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**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION
AND ASSESSMENT SCHEME**

FULL PUBLIC REPORT

CYAGARD UV-1164L LIGHT STABILISER

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT**CYAGARD UV-1164L LIGHT STABILISER****1. APPLICANT**

Cyanamid Australia Pty Ltd, 5 Gibbon Road, Baulkham Hills NSW 2153

2. IDENTITY OF THE CHEMICAL

Trade names: CYAGARD UV-1164L Light Stabiliser
CYASORB UV-1164L Light Stabiliser

Molecular weight: 510

Method of detection and determination: HPLC method was submitted.

Spectral data: UV-Vis, IR and ^1H NMR spectra were submitted.

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa:	Semi-viscous toffee-like liquid (product containing 31% xylene)
Odour:	Xylene odour (product containing 31% xylene)
Melting Point:	59.8°C (Melting point of crystals in liquid)
Density:	1117.4 kg/m ³ at 25°C
Vapour Pressure:	0.144 kPa at 25°C
Water Solubility:	0.6 x 10 ⁻³ g/L at 30°C
Fat Solubility:	>1024 g/kg fat simulant HP at 37°C
Partition Co-efficient: (n-octanol/water) log P_{o/w}	4.8
Surface Tension:	68.7 mN/m at 25°C and concentrations of 0.08 and 0.01 mg/L
Flammability Limits:	Not flammable
Decomposition Temperature:	Stable up to 350°C
Autoignition Temperature:	No decomposition exotherm observed up to 350°C
Explosive Properties:	None based on chemical structure

Particle size distribution: Not relevant

Comments on physico-chemical properties:

Boiling Point:

Extrapolation of the vapour pressure data indicates a boiling point of 628°C.

Hydrolysis as a Function of pH:

No results were available. This is acceptable as the notified substance contains no readily hydrolysable groups and has very low solubility in water (0.6 ± 0.2 ppm measured). Therefore hydrolysis is unlikely under environmental conditions.

Adsorption/desorption:

No adsorption/desorption data were provided due to the low solubility of the notified substance in water. The low water solubility and relatively high partition coefficient suggest that the notified substance is likely to be sorbed onto soil or sediment particles.

Dissociation constant:

Dissociation tests were not conducted due to the low solubility and relatively high MW of the notified substance. The weak acidity of the phenolic functionality of the notified substance would suggest some solubility in highly basic media.

4. PURITY OF THE CHEMICAL

Degree of purity: 95% (estimated from composition of commercial product)

Non-hazardous impurity/impurities: 4.2%

Toxic or hazardous impurities: None known in the notified substance

Additives:

Chemical name:	Xylene
CAS no:	1330-20-7
Weight percentage:	31%
Toxic properties:	

- . Rat oral LD₅₀ = 4,300 mg/kg
- . Rat subcutaneous LD₅₀ = 1,700 mg/kg
- . Rat inhalation LC₅₀ = 5,000 ppm/4 hours

Xylene has low acute toxicity by the oral and inhalation routes and moderate acute toxicity by the subcutaneous route. In humans, ocular and respiratory irritation have been observed at atmospheric concentrations of 200 ppm and above (1). The Australian exposure standard for xylene is 80 ppm or 350 mg/m³ (TWA) (2).

5. INDUSTRIAL USE

Cyagard UV-1164L will be incorporated in surface coatings to provide protection against photochemically induced radical degradation. This substance belongs to the benzotriazole class of UV light stabilisers. It has strong, broad-band UV absorbing properties and it is a liquid

with low volatility. Therefore, this substance is intended to replace currently used stabilisers which are in powder form. The notified chemical is added to resins at levels of 1 - 10%.

The company intends to import between 1 - 2 tonne/year of the notified chemical.

6. OCCUPATIONAL EXPOSURE

Cyagard UV-1164L commercial product (containing 31% xylene) will be transported and stored in 200 L containers (type not specified) and treated as a flammable liquid.

At the reformulation site(s) Cyagard UV-1164L will be liquid blended into the mixing vessel containing the resin. Drums containing the notified chemical will be mechanically lifted and poured into the mixing vessel, which will be supplied with local ventilation. The formulated product will be then filtered and pumped into drums for storage and distribution.

The estimated worker exposure per site will be as follows:

<u>Category</u>	<u>Number</u>	<u>Exposure</u>
Shipping, handling storage and maintenance	5	2-3 hrs/day for 3 days/year (Maintenance: 1-8 hrs/day for 1 day/year)
Production and use	3	1-8 hrs/day 300 days/year

7. PUBLIC EXPOSURE

The public might come into contact with surface coatings which contain the notified chemical. As the chemical will be encapsulated at low concentrations in the cured polymer matrix where it is unlikely to escape due to its low vapour pressure and minimal water solubility, public exposure to the notified chemical will be relatively low.

8. ENVIRONMENTAL EXPOSURE

. Formulation, handling and disposal

The notified substance will be incorporated into surface coatings in a simple weighing and blending operation at a late stage in the manufacturing process. The concentration of the notified substance in the final coating will be 0.1-1.0% w/w. Incorporation of the stabiliser can be carried out as the final formulation step. The blending process should be facilitated by the fact that Cyagard UV-1164L is a solution.

