File No: LTD/1042

8 April 2003

NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME (NICNAS)

FULL PUBLIC REPORT

Tungsten Boride

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

Tungsten Boride

1. APPLICANT AND NOTIFICATION DETAILS

APPLICANT(S)
Brenco Thermal Coating Technology Pty Ltd (ACN 050 692 987)
171-173 Fairbairn Road Sunshine VIC 3020

NOTIFICATION CATEGORY
Limited-small volume: Chemical other than polymer (1 tonne or less per year).

EXEMPT INFORMATION (SECTION 75 OF THE ACT)
No details are claimed exempt from publication.

VARIATION OF DATA REQUIREMENTS (SECTION 24 OF THE ACT)
No variation to the schedule of data requirements is claimed.

PREVIOUS NOTIFICATION IN AUSTRALIA BY APPLICANT(S)
Commercial Evaluation Permit: 1 August 2002.

NOTIFICATION IN OTHER COUNTRIES
Listed on inventories of Canada (NDSL), EEC (EINECS), Japan (ENCS), Korea (ECL), and USA (TSCA).

2. IDENTITY OF CHEMICAL

CHEMICAL NAME
Tungsten boride

OTHER NAME(S)
Tungsten monoboride

MARKETING NAME(S)
Amperit 539.054 (30% tungsten boride)

CAS NUMBER
12007-09-9

MOLECULAR FORMULA
BW

STRUCTURAL FORMULA
B≡W

MOLECULAR WEIGHT
194.7 g/mol

SPECTRAL DATA

METHOD	IR spectroscopy
Remarks	IR peaks: 3200, 1400, 1360, 1200, 1120, 720, 660, 500 cm^{-1}.

3. COMPOSITION

DEGREE OF PURITY
> 99%

HAZARDOUS IMPURITIES/RESIDUAL MONOMERS
None.

NON HAZARDOUS IMPURITIES/RESIDUAL MONOMERS
<1% unknown impurities.

ADDITIVES/ADJUVANTS
None.

4. INTRODUCTION AND USE INFORMATION

MODE OF INTRODUCTION OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS
Import.

MAXIMUM INTRODUCTION VOLUME OF NOTIFIED CHEMICAL (100%) OVER NEXT 5 YEARS

Year	*1*	*2*	*3*	*4*	*5*
Tonnes	0.15	0.15	0.15	0.15	0.15

USE
A component of a metal thermal spray powder for improvement of surface properties.

5. PROCESS AND RELEASE INFORMATION

5.1. Distribution, Transport and Storage

PORT OF ENTRY
Melbourne, VIC.

IDENTITY OF MANUFACTURER/RECIPIENTS
Brenco Thermal Coating Technology Pty Ltd.

TRANSPORTATION AND PACKAGING
Tungsten boride will be imported as a component of a ready-to-use thermal spray product (Amperit 539.054) in purpose-built 5 kg plastic bottles packed in 50 kg lots within a steel drum. The product will be transported by road from dockside directly to the Brenco premises at Sunshine VIC prior to delivery to an industrial customer.

5.2. Operation Description

No reformulation or repackaging of the notified chemical will occur in Australia. The imported product containing 30% tungsten boride in powder will come in purpose-built bottles for fitting directly into spray equipment. One industrial customer will use it to provide a wear and corrosion protection coating on metal surfaces. Application is by high velocity oxygen-fuel (HVOF) method where combustion of oxygen and fuel gases accelerates and projects the powder onto the substrate. The spraying however is fully automated and carried out in an enclosed spray booth. Fumes and dust generated by overspray are removed by an extraction system and is collected into dust free bags for disposal. The bottles will be replaced twice a day, and the dust collection bags will be removed twice a year. The bags are sealed and transferred to drums for disposal.

Spray applicators, after connecting the bottles to the spray equipment inlet, will leave the spray booth before spraying commences. Prior to application of the powder coating, the substrate is degreased and cleaned then grit blasted to ensure the surface is appropriately prepared for the coating. After the coating has been applied and allowed to solidify on the substrate, a Quality Assurance (QA) inspector

will check it against a number of specifications such as surface roughness, coating thickness (200 µm), and coat bond strength. The coated product will also be cleaned before despatch.

