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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

PIGMENT RED 5021B

This Assessment has been compiled in accordance with the provisions of *the Industrial Chemicals (Notification and Assessment) Act 1989*, and Regulations. This legislation is an Act of the Commonwealth of Australia. The National Industrial Chemicals Notification and Assessment Scheme (NICNAS) is administered by Worksafe Australia which also conducts the occupational health & safety assessment. The assessment of environmental hazard is conducted by the Department of the Environment, Sport, and Territories and the assessment of public health is conducted by the Department of Human Services and Health.

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT

PIGMENT RED 5021B

1. APPLICANT

Ciba-Geigy Australia Pty Ltd, 140 Bungaree Rd, Pendle Hill, NSW, 2145.

2. IDENTITY OF THE CHEMICAL

Pigment Red 5021B is not considered to be hazardous based on the nature of the chemical and the data provided. Therefore the chemical name, CAS number, molecular and structural formulae, spectral data, composition, exact amount to be imported and specific use have been exempted from publication in the Full Public Report and the Summary Report.

Trade name: The notified chemical is known as Pigment Red 5021B will be imported as an ingredient (< 5%) of the formulated product Irgazin DPP Red BL

Methods of detection and determination:

Infrared spectroscopy, elemental analysis, spectrophotometry

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa:	red powder
Melting Point:	> 300°C
Density:	1670 kg/m^3 at 22°C
Vapour Pressure:	< 4 X 10^{-13} Pa at 20°C (extrapolated)
Water Solubility:	< 0.5 mg/L at 20°C

Partition Co-efficient (n-octanol/water) log $P_{o/w}$:	-2.1 for the new chemical entity. Calculated using computer program CLOGP. This result should be viewed with extreme caution in view of the low water solubility. Calculated partition coefficients of salts are known to be unreliable (1).
Hydrolysis as a function of pH:	Not able to be determined due to low water solubility. It is noted that significant hydrolysis is not expected at environmentally relevant pH due to lack of suitable functionalities.
Adsorption/Desorption:	Test not performed due to low water solubility. This would suggest strong adsorption. Furthermore, very little will be discharged to the environment except when encapsulated in paints.
Dissociation Constant pKa:	Test not performed due to low water solubility
Flash Point:	Not applicable. Solid substance with m.p. > 300°C
Flammability Limits:	Nonflammable
Autoignition Temperature:	390°C
Explosive Properties:	Not explosive
Reactivity/Stability:	Not oxidising. No incompatibility with other substances known
Particle size distribution:	range - 1 - 64 µm mean - 14.1 µm (c. 31% < 7µm)

4. PURITY OF THE CHEMICAL

Degree of purity: 45%

Toxic or hazardous impurity/impurities: None known

Additives/Adjuvants: None

5. INDUSTRIAL USE

The notified substance is used as an additive in high performance automotive and industrial paints.

6. OCCUPATIONAL EXPOSURE

No formulation will take place in Australia. The notified chemical will be imported as a component (< 5%) of the industrial paint colourant Irgazin DPP Red BL in 25 kg cardboard containers with antistatic plastic liners, at a rate of 90 kg in the first year increasing to 160 kg in the fifth year.

It is expected that about 8 industrial establishments in Australia will be using the notified chemical with about 6 plant operators and 2 laboratory technicians per establishment.

Exposure during transport and storage of pigment powders is only expected to occur in the case of accidental damage to containers so that the risk of exposure is low under normal conditions.

Laboratory testing is required to determine the correct paint formulation and to test each incoming batch. The paint formulation involves less than 30 g of the notified chemical (1 kg of pigment powder) in tests conducted once per year for less than 8 hours duration. Testing of the incoming pigment powder batches would involve 3 g of the notified chemical for a maximum of 2 hours every month.

