Density	Not applicable	Liquid
Water Solubility	Insoluble	
Solubility in other solvents	No information available	

Partition Coefficient (n-octanol/water)

Component	**log Pow**
Iron, pentacarbonyl-	3

Autoignition Temperature	49 - °C / 120.2 - °F
Decomposition Temperature	No data available

Viscosity	No data available	
Explosive Properties	No information available	Vapors may form explosive mixtures with air
Oxidizing Properties	No information available	

9.2. Other information

Molecular Formula	C5 Fe O5
Molecular Weight	195.9

SECTION 10: STABILITY AND REACTIVITY

10.1. Reactivity

None known, based on information available

10.2. Chemical stability

Stable under normal conditions

10.3. Possibility of hazardous reactions

Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

10.4. Conditions to avoid

Incompatible products. Excess heat. Keep away from open flames, hot surfaces and sources of ignition.

10.5. Incompatible materials

Strong oxidizing agents. Strong bases. Halogens. Amines.

10.6. Hazardous decomposition products

None under normal use conditions.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects

Product Information

(a) acute toxicity;

Oral	Category 2
Dermal	Category 2
Inhalation	Category 1

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Iron, pentacarbonyl-	LD50 = 40 mg/kg (Rat)	LD50 = 56 mg/kg (Rabbit)	LC50 = 10 ppm (Rat) 4 h LC50 = 0.32 mg/L (Rat) 4 h

(b) skin corrosion/irritation; No data available

(c) serious eye damage/irritation; No data available

(d) respiratory or skin sensitization;

Respiratory	No data available
Skin	No data available

(e) germ cell mutagenicity; No data available

(f) carcinogenicity; No data available

There are no known carcinogenic chemicals in this product

(g) reproductive toxicity; No data available

(h) STOT-single exposure; No data available

(i) STOT-repeated exposure; Category 1

Target Organs Respiratory system, Blood, Liver, Gastrointestinal tract (GI), Central nervous system (CNS), Eyes, Kidney, Skin.

(j) aspiration hazard; No data available

Other Adverse Effects The toxicological properties have not been fully investigated.

Symptoms / effects,both acute and delayed Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

SECTION 12: ECOLOGICAL INFORMATION

12.1. Toxicity

Ecotoxicity effects .

Component	Freshwater Fish	Water Flea	Freshwater Algae	Microtox
Iron, pentacarbonyl-	LC50: = 990 mg/L, 96h static (Leuciscus idus)	EC50: = 130 mg/L, 48h (Daphnia magna)	EC50: = 150 mg/L, 72h (Desmodesmus subspicatus)	EC50 > 10000 mg/L 30 min

12.2. Persistence and degradability

Persistence Insoluble in water, Persistence is unlikely, based on information available.

Degradability Not relevant for inorganic substances.

12.3. Bioaccumulative potential May have some potential to bioaccumulate

Component	log Pow	Bioconcentration factor (BCF)
Iron, pentacarbonyl-	3	No data available

12.4. Mobility in soil Spillage unlikely to penetrate soil The product is insoluble and sinks in water The product contains volatile organic compounds (VOC) which will evaporate easily from all surfaces . Is not likely mobile in the environment due its low water solubility. Will likely be mobile in the environment due to its volatility.

12.5. Results of PBT and vPvB assessment No data available for assessment.

12.6. Other adverse effects

Endocrine Disruptor Information This product does not contain any known or suspected endocrine disruptors

Persistent Organic Pollutant This product does not contain any known or suspected substance

Ozone Depletion Potential This product does not contain any known or suspected substance

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Waste from Residues / Unused Products Waste is classified as hazardous. Dispose of in accordance with the European Directives on waste and hazardous waste. Dispose of in accordance with local regulations.

Contaminated Packaging Dispose of this container to hazardous or special waste collection point. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep product and empty container away from heat and sources of ignition.

European Waste Catalogue (EWC) According to the European Waste Catalogue, Waste Codes are not product specific, but application specific.

Other Information Waste codes should be assigned by the user based on the application for which the product was used. Do not dispose of waste into sewer. Can be incinerated, when in compliance with local regulations.