The notifier estimates that 3% wastage will occur during reformulation. The material is collected and treated on site for solvent recovery. Remaining solids are treated (presumably polymerised) and dumped to landfill. Spills have a similar fate. Transport drums are recycled and all wastes from the drums are incinerated.

The application of the coating containing the notified chemical will be by rollercoater and curing is via a gas fired baking oven. The recycled solvents are burnt at approximately 700°C to maintain the oven temperature and reduce gas consumption.

During application wastage will occur since process equipment must be routinely cleaned to prevent product contamination and maintain operational efficiency (3). However, wastage from such operations is likely to be low since most of the residues are likely to be collected for

use in other batches. The notifier estimates wastage by the end user during application at approximately 1%. These wastes are consigned to licensed waste disposal outlets.

A further 1% wastage of the notified substance will result from processing of the coated substrate. Such wastage will be associated with the off cuts and will be disposed of to landfill.

Incineration and landfill are the recommended methods of disposal, with incineration being the preferred method. Spillages of the notified substance (liquid) will be adsorbed on an inert material before disposal in a suitable manner.

. Release

The notified substance is not expected to be released to the environment until it has been fully encapsulated with the cured surface coating.

When used in the manner indicated above the release of Cyagard UV-1164L into the environment may occur in two identifiable ways:

- gradual weathering of coatings containing the notified substance; and
- discard of coated materials to landfill.

None of these routes are likely to give rise to significant environmental exposure to the free stabiliser. The notified substance is expected to remain encapsulated within polymer matrices of the surface coating by virtue of its low vapour pressure and minimal water solubility.

. Fate

No biodegradation or bioaccumulation data were provided. The notified substance is not expected to hydrolyse under environmentally relevant conditions. While the biodegradation potential is unclear, bioaccumulation is not expected under the proposed conditions of use.

Cyagard UV-1164L is expected to remain encapsulated within the coating formulation after curing. The low water solubility and high log P of the notified substance indicate that it will be adsorbed onto sediment particulates. Similarly, leaching from wastes disposed in landfill is considered unlikely. Significant exposure of air or water is not expected, with wastes expected to be either destroyed by incineration or consigned to landfill where they will remain immobile.

9. EVALUATION OF TOXICOLOGICAL DATA

9.1 Acute Toxicity

Table 1 Summary of the acute toxicity of Cyagard UV-1164L

Test	Species	Outcome	Reference
Acute oral	Rat	LD50 >5,000	4
Acute dermal	Rabbit	LD50 >2,000	4
Skin irritation	Rabbit	Non-irritant	4
Eye irritation	Rabbit	Slight irritant	4
Skin sensitisation	Guinea-pig	Non-sensitising	4

9.1.1 Oral Toxicity (4)

Cyagard UV-1164L (neat) was administered to Sprague-Dawley rats (5/sex) by gavage at a dose of 5000 mg/kg. The animals were observed for a period of 14 days.

There were no deaths or significant clinical signs. The mean body weight increased throughout the study in both sexes. Gross examination at necropsy did not reveal any abnormalities.

Cyagard UV-1164L was shown to have low acute oral toxicity in rats with LD₅₀ >5,000 mg/kg.

9.1.2 Dermal Toxicity (4)

Cyagard UV-1164L (neat) was applied at a dose of 2,000 mg/kg under occlusive bandage to the clipped dorsal area of New Zealand white rabbits (5/sex). The bandage was allowed to remain in contact with the skin for 24 hours. The animals were observed for a period of 14 days.

There were no deaths or treatment related clinical signs. Mean body weights were slightly lower than initial values on day 4, but recovered by day 14. There were no treatment related findings during gross examination at necropsy.

Based on these results, Cyagard UV-1164L has low acute dermal toxicity in rabbits with LD₅₀ >2,000 mg/kg.

9.1.4 Skin Irritation (4)

Cyagard UV-1164L was tested for potential skin irritation properties in New Zealand white rabbits (1 male and 2 females). The neat test substance was applied for 4 hours to the clipped dorsal area of each rabbit under occlusive bandage at a dose of 0.5 mL. The test substance was applied to both intact and abraded skin. The application site was examined at 0.5, 24, 48 and 72 hours and at 4, 7, 10 and 14 days after removal of the bandage.

With intact skin, slight erythema (2/3 rabbits) and oedema (1/3 rabbits) were observed at the 0.5 hour examination, but these were no longer present at 24 hours.

With abraded skin, slight (1/3) to moderate (2/3) erythema and moderate oedema (1/3) were observed at 0.5 hours. At 72 hours, slight erythema was still present in all 3 animals. Erythema was still present in one animal on day 10.

These data show that Cyagard UV-1164L does not cause skin irritation in intact skin. However, it is a slight to moderate irritant in abraded skin.

9.1.5 Eye Irritation (4)

Cyagard UV-1164L was tested for potential ocular irritation rabbit eye. The neat test substance (0.1 mL) was instilled into the conjunctival sac of the right eye of each of 6 female New Zealand white rabbits. The left eye served as control. The eyes of three of the rabbits were rinsed 30 seconds after instillation of the test substance. The eyes were examined for signs of irritation at 1, 14, 48 and 72 hours and at 4 days after instillation.