A new batch of paint would normally be manufactured every 1 - 2 months using about 120 kg of pigment powder containing about 3.5 kg of the notified chemical. During paint production local exhaust ventilation is used to minimise exposure to the solvents used in the paint formulations. As a result, exposure to pigment powder is also minimised. Resin solutions and solvents are loaded into a pre-mix vessel by pumping and the pigment powder is added in stages to ensure thorough wetting of the individual pigment particles. Stirring is then continued for a further 15 minutes using an impeller inserted from above.

Following dispersion on a bead mill or attritor, a batch which meets specifications will have added to it additional medium followed by discharge to mixing tanks to produce the finished paint.

The finished paint is applied by spraying. After curing the notified chemical will be encapsulated by the paint resin.

7. PUBLIC EXPOSURE

Public exposure to the notified chemical may occur during transportation in the event of an accidental spillage. However, in view of the packaging used for transportation of the notified chemical (sealed cardboard boxes with an attached plastic liner), the likelihood for public exposure to the notified chemical is considered to be minimal.

Disposal of waste materials will be by incineration or by landfill. The potential for leaching out of the landfill into the water table is expected to be low since the notified chemical has extremely low water solubility.

The notified chemical will be used in automotive paints, where in the process of drying and curing, the notified chemical is encapsulated in the resin of the paint. The public will be in contact with the dried cured paint of motor vehicles. However, since the notified chemical has low volatility, extremely low water solubility, is present in very low concentrations in the paint and is encapsulated in the resin of the cured paint, it is not expected to 'bleed' from the cured paint, and therefore, transfer of the notified chemical to the skin is not expected to occur.

The notifier states that there is a likelihood that the notified chemical will be used in colouration of plastics and in specialty printing inks. However, the type of products which will contain the notified chemical and the availability of those products to the public are not known at this stage.

8. ENVIRONMENTAL EXPOSURE

. Release

It is estimated that negligible amounts of the new chemical will be released to the environment (<<1 kg per site) during the

manufacture of these paints.

. **Fate**

A 28 day test for biodegradation was performed according to OECD test guideline TG 301 B, at actual concentrations of 10.9 and 20.1 mg/L. The result showed limited degradation of Pigment Red 5021B (9% and 3% for concentrations 10.9 and 20.1 mg/L respectively) and therefore it should not biodegrade in landfill.

After incorporation into the paint the new chemical entity will be encapsulated in the resin and therefore not available to the environment once the paint is dry. During manufacture of the paint, negligible (<<1 kg per site) amounts will be released to the environment. The major routes of exposure to the environment will be during application to new cars (60-70%) and when repairs are made to the vehicles (30-40%).

The paint is to be applied electrostatically to new cars, with minimum overspray, estimated at <15%. This overspray is treated before discharge to the sewers by passage through interceptor pits. The new chemical should be in the settled solids and will be disposed of by landfill.

During vehicle repairs, only part of the vehicle is repainted, but the amount of wastage is high, estimated at as high as 50%. Waste paint from panel repair shops may or may not be treated before disposal. However, quantities are small, and the properties of the pigment are such that it would become associated with sludge during sewage treatment or with soil at the site that receives overspray.

As the paint is formulated to be resistant against breakdown, erosion of the paint should be minimal. As the total amount of embedded new pigment is ~10 grams per vehicle, the amount released to the environment is likely to be insignificant and diffused over a wide area. Similar comment apply to the polishing and cutting of the cars finishes by the public.

On disposal of the vehicle by recycling or landfill there should not be any environmental releases of the new chemical. The surface coatings will be incinerated by the recycling operations and at landfill the new chemical should not leach due to its low water solubility. Additionally, the compound will be encapsulated in the paint resin which will reduce the leachability even further.

9. EVALUATION OF TOXICOLOGICAL DATA

Under the *Industrial Chemicals (Notification and Assessment) Act, 1989*, toxicity data are not required for new chemicals intended to be manufactured or imported at a rate of less than 1 tonne per year. However, the studies evaluated below were available and were submitted on request as part of the notification statement.