5.3. Occupational exposure

Number and Category of Workers

Category of Worker	*Number*	*Exposure Duration*	*Exposure Frequency*
Waterside, transport, & warehouse workers	3-8	1-24 hours/day	8-10 days/year
Plant operators (Spray applicators, QA inspector, & substrate cleaner)	4-6	1-2 hours/day	55 days/year

Exposure Details

Waterside, transport and warehouse workers will handle sealed containers and thus they would be exposed to the notified chemical only in the event of an accident. Spills, if any, will be collected and disposed of as outlined in the MSDS. The workers will wear overalls and safety boots.

Although spray applicators are not expected to enter the spray booth while spraying is taking place this group of workers may receive transient dermal and ocular exposure to the notified chemical during routine operations. They will wear appropriate PPE such as overalls, safety boots, gloves and goggles. Appropriate engineering controls will also be in place to minimise dust formation and deposition. QA and substrate cleaning staff may experience dermal exposure when checking and cleaning the coated product. However, once cured tungsten boride will be locked in a coating matrix and not bioavailable. No exposure would be expected during preparation of the substrates as the notified chemical has not yet been applied. QA personnel and substrate cleaners will wear overalls and gloves.

5.4. Release

RELEASE OF CHEMICAL AT SITE

There will be no release during manufacture or reformulation as the notified chemical will be imported in a finished product in ready-to-use containers.

RELEASE OF CHEMICAL FROM USE

The notifier estimated the following maximum annual releases of the notified chemical during the use of the spray product:

Spills	1%	1.50 kg
Container residuals	0.1%	0.15 kg
Spray equipment residuals	0.5%	0.75 kg
Dust/fumes from overspray	5%	7.50 kg
TOTAL Release	6.6%	9.90 kg

The powder is applied by a high velocity oxygen fuel thermal spray process which, through inter particle bonding and a sintering process, creates a dense uniform coating with the generation of small amounts of dust and fumes due to the precise means of application. This form of application only requires the use of small amount of powder at any one time.

5.5. Disposal

Since the product containing the notified chemical is a powder any spilt material will be collected via sweeping or vacuuming. If uncontaminated it is likely to be used otherwise it will be disposed of to landfill.

The cleaning of the spray equipment does not utilise solvents or water but rather any residual metal powder is vacuumed up or is disposed of with the equipment component that is replaced (eg O-rings or spray nozzles), in both cases the material will be disposed of to landfill.

The containers with any residual product (and notified chemical) will be disposed of to landfill.

The spray booths all have collection and extraction systems, thus the dust and fumes will be collected in dust-free bags. The collected dust will be disposed of to landfill.

All material containing the notified chemical will be removed from the site and transported to landfill

by licensed waste contractors.

5.6. Public exposure

Members of the public are unlikely to come into contact with the notified chemical as neither the notified chemical nor sprayed/coated objects will be sold to the public with the chemical coated film exposed.

6. PHYSICAL AND CHEMICAL PROPERTIES

The physicochemical properties of the final product, Amperit 539.054, are provided unless otherwise stated.

Appearance at 20°C and 101.3 kPa Odourless grey powder.

Melting Range 1500°C - 2700°C

Remarks Full test report not provided. For tungsten boride (WB), no melting point was found below 400°C.

TEST FACILITY Bayer AG (2000)

Density 2800 – 3200 kg/m^3

Remarks Full test report not provided.

Vapour Pressure Not determined.

Remarks WB is not expected to have a significant vapour pressure.

Water Solubility 0.16 g/L at 20°C

METHOD In-house method.

Remarks Full test report not provided.
Analytical Method: 1 g of material was added to 100 mL of demineralised water and stirred for 24 hours at 20°C. The suspension was then separated by centrifugation. The resultant clear solution was tested for tungsten and boron content.
It was commented that WB is an intercalation compound with the boron atoms locating in the interspaces of the metallic lattice of the tungsten. Therefore, the value found was not a 'true' water solubility but possibly reflects the concentrations of oxidised (tungsten) or reduced material (boric acid).