SECTION 14: TRANSPORT INFORMATION

IMDG/IMO

14.1. UN number UN1994
14.2. UN proper shipping name IRON PENTACARBONYL
14.3. Transport hazard class(es) 6.1
Subsidiary Hazard Class 3
14.4. Packing group I

ADR

14.1. UN number UN1994
14.2. UN proper shipping name IRON PENTACARBONYL
14.3. Transport hazard class(es) 6.1
Subsidiary Hazard Class 3
14.4. Packing group I

IATA Forbidden

14.1. UN number
14.2. UN proper shipping name
14.3. Transport hazard class(es)
14.4. Packing group

14.5. Environmental hazards No hazards identified

14.6. Special precautions for user No special precautions required

14.7. Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code Not applicable, packaged goods

SECTION 15: REGULATORY INFORMATION

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

International Inventories X = listed

Component	EINECS	ELINCS	NLP	TSCA	DSL	NDSL	PICCS	ENCS	IECSC	AICS	KECL
Iron, pentacarbonyl-	236-670-8	-		X	X	-	X	X	-	X	X

National Regulations

Component	Germany - Water Classification (VwVwS)	Germany - TA-Luft Class
Iron, pentacarbonyl-	WGK 2	

Take note of Control of Substances Hazardous to Health Regulations (COSHH) 2002 and 2005 Amendment.
Take note of Dir 94/33/EC on the protection of young people at work
Take note of Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work

15.2. Chemical safety assessment

A Chemical Safety Assessment/Report (CSA/CSR) has not been conducted

SECTION 16: OTHER INFORMATION

Full Text of H-/EUH-Statements Referred to Under Section 3

H225 - Highly flammable liquid and vapor
H300 - Fatal if swallowed
H310 - Fatal in contact with skin
H330 - Fatal if inhaled
H372 - Causes damage to organs through prolonged or repeated exposure

Legend

CAS - Chemical Abstracts Service

EINECS/ELINCS - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances

PICCS - Philippines Inventory of Chemicals and Chemical Substances

IECSC - Chinese Inventory of Existing Chemical Substances

KECL - Korean Existing and Evaluated Chemical Substances

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory

DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

ENCS - Japanese Existing and New Chemical Substances

AICS - Australian Inventory of Chemical Substances

NZIoC - New Zealand Inventory of Chemicals

WEL - Workplace Exposure Limit

ACGIH - American Conference of Governmental Industrial Hygienists

DNEL - Derived No Effect Level

RPE - Respiratory Protective Equipment

LC50 - Lethal Concentration 50%

NOEC - No Observed Effect Concentration

PBT - Persistent, Bioaccumulative, Toxic

TWA - Time Weighted Average

IARC - International Agency for Research on Cancer

PNEC - Predicted No Effect Concentration

LD50 - Lethal Dose 50%

EC50 - Effective Concentration 50%

POW - Partition coefficient Octanol:Water

vPvB - very Persistent, very Bioaccumulative

ADR - European Agreement Concerning the International Carriage of Dangerous Goods by Road

IMO/IMDG - International Maritime Organization/International Maritime Dangerous Goods Code

OECD - Organisation for Economic Co-operation and Development

BCF - Bioconcentration factor

ICAO/IATA - International Civil Aviation Organization/International Air Transport Association

MARPOL - International Convention for the Prevention of Pollution from Ships

ATE - Acute Toxicity Estimate

VOC - Volatile Organic Compounds

Key literature references and sources for data

Suppliers safety data sheet, Chemadvisor - LOLI, Merck index, RTECS

Training Advice

Chemical hazard awareness training, incorporating labelling, Safety Data Sheets (SDS), Personal Protective Equipment (PPE) and hygiene.

Use of personal protective equipment, covering appropriate selection, compatibility, breakthrough thresholds, care, maintenance, fit and standards.

First aid for chemical exposure, including the use of eye wash and safety showers.

Creation Date	25-Jan-2011
Revision Date	10-Sep-2015
Revision Summary	Update to Format.

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006

Disclaimer

The information provided on this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guide for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered as a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other material or in any process, unless specified in the text.

End of Safety Data Sheet