9.1 Acute Toxicity

Table 1 Summary of the acute toxicity of Pigment Red 5021B

Test	Species	Outcome	Reference
Acute oral toxicity	Rat	LD_{50} > 2000 mg/kg	(2)
Acute dermal toxicity	Rat	LD_{50} > 2000 mg/kg	(3)
Skin Irritation	Rabbit	non-irritant	(4)
Eye irritation	Rabbit	slight irritant	(5)
Skin sensitisation	Guinea pig	non-sensitiser	(6)

9.1.1 Oral Toxicity (2)

Pigment Red 5021B in 0.5% (w/v) carboxymethylcellulose (CMC) in 0.1% (w/v) aqueous polysorbate 80 was administered to Tif: RAIf (SPF) rats (5/sex) by gavage at a dose level of 2000 mg/kg.

Piloerection, hunched posture and dysnea were noted during a 14 day observation period with all animals recovering by day 5. All animals survived to the end of the observation period and no abnormalities were noted at post mortem on day 15.

It can be concluded that the acute oral LD_{50} of Pigment Red 5021B is greater than 2000 mg/kg.

9.1.2 Dermal Toxicity (3)

Pigment Red 5021B in 0.5% (w/v) CMC in 0.1% (w/v) aqueous polysorbate 80 was applied to a clipped area of the backs of to Tif: RAIf (SPF) rats (5/sex) under a semi- occlusive dressing at a dose level of 2000 mg/kg. The cuff was removed after 24 hours and the test site was cleaned with lukewarm water.

No mortality occurred during a 14 day study period. Piloerection

and hunched posture were observed and erythema was observed up to day 3 but could not be evaluated due to discolouration of the skin by the test article.

No abnormalities were noted at post mortem on day 15.

It can be concluded that the acute dermal LD_{50} of Pigment Red 5021B is greater than 2000 mg/kg.

9.1.3 Skin Irritation (4)

Pigment Red 5021B (0.5 g) was applied under a semi-occlusive dressing moistened with 0.5% (w/v) CMC in 0.1% (w/v) aqueous polysorbate 80 to the intact shaved skin on one flank of each of 3 female New Zealand White rabbits. The contralateral flank was similarly prepared but without test substance or vehicle. Four hours after the application, the dressing was removed.

One hour after patch removal, a slight oedema was observed in two animals. Evaluation of erythema at one hour was impeded by substance-related red discolouration of the application area. Neither erythema nor oedema was observed in any animal at 24, 48 and 72 hours after application of the notified chemical.

It can be concluded that Pigment Red 5021B is not irritating to rabbit skin.

9.1.4 Eye Irritation (5)

Pigment Red 5021B (0.1 ml, 90 mg) was instilled into the conjunctival sac of one eye of each of 3 male New Zealand White rabbits and the lids held closed for about 1 second. The contralateral eye of each animal remained untreated and served as the reference control. Observations were made at 1, 24, 48 and 72 hours after treatment.

No effect on the cornea was noted at any time point. Some effect on the iris of one animal was noted at 1 hour post-treatment. Effects on the conjunctiva were seen in all animals. Slight conjunctival redness was observed in two animals up to 48 hours and in the other up to 24 hours post treatment. Slight swelling was observed in two animals at 1 hour post-treatment. In the other animal swelling was slight at 24 hour following obvious swelling at 1 hour.

It can be concluded that Pigment Red 5021B is a slight irritant to the rabbit eye.

9.1.5 Skin Sensitisation (6)

A skin sensitisation test was performed using the maximisation protocol of Magnusson and Kligman() with Pigment Red 5021B in guinea pigs of the Pirbright strain (10/sex: 5/sex in the test and control groups).

Induction was carried out in two stages:

- the first induction was three pairs of injections (0.1 ml) in the shaved neck: adjuvant/saline (1:1); test article in 5% arachid oil; test article in adjuvant/saline mixture.

- the second induction one week later involved occluded topical administration to shaved skin for 48 hours of 0.4 g of test article in vaseline (w/w).

