Material Safety Data Sheet of:

Electrochemical Gas Sensors – TOX-Cells

.: I - PRODUCT IDENTIFICATION :.

Product: Electrochemical NO, NO_2, CO, SO_2, H_2S Sensor, TOX-Cells w/o Potentiostat

Manufacturer: IT Dr. Gambert GmbH

Address: Hinter dem Chor 21
23966 Wismar
Germany

Phone: +49 (0) 3841 22 00 50
Fax: +49 (0) 3841 22 00 546

Technical Support: itg@itg-wismar.de
Environment, Health, Safety: winfried.kaemtner@itg-wismar.de

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.: II - HAZARDOUS INGREDIENTS/COMPOSITION :.

Material or Component	C.A.S. #	Quantity	OSHA PEL
Palladium	7440-05-3	< 50 mg	-
Iridium	7439-88-5	< 50 mg	-
Ruthenium	7440-18-8	< 5 mg	-
Platinum	7440-06-04	< 5 mg	0.002 mg/m^3
Gold	7440-57-5	< 1.5 mg	-
Graphite	7782-42-5	< 20 mg	2.4 mg/m^3
Sulfuric Acid (30 to 40%)	7664-93-9	< 1.5 ml	1 mg/m^3
Orto-Phosphoric Acid (85%)	7664-38-2	< 1.5 ml	1 mg/m^3

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.: III - HEALTH HAZARD DATA :.

Routes of Entry:

Inhalation: Highly unlikely.
Ingestion: May be fatal if swallowed.
Skin: The electrolytes (sulphuric acid and ortho-phosphoric acid) are very corrosive; skin contact may cause irritation or severe chemical burns.
Eyes: The electrolytes are very corrosive; eye contact may cause irritation or severe chemicals burns.

Acute Effects:

The electrolytes are harmful if swallowed, inhaled or absorbed through the skin. Exposure symptoms include burning sensation, coughing, wheezing, shortness of breath, nausea, and vomiting. It is extremely destructive to tissue of the mucous membranes, stomach, mouth, upper respiratory tract, eyes and skin.

Chronic Effects:

Prolonged exposure with the electrolytes has a destructive effect on tissue. Palladium, Iridium, Ruthenium, Platinum, Gold and Graphite (Carbon) are practically non-toxic. Irritating to eyes and respiratory system if inhaled as dust. Gold salts may leave persistent purple stains on the skin and, in rare instances, cause allergic reactions.

Signs and Symptoms of Exposure:

Contact of electrolyte with skin or eyes will cause a burning sensation. Sulphuric acid and phosphoric acid are very destructive to eyes and skin.

Substance	Sulfuric Acid	Ortho-Phosphoric Acid	Palladium	Iridium	Platinum	Gold	Graphite	Ruthenium
Carcinogenicity	none	none	none	n.a.	Equivocal by RECS criteria	Tumor effects possible	n.a.	none
Acute Toxitity	LD50: 2140 mg/kg oral (rat)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.

.: IV - EMERGENCY FIRST AID PROCEDURES :.

In case of contact with the skin or eyes, immediately flush with plenty of water for at least 15 minutes and remove all contaminated clothing. Get medical attention immediately.

If ingested, give large amounts of water and DO NOT INDUCE VOMITING. Obtain medical attention immediately.

If inhaled, remove to fresh air and obtain medical attention immediately.

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.: V - FIRE AND EXPLOSION HAZARD DATA :.

Flash Point: n.a. **Flammable Limits:** n.a. **LEL:** n.a. **UEL:** n.a.

Extinguishing Media: Use extinguishing media appropriate to surrounding fire conditions. No specific agents recommended.

Special Fire Fighting Equipment: Wear NIOSH/OSHA approved self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Unusual Fire and Explosion Hazards: n.a.

Fire Protection Classification B1 (DIN 4102)

.: VI - CLEANUP PROCEDURES :.

Wipe down the area several times with a wet paper towel. Use a fresh towel each time. Contaminated paper towels are considered hazardous waste.

.: VII - PRECAUTIONS FOR SAFE HANDLING AND USE :.

Note: The sensors are sealed and under normal circumstances the contents of the sensors do not present a health hazard. The following information is given as a guide in the event that a cell leaks.

Protective Measures During Cell Replacement: Before opening the bag containing the sensor cell, check the sensor cell for leakage. If the sensor cell leaks, do not open the bag/use it. If there is liquid around the cell while in the instrument, wear eye and hand protection.