TEST FACILITY Bayer AG (2000)

Hydrolysis as a Function of pH Not determined.

Remarks WB is not expected to undergo hydrolysis in the environmental pH 4-9. However, there may be some oxidation or reduction.

Partition Coefficient (n-octanol/water) Not determined.

Remarks Due to the possible low water solubility and the intercalation properties WB was not deemed suitable or possible to determine the partition coefficient.

Adsorption/Desorption Not determined.

Remarks Due to the possible low water solubility it is not expected to be mobile in soil.

Dissociation Constant Not determined.

Remarks Due to the possible low water solubility and the intercalation properties WB was not deemed suitable or possible to determine the dissociation constant. It is not expected to dissociate but may undergo some oxidation or reduction.

Particle Size

Range (μm)	*Mass (%)*
58.1	90%
33.9	50%
17.2	10%

Remarks Full test report not provided. The smallest particle size is 5.5 μm of which 0.3% is contained in Amperit 539.054.
TEST FACILITY Bayer AG (year not specified)

Flash Point Not applicable.

Remarks WB is not in a liquid form.

Flammability Limits Neither flammable nor pyrophoric.

Remarks Test not conducted.

Autoignition Temperature Not expected to self-ignite.

Remarks Test not conducted.

Explosive Properties Not expected to be explosive.

Remarks Metal powder may form explosive dust.

Reactivity Not determined.

Remarks Hydrogen will evolve on contact with acids.

7. TOXICOLOGICAL INVESTIGATIONS

Toxicity data are not available for the notified chemical, tungsten boride. The acute toxicity of tungsten metal and its compounds in general was provided. The LD50 for soluble compounds (sodium tungstate) is 223-225 mg/kg (rat, oral), and 140-160 mg/kg (rat, sc), and for insoluble compounds (tungsten metal powder) is 5000 mg/kg (rat, ip). Intratracheal instillation of tungsten metal or tungsten carbide dust in guinea pigs at 50 mg/week for 3 weeks showed moderate interstitial cellular proliferation with tungsten metal exposure. Tungsten carbide dust was found less harmful to pulmonary tract tissues than was tungsten metal.

The toxicity of tungsten carbide powder is summarised below:

Endpoint and Result	*Assessment Conclusion*
Rat, acute oral LD50 >2000 mg/kg bw	low toxicity
Rat, acute dermal LD50 >2000 mg/kg bw	low toxicity
Rabbit, skin irritation	non-irritating
Rabbit, eye irritation	slightly irritating
Guinea pig, skin sensitisation - adjuvant test	no evidence of sensitisation

7.1. Acute toxicity – oral

TEST SUBSTANCE Tungsten carbide powder – pure (99.98%)

METHOD OECD TG 401 Acute Oral Toxicity.
Species/Strain Rat/Sprague-Dawley.
Vehicle 1% aqueous methylcellulose.
Remarks - Method The lowest humidity recorded was 29%, which was lower than the range

of 30%-70% stated in the protocol. However, this was not considered to have affected the integrity or validity of the study.

RESULTS

Group	*Number and Sex of Animals*	*Dose mg/kg bw*	*Mortality*
I	5 females	2000	0
II	5 males	2000	0

LD50	> 2000 mg/kg bw
Signs of Toxicity	Piloerection was observed in all rats with all males showing ungroomed appearance (characterised by ungroomed coat) till Day 2. There were no other reaction to treatment and recovery was complete in all animals by Day 3. Bodyweight gains were considered satisfactory in all animals throughout the study.
Effects in Organs	No macroscopic abnormalities were observed for animals killed at study termination on Day 15.
Remarks - Results	

CONCLUSION The notified chemical is of low toxicity via the oral route.

TEST FACILITY Huntingdon Life Sciences Ltd (1999a).

7.2. Acute toxicity – dermal

TEST SUBSTANCE Tungsten carbide powder – pure (99.98%)

METHOD OECD TG 402 Acute Dermal Toxicity.