After a two week rest period, challenge was accomplished by 24 hour occluded administration of 0.2 g test article in vaseline (w/w) applied to the shaved flank.

The control group was treated similarly except that test article was not administered.

No erythema or oedema was observed in any animal at any stage.

It can be concluded that Pigment Red 5021B is not a skin sensitiser in guinea pigs.

9.2 Repeated Dose Toxicity (7)

Pigment Red 5021B in 0.5% CMC/ 0.1% Tween 80 was administered by gavage to groups of Tif: RAIf rats at doses of 0, 50, 200 or 1000 mg/kg/day. There were 10 animals/sex in the 0 and 1000 mg/kg/day dose groups and 5/sex in the other two to accommodate a 4 week recovery period.

No deaths were recorded during the study and there were no effects on body weight or food consumption.

No treatment-related effects on haemotological parameters were noted.

Some small differences were noted in clinical chemistry parameters but were judged not to be biologically significant.

No treatment-related effects on organ weights, gross pathology or histopathology were found.

It can be concluded that Pigment Red 5021B does not cause sub-acute toxic effects when administered repeatedly over a 28 day period.

9.3 Genotoxicity

9.3.1 Mutagenicity in Salmonella typhimurium and Escherichia coli (8)

Induction of back mutation to prototrophy by Pigment Red 5021B in dimethylsulfoxide was tested in *Salmonella typhimurium* strains TA 1535, TA 1537, TA 98 and TA 100 and in *Escherichia coli* strain WP2*uvrA* with and without metabolic activation provided by rat liver S9.

Negative controls were within acceptable limits and positive controls gave the expected responses. The positive controls were:

Strain	-S9	+S9
TA 100	sodium azide	2-aminoanthracene
TA 1535	sodium azide	cyclophosphamide
TA 98	2-nitrofluorene	2-aminoanthracene
TA 1537	9-aminoacridine	2-aminoanthracene
E. coli WP2*uvrA*	4-nitroquinoline-N-oxide	2-aminoanthracene

In replicate experiments, no increases in mutant numbers above background were observed with Pigment Red 5021B at doses up to 5000 µg/ plate.

It can be concluded that Pigment Red 5021B is unlikely to be mutagenic in *Salmonella typhimurium* or *Escherichia coli.*

9.3.2 Induction of Chromosomal Aberrations in Chinese Hamster Ovary Cells in vitro (9)

Pigment Red 5021B in dimethylsulfoxide was tested for induction of chromosomal aberrations in chinese hamster ovary cells *in vitro* both in the presence and absence of metabolic activation provided by rat liver S9.

Doses of the test substance were chosen to reduce the mitotic index by 50-80% compared to the control group. In the absence of metabolic activation, doses up to 62.5 μg/ml and 125 μg/ml were used for incubation times of 18 and 42 hours respectively. In the presence of metabolic activation doses up to 1000 μg/ml for 3 hours were used followed by 15 or 39 hour recovery periods.

Negative controls were within acceptable limits and the positive controls mitomycin C (-S9) and cyclophosphamide (+S9) gave the expected responses.

Treatment of chinese hamster ovary cells with Pigment Red 5021B did not induce chromosomal aberrations at any dose tested either in the presence or absence of metabolic activation.

It can be concluded that Pigment Red 5021B is unlikely to induce chromosomal damage in chinese hamster ovary cells *in vitro.*

9.4 Overall Assessment of Toxicological Data

Pigment Red 5021B was of low acute oral and dermal toxicity in rats, was not a skin irritant but was a slight eye irritant in rabbits and was not a skin sensitiser in guinea pigs. No treatment-related toxic effects were observed in a 28-day repeated dose study.

Pigment Red 5021B was found to be non-genotoxic as determined by a mutagenicity test in bacteria and induction of chromosomal aberrations *in vitro* in chinese hamster ovary cells.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

The following tests to assess the environmental effects of Pigment Red 5021B were performed according to EU test guidelines (concentrations are actual unless otherwise stated).

