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REVISION N°.: 1	HAZARD DATA SHEET – PALLADIUM
	DOCUMENT N°.: HDS 014

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1. **PRODUCT AND COMPANY IDENTIFICATION**

Product Name: Palladium Powder

Synonyms: Impala Palladium, Palladium Metal

Use(s): Catalytic reactions in industry, such as in hydrogenation of unsaturated hydrocarbons, as well as alloys in jewellery, dental fillings and crowns. Palladium also used as catalytic converters in car exhaust systems and as component in fuel cells.

Supplier Details: Impala Platinum Ltd – Refineries
Platinum Metals Refinery
P.O. Box 222
SPRINGS
1560
GAUTENG
Republic of South Africa

Contact Persons: Laboratory Manager – Jamie Welman;
Tel: +27 11 360 3255; E-mail: jamie.welman@implats.co.za

Palladium Section Manager – Rayen Ramlugan
Tel: +27 11 360 3172; E-mail: rayen.ramlugan@implats.co.za

Emergency Contact Information:
For emergency information – see above for Impala Platinum contacts.
South Africa Poisons Information Centre (24 hours): 0861-555-777 (South Africa only).

2. **HAZARDS IDENTIFICATION**

Classification according to GHS Classification (SANS 10234):

Health hazards:

Acute toxicity, oral	Category 1	H303 – May be harmful if swallowed
Respiratory sensitisation	Category 1	H333 – May be harmful if inhaled
Skin sensitisation	Category 1	H317 – Prolonged skin contact may cause an allergic skin reaction

Environmental hazards: Category 4 H413 – May cause long lasting harmful effects in aquatic life

Hazard Summary:

Physical hazards: Not classified for physical hazards

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Health hazards: May be harmful if swallowed and/or inhaled. May cause skin irritation during dust generation.

Environmental hazards: May cause long lasting adverse effects in aquatic environment.

Specific hazards: If dissolved, ensure adequate enclosure or ventilation; do not breathe mists and avoid solution contact with eyes, skin and clothing – may cause sensitization or allergic reaction. If melted do not inhale furnace fumes.

Label Elements:

Hazard Pictograms:



Signal Word: DANGER

Health Statements:
 H303 – May be harmful if swallowed
 H317 – May cause an allergic skin reaction
 H333– May be harmful if inhaled

Precautionary statements:

Prevention:
 P201 – Obtain special instruction before use
 P202 – Do not handle until all safety precautions have been read and understood
 P261 – Avoid breathing dust/fume
 P264 – Wash thoroughly after handling
 P270 – Do not eat, drink or smoke when using this product
 P273 – Avoid release to the environment
 P280 – Wear protective gloves, protective clothing and eye protection
 P285 – In case of inadequate ventilation wear respiratory protection

Response:
 P330 – Rinse mouth
 P363 – Wash contaminated clothing before reuse
 P302 + P352 – IF ON SKIN: Wash well with plenty of soap and water
 P308 + P313 – If exposed or concerned get medical advice/attention
 P304 + P340 – IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing
 P305 + P351 + P338 – IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing.
 P337 + P313 – If eye irritation persists get medical advice/attention
 P333 + PP313 – If skin irritation or rash occurs get medical advice/attention

Storage: Not applicable

Disposal: P501 – Dispose of contents/container to hazardous or special waste collection point.

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Supplemental label information: None

Other Hazards: Not a BPT or vPvB substance or mixture. Take care when dissolving palladium metal/powder. Ensure to get the necessary safety data for the specific salts in solution. Wear the required personal protective equipment when doing so. No other acute or chronic health impact noted.

3. **COMPOSITION / INFORMATION ON INGREDIENTS**

Ingredient	:	Palladium	
Formula	:	Pd	
CAS N°.	:	7440-05-3	
Poison Sched.	:	None Allocated	
Conc. Pd	:	≥99.95%	:
RTECS N°.	:	RT 3480500	
EC No.	:	231-115-6	
Hazchem.	:	None Allocated	
UN N°.	:	None Allocated	
D.G Class	:	None Allocated	
PKG Group	:	None Allocated	
EPG	:	None Allocated	
Sub/Tert. Risk	:	None Allocated	

4. **FIRST AID MEASURES**

Eye: Flush gently with running water for minimum 15 minutes. Seek medical attention if irritation develops.