Species/Strain	Rat/Sprague-Dawley.
Vehicle	1% aqueous methylcellulose.
Type of dressing	Occlusive.
Remarks - Method	The lowest humidity recorded was 29%, which was lower than the range of 30%-70% stated in the protocol. However, this was not considered to have affected the integrity or validity of the study.

RESULTS

Group	*Number and Sex of Animals*	*Dose mg/kg bw*	*Mortality*
I	5 females	2000	0
II	5 males	2000	0

LD50	> 2000 mg/kg bw
Signs of Toxicity - Local	No dermal irritation was seen in any animal during the study.
Signs of Toxicity - Systemic	There were no deaths and no evidence of a systemic response in any animal throughout the study. All animals were considered to have achieved satisfactory body weight gains throughout the study.
Effects in Organs	No macroscopic abnormalities were observed for animals killed at study termination on Day 15.
Remarks - Results	

CONCLUSION The notified chemical is of low toxicity via the dermal route.

TEST FACILITY Huntingdon Life Sciences Ltd (1999b).

7.4. Irritation – skin

TEST SUBSTANCE	Tungsten carbide powder – pure (99.98%)
METHOD	OECD TG 404 Acute Dermal Irritation/Corrosion.
Species/Strain	Rabbit/New Zealand White.
Number of Animals	3 males.
Vehicle	Distilled water.
Observation Period	72 hours.
Type of Dressing	Semi-occlusive.
Remarks - Method	No significant protocol deviations.
RESULTS	
Remarks - Results	No dermal response to treatment was observed in any animal throughout the study (ie, all Draize scores were zero). There were no signs of toxicity in any rabbit during the observation period.
CONCLUSION	The notified chemical is non-irritating to skin.
TEST FACILITY	Huntingdon Life Sciences Ltd (1999c).

7.5. Irritation – eye

TEST SUBSTANCE	Tungsten carbide powder – pure (99.98%)
METHOD	OECD TG 405 Acute Eye Irritation/Corrosion.
Species/Strain	Rabbit/New Zealand White.
Number of Animals	3 females.
Observation Period	72 hours.
Remarks - Method	No significant protocol deviations.

RESULTS

Lesion	*Mean Score* Animal No.*			*Maximum Value*	*Maximum Duration of Any Effect*	*Maximum Value at End of Observation Period*
	1	2	3			
Conjunctiva: redness	0	0.3	0.3	2	1 h	0
Conjunctiva: chemosis	0	0	0	1	1 h	0
Conjunctiva: discharge	(Not reported)				--	--
Corneal opacity	0	0	0	0	0	0
Iridial inflammation	0	0	0	0	0	0

*Calculated on the basis of the scores at 24, 48, and 72 hours for EACH animal.

Remarks - Results	A diffuse crimson colouration of the conjunctivae with or without slight swelling was seen in 2 animals. Transient hyperaemia of blood vessels was observed only in the remaining rabbit. These reactions had resolved by either day 1 or 2 after instillation.
CONCLUSION	The notified chemical is slightly irritating to the eye.
TEST FACILITY	Huntingdon Life Sciences Ltd (1999d).

7.6. Skin sensitisation

TEST SUBSTANCE	Tungsten carbide powder – pure (99.98%)
METHOD	OECD TG 406 Skin Sensitisation – Maximisation Test.

	EC Directive 96/54/EC B.6 Skin Sensitization – Maximisation Test.
Species/Strain	Guinea pig/Dunkin-Hartley
PRELIMINARY STUDY	Maximum Non-irritating Concentration: intradermal: 50% in Alembicol D topical: 75% in Alembicol D
MAIN STUDY	
Number of Animals	Test Group: 10 Control Group: 5
INDUCTION PHASE	Induction Concentration: intradermal: 50% in Alembicol D topical: 75% in Alembicol D
Signs of Irritation	
CHALLENGE PHASE	
1st challenge	topical:: 37.5% and 75% in Alembicol D.
Remarks - Method	Although group scoring was indicated in the protocol, dermal reactions were scored and reported individually for each animal