Table 2 Environmental Effects of Pigment Red 5021B

Species	Test	Result
Zebra Fish *(Brachydanio rerio)*	96 hour acute TG 203	NOEC > 0.5 mg/L (Maximum conc. at end of test)
Daphnia, *Daphnia magna*	48 hour immobilis-ation TG 202	NOEC > 7.7 mg/L
Activated sludge	3 hour respiration inhibitory TG 209	IC_{50} > 100 mg/L (nominal)

In the fish studies the vehicle was lecithine (3.6 mg/L), with nominal concentrations of the test substance being 10, 18, 32, 58 and 100 mg/L. After 96 hours a strong deposit was noted at all concentrations, with analytical values of 0.5 mg/L found. The Daphnia tests were performed using the same vehicle and nominal concentrations as for the fish studies but the highest actual concentration was 7.7 mg/L. These results show that at the maximum concentration in water there should be no effects on aquatic organisms. In addition, they demonstrate that the substance would partition to sediment, thereby limiting exposure.

The respiration inhibition test for activated sludge shows there should be little, if any effects of the notified substance on microbial populations in sewage treatment works.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The environmental hazard of Pigment Red 5021B can be rated as negligible. Of the new chemical entity that is imported, most is incorporated into paint resins, which will limit the environmental exposure to negligible levels. The waste generated during application of red paints containing Pigment Red will be treated which should remove most of the pigment, with the solids containing the pigment disposed of at landfill. An estimate for the amount of waste to be disposed of annually by landfill can be made, i.e. 15% of 70% of 160 kg, 16.8 kg of the new chemical entity. The pigment should be immobile in landfill.

The amount of the new chemical disposed of annually by repairs to vehicles is 50% of 40% of 160 kg, 32 kg but is diffused over a wide area, with extremely low levels. Further it is unlikely to leach and is of low toxicity.

When the painted articles are at the end of their useful lives, they will be disposed of by landfill or by recycling. In landfill Pigment Red will not leach due to its insolubility. Additionally, incorporation into the paint resin further reduces its leachability. During recycling the paint will be incinerated to release water vapour and oxides of carbon and nitrogen.

The low level environmental exposure of the notified chemical as a result of normal use, together with its lack of significant biological activity, indicate the environmental hazard should be negligible.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

Occupational exposure to the notified chemical is likely to be low during transport, storage, distribution and use. During paint production, exposure to the pigment powder formulation is minimised by the use of local exhaust ventilation which is required to minimise exposure to the solvents contained in the paint. Particle size measurements on the notified chemical revealed a sizable (30%) respirable component. However, this is unlikely to present a health risk given its low percentage in the pigment powder (c. 3%) and the fact that exposure to the pigment powder should be less than the Worksafe exposure standard for nuisance dusts of 10 mg/m^3 (10).

There is low potential for public exposure to the notified chemical during transportation, distribution and disposal. Additionally, once incorporated into cured paint, exposure of humans is expected to be minimal.

The toxicological profile of the notified chemical suggests it is of low acute oral and dermal toxicity, is not a skin irritant or a skin sensitiser, is not likely to exhibit toxicity following repeated exposure and is not genotoxic but may be a slight eye irritant. However, given the low likely exposure, the risk of adverse occupational and public health effects may be considered to be minimal.

13. RECOMMENDATIONS

To minimise occupational exposure to Pigmement Red 5021B the following guidelines and precautions should be observed:

- the Worksafe exposure standard for nuisance dusts of 10 mg/m^3 (10) should be adhered to.

- if engineering controls and work practices are insufficient to reduce exposure to Pigment Red 5021B to a safe level, then personal protective devices which conform to and are used in accordance with Australian Standards (AS) for eye protection (AS 1336, AS 1337) (11,12), impermeable gloves (AS 2161) (13) protective clothing (AS 3765.1, 3765.2) (14,15) and respiratory protection (AS 1715) (16), should be worn;

- a copy of the Material Safety Data Sheet should be easily accessible to employees.