Inhalation: If over exposure occurs leave exposure area immediately. If other than minor symptoms are displayed seek immediate medical attention.

Skin: Remove contaminated clothing and gently flush affected areas with soap and water. Seek medical attention if irritation develops. Launder clothing before reuse.

Ingestion: Seek immediate medical attention if ingestion occurs. Do not induce vomiting.

First Aid Facilities: Eye wash facilities should be available.

5. **FIRE FIGHTING MEASURES**

Flash Point: Not applicable

Flammable Limits: Not applicable

Auto-ignition Point: Not applicable

Fire Extinguishing Media: Non-flammable

Special Fire Fighting Procedures: None

Hazardous Chemical Code: None allocated.

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NOTE: Unlike some finely divided Palladium powder supplied by other companies, the material supplied by Impala Platinum is non-flammable and therefore DOES NOT present a fire hazard.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions: If spilt (bulk) wear goggles and PVC or rubber gloves. Where a dust inhalation hazard exists (i.e. when used in large quantities) wear a Class P1 (particulate) respirator.

Environmental precautions: May cause long lasting harmful effects in aquatic life. Do not flush residues to drains. Absorb all residues.

Methods for cleaning-up: SOLID – sweep up and place in sealed container. SOLUTION - Absorb with moist sand or similar and place in sealed containers for reprocessing or recovery.

7. HANDLING AND STORAGE

Packaging Material: Packed in plastic bags sealed in tins which in turn are sealed in boxes.

Handling: Before use, read the product label. Use safe work practices to avoid eye or skin contact and inhalation of dust or fumes. Observe good personal hygiene. Prohibit eating, drinking and smoking in contaminated areas (e.g. if container is damaged). Wash hands before eating or smoking.

Storage: Store in tightly sealed containers in a cool, dry and well-ventilated area removed from formic acid, sodium borohydride, active metals (e.g. Aluminium), hydrogen peroxide, ignition sources and foodstuffs. Ensure containers are adequately labelled, protected from physical damage and sealed when not in use. Check regularly for leaks or spills.

Transport: Not regulated for transport purposes.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational Exposure Limit: (ACGIH, edition 2008)

TLV-TWA: 10mg/m³ (inhalable particles); 3mg/m³ (respirable particles) based on “particulates not otherwise classified”

Respiratory protection: Use an appropriate and approved respirator for toxic dust or fume if airborne concentration is likely to exceed the occupational exposure limits.

Hand protection: Wear suitable gloves (PVC or rubber)

Eye protection: Wear dust-proof goggles.

Skin protection: Safety shoes, overalls or similar full-body work clothes should be worn and laundered daily. This protective clothing should not be worn at home.

Personal Hygiene: Practice good housekeeping and personal hygiene procedures. No eating, drinking or smoking in work area. Wash hands thoroughly before eating, drinking or smoking. Avoid ingestion, inhalation and skin and eye contact. Medical examinations, monitoring, record keeping and hygiene facilities are recommended

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Exposure Controls: Do not inhale dust / powder. Use with adequate natural ventilation. Where a dust inhalation hazard exists, mechanical extraction ventilation is recommended. Maintain dust / fume levels below the recommended exposure standard.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	:	Pale gray metallic lumps
Odour	:	Odourless
Flammability (Solid, gas)	:	Non Flammable
Flash Point	:	Not Relevant
Lower Explosion Limit	:	Not Relevant
Upper Explosion Limit	:	Not Relevant
Auto Ignition Temperature	:	Not Relevant
Boiling Point	:	2963 °C
Melting Point	:	1555 °C
Evaporation Rate	:	Not Relevant
pH	:	Not Relevant
%Volatiles	:	Not Relevant
Specific Gravity	:	12.02
Vapour Pressure	:	Not Relevant
Relative density	:	2.9-3.6 (variable) g/cm ³
Solubility (water)	:	Insoluble
Molecular Weight	:	106.42g/mole
Pd concentration	:	≥99.95%

10. STABILITY AND REACTIVITY

Flammability: Non-flammable. May evolve toxic metal oxides when heated. Very fine dusts may explode in very high concentrations if exposed to high energy heat or ignition sources (highly unlikely in current form). May evolve flammable – explosive hydrogen gas in contact with strong acids.

Reactivity: The material is stable under normal circumstances. Avoid conditions which create dust or fumes. Materials to avoid are oxidizing agents, strong acids, halogens and bases. Palladium undergoes a violent reaction with arsenic, methanol, ethanol, and alcohols.