RESULTS

Animal	*Challenge Concentration*	*Number of Animals Showing Skin Reactions after: 1st challenge*	
		24 h	*48 h*
Test Group	37.5% & 75%	0/10	0/10
Control Group	37.5% & 75%	0/5	0/5

Remarks - Results	Following the induction applications, necrosis was recorded at all sites receiving adjuvant. Test animals showed slight to well-defined irritation and control animals showed slight irritation at the intradermal injection sites. At the topical application sites, slight erythema was observed in most test and control animals. Following the challenge applications, no dermal reactions were seen in any of the test or control animals. Black staining was observed on the dosed site during both phases, however this was stated not to interfere with scoring. No signs of ill health or toxicity were recorded. All guinea pigs showed normal weight gain over the study period.
CONCLUSION	There was no evidence of reactions indicative of skin sensitisation to the notified chemical under the conditions of the test.
TEST FACILITY	Huntingdon Life Sciences Ltd (1999e).

8. ENVIRONMENT

8.1. Environmental fate

No environmental fate data were submitted.

8.2. Ecotoxicological investigations

No ecotoxicity data for the notified chemical were submitted. The following unreferenced ecotoxicity values for tungsten carbide, the major component of the imported powder, and which is closely related to tungsten boride, have been provided for fish, daphnia, algae and bacteria with no supporting reports.

	Tungsten monocarbide
Fish (*Brachydanio rerio*)	96 h LC_0 = 1000 mg/L
Daphnia (*Daphnia magna*)	48 h EC_{50} > 1000 mg/L
Algae (*Selenaastrum capricornutum*)	Biomass 72 h EC_{20} = 80 mg/L Growth 72 h EC_{50} = 130 mg/L
Bacteria (activated sludge)	3 h EC_{20} > 1000 mg/L

These figures indicate that tungsten carbide is practically non-toxic to aquatic organisms. Since it is similar to the notified chemical, it is likely that tungsten boride will also be practically non-toxic to aquatic organisms and not require classification under the Globally Harmonised System of Classification and Labelling of Chemicals.

9. RISK ASSESSMENT

9.1. Environment

9.1.1. Environment – exposure assessment

The majority of the notified chemical will become part of a solid inert coating, therefore once the coating has hardened release into the aquatic environment is not anticipated. Possibly during the life of the coated article, the coating may chip. However, this would most likely occur in an extremely diffuse manner and very slowly. The slow rate of release will result in a very low environmental concentration. The solid chips are expected to be inert. Ultimately the coated article will be disposed of generally to landfill at the end of its useful life.

The notifier estimates that less than 10 kg per year of the notified chemical will go to landfill during its use (container residuals, overspray, etc). Once in landfill it is expected to be immobile and thus not leach out. Over time it will undergo slow oxidation but it is likely to remain in the landfill.

Due to its low water solubility it is unlikely to bioaccumulate.

9.1.2. Environment – effects assessment

No ecotoxicity data were submitted. However, it is unlikely that the notified chemical will be toxic to aquatic organisms.

9.1.3. Environment – risk characterisation

The notified chemical is a component in a coating product, once applied and treated it will be part of an inert coating. At end use, the polymer is not expected to pose a significant risk to the aquatic environment. Annually less than 10 kg will go to landfill, where it is unlikely to leach out but if it does it will be at very low concentrations.

9.2. Human health

9.2.1. Occupational health and safety – exposure assessment

The 30% tungsten boride powder will come to Australia in purpose-built bottles for fitting directly into thermal spray equipment at one industrial site. During loading/unloading, transport and warehouse workers will wear coveralls and safety boots. Therefore, exposure will be negligible. Clean up of accidental spills will be in accordance with instructions in the MSDS.

At the industrial customer site, although the spraying process is fully automated and occurs within the spray booth, spray applicators may be transiently exposed to the notified chemical as a result of accidental leaks and spills when they connect the bottles to the equipment inlet. Workers will wear overalls, safety boots, gloves and goggles as appropriate. Also, engineering controls such as an extraction system will be in place to help control worker exposure to fumes and dust generated by overspray.