14. MATERIAL SAFETY DATA SHEET

The attached Material Safety Data Sheet (MSDS) for Irgazin DPP Red BL containing the notified chemical was provided in Worksafe Australia format (17).

This MSDS was provided by Ciba-Geigy Australia Pty Ltd as part of their notification statement. The accuracy of this information remains the responsibility of Ciba-Geigy Australia Pty Ltd.

15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under the *Industrial Chemicals (Notification and Assessment) Act 1989*, secondary notification of Pigment Red 5021B shall be required if any of the circumstances stipulated under subsection 64(2) of the Act arise. No other specific conditions are prescribed.

16. REFERENCES

1. Altschuh J and Brüggemann in *Chemical Exposure Predictions* Ed. Davide Calamari (Lewis Publishers, London, 1993) pages 1-11.

2. *Acute Oral Toxicity in the Rat Test No. 914075 TK 13270 (Pigment Red 5021B)*, data on file, Ciba-Geigy Limited, Basle, Switzerland, 1991.

3. *Acute Dermal Toxicity in the Rat Test No. 914076 TK 13270 (Pigment Red 5021B)*, data on file, Ciba-Geigy Limited, Basle, Switzerland, 1991.

4. *Acute Dermal Irritation/Corrosion Study in the Rabbit Test No. 914078 TK 13270 (Pigment Red 5021B),* data on file, Ciba-Geigy Limited, Basle, Switzerland, 1991.

5. *Acute Eye Irritation/Corrosion Study in the Rabbit Test No. 914079 TK 13270 (Pigment Red 5021B),* data on file, Ciba-Geigy Limited, Basle, Switzerland, 1991.

6. *Skin Sensitisation Test in the Guinea Pig Maximisation Test Test No. 914080 TK 13270 (Pigment Red 5021B),* data on file, Ciba-Geigy Limited, Basle, Switzerland, 1991.

7. *28 Days Subacute, Oral Toxicity Study in Rats (Gavage) Test No. 914082 TK 13270 (Pigment Red 5021B),* data on file, Ciba-Geigy Limited, Basle, Switzerland, 1991.

8. *Salmonella and Escherichia/Liver-Microsome Test Test No. 914077 TK 13270 (Pigment Red 5021B),* data on file, Ciba-Geigy Limited, Basle, Switzerland, 1991.

9. *Cytogenetic Test on Chinese Hamster Cells In Vitro Test No. 914117 TK 13270 (Pigment Red 5021B),* data on file, Ciba-Geigy Limited, Basle, Switzerland, 1992.

10. National Occupational Health and Safety Commission, *Exposure Standards for Atmospheric Contaminants in the Occupational Environment*, 2nd Edition, Australian Government Publishing Service Publ., Canberra, 1991.

11. Australian Standard 1336-1982, *Recommended Practices for Eye Protection in the Industrial Environment*, Standards Association of Australia Publ., Sydney, 1982.

12. Australian Standard 1337-1984, *Eye Protectors for Industrial Applications*, Standards Association of Australia Publ., Sydney, 1984.

13. Australian Standard 2161-1978, *Industrial Safety Gloves and Mittens (excluding Electrical and Medical Gloves)*, Standards Association of Australia Publ., Sydney, 1978.

14. Australian Standard 3765.1-1990, *Clothing for Protection Against Hazardous Chemicals, Part 1: Protection Against General or Specific Chemicals*, Standards Association of Australia Publ., Sydney, 1990.

15. Australian Standard 3765.2-1990, *Clothing for Protection Against Hazardous Chemicals, Part 2: Limited Protection*

Against Specific Chemicals, Standards Association of Australia Publ., Sydney, 1990.

16. Australian Standard 1715-1991, *Selection, use and maintenance of Respiratory Protective Devices*, Standards Association of Australia Publ, Sydney 1991.

17. National Occupational Health and Safety Commission, *Guidance Note for the Completion of a Material Safety Data Sheet*, 2nd. edition, AGPS, Canberra, 1990.