Decomposition Products: Exposure to high temperatures (> 1000°C), generation of dust. Will evolve toxic metal oxides when heated to decomposition.

11. TOXICOLOGICAL INFORMATION

ACUTE TOXICITY

Ingestion: Palladium powder is **non-toxic**. May cause irritation of the gastro-intestinal tract.

Palladium **salts** may be more toxic e.g. Palladium Chloride LD₅₀ 2704mg/kg Rat, oral (other salts LD₅₀ 5 – 170mg/kg Rat)

SKIN CORROSION / IRRITATION

Low-irritant: Palladium metal is relatively inert. Prolonged and repeated exposure to dust/power may result in irritation due to mechanical action.

SERIOUS EYE DAMAGE / IRRITATION

Irritant: Exposure may result in eye irritation, lachrymation, pain, redness, conjunctivitis and possible corneal burn with prolonged contact.

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RESPIRATORY OR SKIN SENSITISATION

Non-irritant: Palladium metal is unlikely to cause irritation except as a dust. Palladium **salts** are irritating to eyes, skin and mucous membranes and may cause sensitization.

GERM CELL MUTAGENICITY

The effects of Palladium **salts** have not been fully investigated.

CARCINOGENICITY

Non-carcinogenic: Palladium **salts** are listed as a non-carcinogenic in (all U.S.):

- i) in the National Toxicity Program (NTP) Report on Carcinogens
- ii) in the International Agency for Research on Cancer (IARC) monographs
- iii) by the Occupational Safety and Health Administration (OSHA)

Palladium chloride has caused tumours in some animal studies.

REPRODUCTIVE TOXICITY

Animal experiments indicate that exposure to Palladium **salts** may result in production of abnormal foetuses. Pregnant women should avoid therefore contact with Palladium **salts**. However, the effects have not been fully investigated.

SPECIFIC TARGET ORGAN SYSTEMIC TOXICITY – Single exposure

Palladium **salts have** caused bone marrow, liver and kidney damage in experimental animals. They may also interfere with the use of energy in nerves and muscles and induce lung malfunctions. However, the effects have not been fully investigated.

SPECIFIC TARGET ORGAN SYSTEMIC TOXICITY – Repeated exposure

Palladium **salts have** caused bone marrow, liver and kidney damage in experimental animals. They may also interfere with the use of energy in nerves and muscles and induce lung malfunctions. However, the effects have not been fully investigated.

ASPIRATION HAZARD

Inhalation: Low irritant. Inhalation of dusts may result in upper respiratory tract irritation. Palladium metal poses a low hazard but palladium **salts** are potential irritants and sensitisers.

12. **ECOLOGICAL INFORMATION**

The product is insoluble in water, there is low potential to aquatic life. Due to the very low solubility of Palladium powder it does not directly pose any ecological threat.

However, if converted to soluble Palladium salts it may have the following effects:

Accumulation:

- **Persistence:** hazard of platinum persistency in the environment
- **Bioaccumulative potential:** hazard of palladium accumulation
- **Biomagnification:** potential hazard of palladium magnification
- **Biodegradability:** no information available

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Ecotoxicity:

- **Aquatic organisms: Very toxic** to aquatic organisms. May cause long term adverse effects in the aquatic environment.

LC₅₀ Fish 24h; 7mg/l EC₅₀ Algae 24h; 0.03mg/l

EC₅₀ Algae 72h; 0.02mg/l LC₅₀ Worm 24h; 0.24mg/l

- **Soil organisms:** unknown

- **Plants and terrestrial animals:** unknown; no data available

Other adverse effects:

- **Ozone depletion potential:** does not contain ozone depleting substances

- **Photochemical ozone creation potential:** not applicable

- **Global warming potential:** not applicable

- **Effects on waste water treatment plants:** unknown; no data available

The environmental effects of Palladium and its compounds have not been fully evaluated.

13. **DISPOSAL CONSIDERATION**

Waste Disposal: Disposer must comply with state and local laws. This material can be metallurgically recycled by Impala Platinum, South Africa, which is a pre-authorized facility for the environmentally sound recovery of metals. Collect and reuse where possible. Minimise dust generation. Contact Impala Refineries Laboratory Manager on +27 11 360 3255 or Palladium Section Manager on +27 11 360 3172.

Legislation: Dispose of in accordance with relevant local legislation.