.: VIII- EXPOSURE CONTROLS/PERSONAL PROTECTION :.

Eye Protection: Chemical splash goggles
Hand Protection: Rubber gloves
Other Protective Clothing: Apron, face shield
Ventilation: n.a.

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.: IX - PHYSICAL/CHEMICAL CHARACTERISTICS :.

Material or Component	Boiling Point (°C)	Specific Gravity (g/cm³)	Vapor Pressure	Melting Point (°C)	Evaporation rate	Solubility in Water	Odor/ Appearance	Physical State
Palladium	3125	12.0	n.A.	1550	n.A.	insoluble	odorless	Solid metal
Iridium	2450	22.5	n.A.	4500	n.A.	insoluble	odorless	Solid metal
Ruthenium	2300	12.2	n.A.	3900	n.A.	insoluble	odorless	Solid metal / black powder
Platinum	1770	21.4	n.A.	3825	n.A.	insoluble	odorless	Solid metal / black powder
Gold	1063	19.3	n.A.	2940	n.A.	insoluble	odorless	Solid metal
Sulfuric Acid (30-40%)	119	1.2 – 1.3	No data	-68	No data	soluble	odorless	liquid
Phosphoric Acid	158	1.71	2 hPa (20 °C)	21	No data	soluble	odorless	liquid

.: X - STABILITY AND REACTIVITY :.

Stability: Stable

Incompatibilities: Bases, Halides, Organic materials, Carbides, fulminates, Nitrates, picrates, Cyanides, Chlorates, alkali halides, Zinc salts, permanganates, e.g. potassium permanganate, Hydrogen peroxide, Azides, Perchlorates., Nitromethane, phosphorous, Reacts violently with: cyclopentadiene, cyclopentanone oxime, nitroaryl amines, hexalithium disilicide, phosphorous(III) oxide, powdered metals

Hazardous Decomposition: Toxic fumes

Hazardous Polymerization Will not occur.

.: XI - TOXICOLOGICAL INFORMATION :.

Toxicity to Animals: Sulfuric acid, acute tocicity (LD50): oral: LD50: 2140 mg/kg (rat)

Mutagenicity: no data available

.: XII - ECOLOGICAL INFORMATION :.

Ecotoxicity: An environmental hazard cannot be excluded if unprofessionally handled or disposed. Harmful to aquatic life.

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.: XIII - DISPOSAL CONSIDERATIONS :.

Waste must be disposed of in accordance with Federal, State and Local environmental control regulations. If discarded in its purchased form, this product is hazardous by its characteristics of toxicity and corrosivity under RCRA. Must follow all State and Local regulations.

EPA Waste Number: D002
DOT Information: Corrosive liquid, acid, inorganic, Hazard class: 8, UN 2796, II

.: XIV - TRANSPORT INFORMATION :.

DOT: Regulated. Refer to Small Quantity Exceptions: 49 CFR 173.4.
IATA: Regulated. Refer to IATA Dangerous Goods in Excepted Quantities, Sec. 2.7

.: XV - REGULATORY INFORMATION :.

European Community:
Sulfuric acid
R35 – Causes severe burns.
S26-36/37/39-45 – In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing, gloves and eye/face protection. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

US Federal Regulations:
1) OSHA – Hazardous by definition of Haz Com Std. 29 CFR 1910.1200
2) SARA TITLE III
Sec 302 (40 CFR Part 355)
Sec 311 & 312
Sec 313 (40 CFR Part 372):
This product contains the following toxic chemicals subject to the reporting requirements of Section 313, of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

Chemical	CAS	wt %
Sulfuric acid 30-40%	7664-93-9	< 5%

3) TSCA (Toxic Substances Control Act)
Components of this product are listed on the TSCA inventory.
4) CERCLA Section 102(A) (40 CFR Part 302)
Hazardous Substances and Reportable Quantities

Canada:
Canadian Environmental Protection Act (CEPA): Phosphoric acid and acetic acid are on the Domestic Substances List (DSL) and acceptable for use under the provisions of CEPA.
WHMIS: Sulfuric acid 30 – 40%
Class E: Corrosive liquid.

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.: XVI – OTHER INFORMATION :.

All chemicals may pose unknown hazards and should be used with caution. While the information contained in this Material Safety Data Sheet is believed to be correct and is offered for your information, consideration and investigation, IT Dr. Gambert GmbH assumes no responsibility for the completeness or accuracy of the information contained herein.

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