QA personnel and substrate cleaners will wear overalls and gloves during inspection and cleaning the coated product. Dermal exposure is likely but once cured tungsten boride is trapped in a coating matrix and not bioavailable.

Considering the PPE worn, the engineering controls and good work practices, exposure of these plant operators is determined to be low.

9.2.2. Public health – exposure assessment

Tungsten boride will not be sold to the public. It will be used at one industrial site only as a component of a thermal spray powder for improving metal surfaces. The well engineered spraying processes and the regulated disposal of spills and waste containing the notified

chemical mean that public contact with the chemical in the environment is unlikely. Once cured on sprayed surfaces, tungsten boride becomes an integral part of a hard durable coating and is not accessible to human contact. Therefore, the potential for public exposure to the notified chemical is assessed as negligible.

9.2.3. Human health - effects assessment

Tungsten boride is considered insoluble. The NOHSC exposure standards for tungsten, insoluble compounds (as W) are 5 mg/m^3 (TWA) and 10 mg/m^3 (STEL) (NOHSC, 1995). Tungsten (soluble and insoluble compounds) is also listed on the *List of Designated Hazardous Substances* (NOHSC, 1999). As a result, tungsten boride should be classified as hazardous.

9.2.4. Occupational health and safety – risk characterisation

The imported powder containing 30% tungsten boride will be shipped in ready-to-use containers packed in secure steel drums. In the event of an accident, damaged/leaking containers and spills will be contained and disposed of in accordance with the MSDS and Government regulations. Transport and warehouse workers would not experience any significant exposure, therefore the risk of adverse health effects is minimal.

At the industrial customer site, plant operators will wear appropriate PPE including overalls and safety boots, gloves and goggles as required. They are not expected to come into contact with the spraying process. Generally, there will be adequate engineering controls in the industrial plant to minimise worker exposure. Taking all into consideration, it is determined that tungsten boride will not pose any significant health risks to these workers.

Following curing of the paint, tungsten boride will be cross-linked with other thermal spray components to form a stable coating. In this form, the chemical is essentially unavailable for absorption and thus the health risk to workers after paint curing would be negligible.

9.2.5. Public health – risk characterisation

With public exposure to tungsten boride being unlikely, except in the event of an accidental spill, the risk posed by the chemical to public health throughout its life cycle is considered to be minimal.

10. CONCLUSIONS – ASSESSMENT LEVEL OF CONCERN FOR THE ENVIRONMENT AND HUMANS

10.1. Hazard classification

Based on the available NOHSC exposure standards for tungsten, soluble and insoluble compounds (as W), and its inclusion on the *List of Designated Hazardous Substances,* the notified chemical should be classified as hazardous.

10.2. Environmental risk assessment

The notified chemical is not considered to pose a risk to the environment based on its reported use pattern.

10.3. Human health risk assessment

10.3.1. Occupational health and safety

There is Low Concern to occupational health and safety under the conditions of the occupational settings described.

10.3.2. Public health

There is Negligible Concern to public health when used in the proposed manner.

11. MATERIAL SAFETY DATA SHEET

11.1. Material Safety Data Sheet

The MSDS of the product containing the notified chemical provided by the notifier was in accordance with the NOHSC *National Code of Practice for the Preparation of Material Safety Data Sheets* (NOHSC, 1994a). It is published here as a matter of public record. The accuracy of the information on the MSDS remains the responsibility of the applicant.

11.2. Label

The label for the product containing the notified chemical provided by the notifier was in accordance with the NOHSC *National Code of Practice for the Labelling of Workplace Substances* (NOHSC, 1994b). The accuracy of the information on the label remains the responsibility of the applicant.

12. RECOMMENDATIONS

CONTROL MEASURES
Occupational Health and Safety

- Employers should implement the following engineering controls to minimise occupational exposure to the imported product, Amperit 539.054:
  - Adequate general and local ventilation and an extraction system in the vicinity of the spray booth to remove fumes and dust generated by overspray. Worker exposure to tungsten compounds should be maintained below the relevant NOHSC Exposure Standards.