14. **TRANSPORT INFORMATION**

NOT CLASSIFIED AS A DANGEROUS GOOD

NOT REGULATED FOR TRANSPORT PURPOSES

Packing: in plastic bags sealed in tins which in turn are sealed in boxes

UN-Number: not applicable

IMDG-Code: not applicable

ICAO / IATA: not applicable

RID / ADR: not applicable

15. **REGULATORY INFORMATION**

United States: CERCLA Sections 102a/103 (40 CFR 302.4): Not regulated

Canada: WHMIS Classification: D2B (toxic material)

EU/EC Classification: X_n (Harmful); not classified in Annex I of Directive 67/548/EEC (will change with implementation of GHS/REACH)

Regulation (EC) No. 1907/2006 of the European Parliament and the Council of December 2006

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16. OTHER INFORMATION

Respirators: In general the use of respirators should be limited and engineering controls employed to avoid exposure. If respiratory equipment must be worn ensure correct respirator selection and training is

undertaken. Remember that some respirators may be extremely uncomfortable when used for long periods. The use of air powered or air supplied respirators should be considered where prolonged or repeated use is necessary.

Colour Rating System: Amber. Chem Alert reports are assigned a colour rating of Green, Amber or Red for the purpose of providing users with a quick and easy means of determining the hazardous nature of a product. Safe handling recommendations are provided in all Chem Alert reports so as to clearly identify how users can control the hazards and thereby reduce the risk (or likelihood) of adverse effects. As a general guideline a Green colour rating indicates a low hazard, and Amber colour rating indicates a moderate hazard and a Red colour indicates rating indicates a high hazard.

Whilst all due care has been taken in the preparation of the Colour Rating System, it is intended as a guide only and does not provide any warranty in relation to the accuracy of the Colour Rating System. As far as is lawfully possible, Impala accepts no liability or responsibility whatsoever for the actions or omissions of any person in reliance on the Colour Rating System.

Personal Protective Equipment Guidelines: The recommendation for protective equipment contained within this Chem Alert report is provided as a guide only. Factors such as method of application, working environment, quantity used, product concentration and the availability of engineering controls should be considered before final selection of personal protective equipment is made. Information provided by Risk Management Technologies is summarised for ease of use. Additional technical information is available by calling +27 11 360 3255 or +27 11 360 3172.

Health Effects from Exposure: It should be noted that the effects from exposure to this will depend on several factors including: frequency and duration of use; quantity used; effectiveness of control measures; protective equipment used and method of application. Given that it is impractical to prepare a Chem Alert report which encompasses all possible scenarios, it is anticipated that users will assess the risks and apply control methods where appropriate.

The buyer assumes all risks with the use and handling of the material. The seller assumes no responsibility for injury or damage caused by use of the material even if reasonable safety procedures are followed. The information contained in this sheet is developed from what is believed to be accurate and reliable sources but the seller makes no warranties, either expressed or implied, and assumes no responsibility for the accuracy or completeness of the data contained herein

Abbreviations:

- mg/m³ – Milligrams per cubic metre.
- ppm – Parts Per Million.
- TWA/ES – Time Weighted Average of Exposure Standard.
- pH – Relates to hydrogen ion concentration - this value will relate to a scale of 0 – 14, where 0 is highly acidic and 14 is highly alkaline.
- CAS N^o. - Chemical Abstract Service number – used to uniquely identify chemical compounds.
- M – Moles per litre, a unit of concentration.
- IARC – International Agency for Research on Cancer.

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RTECS – The Registry of Toxic Effects of Chemical Substances
ICSC – International Chemical Safety Card.
EC No. - European Commission Number
EU – European Union
AUS - Australia

Hazard Information References:

RTECS: Registry of toxic effects of Chemical Substances, NIOSH, edition January 1999

Sax's Dangerous Properties of Industrial Materials (8th edition), R J Lewis Sr.

Material Safety Data Sheet: Platinum Standard solution National Institute of Standards and Technology (USA) August 2006

Screening of Platinum Group Metals; Pt, Rh, Pd SWECO VIAK Screening Report 2007:2 (For Swedish Environmental Protection Agency)

ECOTOX database; <http://cfpub.epa.gov/ecotox>

ENVIRONMENTAL HEALTH CRITERIA 125 Platinum WHO;

<http://www.inchem.org/documents/ehc/ehc/ehc125.htm>

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