- Employers should ensure that the following personal protective equipment is used by workers to minimise occupational exposure when handling/fitting the powder spray bottles of Amperit 539.054 into spray equipment, inspecting or cleaning the sprayed surfaces:
  - Coveralls/laboratory coats;
  - Chemical resistant gloves;
  - Goggles or safety glasses;
  - Vapour respirators if required, especially relevant for spray applicators.

  Guidance in selection of personal protective equipment can be obtained from Australian, Australian/New Zealand or other approved standards.

- A copy of the MSDS should be easily accessible to employees.

- For products and mixtures containing the notified chemical are classified as hazardous to health in accordance with the NOHSC *Approved Criteria for Classifying Hazardous Substances*, workplace practices and control procedures consistent with provisions of State and Territory hazardous substances legislation must be in operation.

Environment

- The following control measures should be implemented by the user to minimise environmental exposure during use of the notified chemical:
  - Well maintained collection and extraction systems in spray booths;
  - Good handling procedures to minimise spills.

Disposal

- The notified chemical should be disposed of to secure landfill where dust suppression methods are in-place (such as mist sprays) and where the material can be covered with soil immediately. This product is not suitable for incineration.

Emergency procedures

- Spills/release of the notified chemical should be handled by sweeping or vacuuming. The collected material should then be placed in a sealable container and clearly labelled. The material should be prevented from entering drains or water bodies.

12.1. Secondary notification

The Director of Chemicals Notification and Assessment must be notified in writing within 28 days by the notifier, other importer or manufacturer:

(1) Under Section 64(2) of the Act:

– if any of the circumstances listed in the subsection arise.

The Director will then decide whether secondary notification is required.

No additional secondary notification conditions are stipulated.

13. BIBLIOGRAPHY

Bayer AG (year not specified) Specific test report 2.3. Leverkusen, ZF-Zentrale Analytik (unpublished test results submitted by the notifier).

Bayer AG (2000) GLP final report – P. C.-Properties (Study no. G 00/0061/00 LEV). Leverkusen, ZF-Zentrale Analytik (unpublished test results submitted by the notifier).

Huntingdon Life Sciences Ltd (1999a). Tungsten carbide powder – pure: Acute oral toxicity to the rat (Study no. ITU 014/982705/AC). Cambridgeshire, England (unpublished test report submitted by the notifier).

Huntingdon Life Sciences Ltd (1999b). Tungsten carbide powder – pure: Acute dermal toxicity to the rat (Study no. ITU 015/982706/AC). Cambridgeshire, England (unpublished test report submitted by the notifier).

Huntingdon Life Sciences Ltd (1999c). Tungsten carbide powder – pure: Skin irritation to the rabbit. (Study no. ITU 016/982643/SE). Cambridgeshire, England (unpublished test report submitted by the notifier).

Huntingdon Life Sciences Ltd (1999d). Tungsten carbide powder – pure: Eye irritation to the rabbit. (Study no. ITU 017/982713/SE). Cambridgeshire, England (unpublished test report submitted by the notifier).

Huntingdon Life Sciences Ltd (1999e). Tungsten carbide powder – pure: Skin sensitisation to the guinea pig. (Study no. ITU 018/983092/SS). Cambridgeshire, England (unpublished test report submitted by the notifier).

NOHSC (1994a) National Code of Practice for the Preparation of Material Safety Data Sheets [NOHSC:2011(1994)]. National Occupational Health and Safety Commission, Canberra, Australian Government Publishing Service.

NOHSC (1994b) National Code of Practice for the Labelling of Workplace Substances [NOHSC:2012(1994)]. National Occupational Health and Safety Commission, Canberra, Australian Government Publishing Service.

NOHSC (1995) Exposure Standards for Atmospheric Contaminants in the Occupational Environment [NOHSC:3008(1995)] & [NOHSC:1003(1995)]. National Occupational Health and Safety Commission, Canberra, Australian Government Publishing Service.

NOHSC (1999) List of Designated Hazardous Substances [NOHSC:10005(1999)]. National Occupational Health and Safety Commission, Canberra, AusInfo.