Slight to moderate erythema of the conjunctiva was observed at 1 hour after instillation of the test substance in all three rabbits with un-rinsed eyes. At 24 hours, only slight erythema of the conjunctiva was present in these animals. The effect of rinsing of the eyes was palliative.

Cyagard UV-1164L was slightly irritating to the rabbit eye.

9.1.6 Skin Sensitisation (4)

The potential for Cyagard UV-1164L to cause skin sensitisation was tested in guinea-pigs (strain not stated). During the induction phase, the neat test substance (0.4 mL) was applied under occlusive dressing to the shaved dorsal area of 20 guinea-pigs (10/sex) for a period of 6 hours. The application of the test material was conducted once per week for 3 weeks. After a 2-week treatment-free period, these animals were challenged with the neat test substance (0.4 mL). An additional naïve group of 10 guinea-pigs (5/sex) was also challenged with the test substance in a similar manner.

Slight erythema was observed in 16/20 induced animals at 24 hours, and 4/20 animals at 48 hours after the removal of the dressing. In the naïve animals slight erythema was observed in 8/10 animals at 24 hours and 4/10 animals at 48 hours.

Since the incidence and severity of the erythema in the induced animals were the same as that in naïve animals challenged with the test substance, it can be concluded that Cyagard UV-1164L does not cause skin sensitisation.

9.2 Repeated Dose Toxicity (5)

Cyagard UV-1164L was administered by gavage to Sprague-Dawley rats (5/sex/dose) at doses of 0 (control), 250, 500 or 1000 mg/kg/day for 29 days.

There were no deaths or any treatment-related clinical signs. Bodyweight gain and food consumption were not affected by the treatment. Haematology showed an increase in the total white blood cell count (WBC) in the mid and high dose males. This increase in WBC was associated with a slight increase in segmented neutrophils. Clinical chemistry did not reveal any treatment-related effects.

At necropsy, mean and absolute organ weights in treated animals were similar to those in control animals. Gross and microscopic examination did not reveal any treatment-related effects.

9.3 Genotoxicity

9.3.1 Salmonella typhimurium Reverse Mutation Assay (6)

Cyagard UV-1164L was tested for its potential to cause point mutations in the histidine reverse mutation assay using *Salmonella typhimurium* strains TA98, TA100, TA1535, TA1537 and TA1538. Cyagard UV-1164L (in acetone) was tested at concentrations of 100, 333, 1,000, 3333 or 10,000 µg/plate both in the presence and absence of metabolic activation (S9).

Slight cytotoxicity was observed at the highest concentration tested. There was no increase in the number of revertant colonies when Cyagard UV-1164L was tested in either the presence or the absence of S9.

Positive controls used without metabolic activation were 2-nitrofluorene for TA98 and TA1538; sodium azide for TA100 and TA1535; and ICR-191 for TA1537. The positive control used with S9 was 2-aminoanthracene for all the strains.

Cyagard UV-1164L was shown not to be mutagenic in bacteria under the conditions of this experiment.

9.4 Overall Assessment of Toxicological Data

Cyagard UV-1164L was shown to have low oral acute toxicity in rats with LD₅₀ >5,000 mg/kg. It also had low dermal acute toxicity in rabbits with LD₅₀ >2,000 mg/kg. It did not

cause skin irritation in intact rabbit skin, but was a slight to moderate skin irritant in abraded skin. The notified substance was slightly irritating to the rabbit eye. There was no evidence of skin sensitisation when Cyagard UV-1164L was tested in guinea-pigs. A 29-day repeat dose toxicity study, where rats were dosed at doses of up to 1,000 mg/kg/day, did not show any significant signs of toxicity. The notified substance was also found not to be mutagenic in a bacterial assay.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No aquatic toxicity data were supplied.

Significant exposure to the aquatic compartment appears unlikely in view of the low solubility, intended use and indicated routes of disposal for waste products containing the substance. However, if the proposed usage pattern changes with a potential for providing greater exposure to the aquatic compartment, full aquatic toxicity and biodegradation data will be required.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

The notified substance is unlikely to present a hazard to the environment at any stage of its use. Of the original quantity imported it is likely that < 5% will be designated waste and consigned to land fill or incinerated at licensed facilities. Waste paint sludge consigned to landfill is expected to remain associated with such wastes. The remainder of the notified substance will be incorporated into surface coatings for steel cladding.

The proposed use will result in the encapsulation of the notified substance within a cured polymer matrix. Therefore the potential for the release of notified substance to the environment is minimal.

No deliberate release of the notified substance to water has been identified and significant contamination of the aquatic compartment is not expected. The potential impact of the notified substance on aquatic species is limited.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

Cyagard UV-1164L is a viscous liquid with relatively low vapour pressure. Therefore, this substance has an advantage of reduced inhalation exposure as compared to other currently used UV light stabilisers which are in powder form.

The notified substance has low water solubility and high fat solubility which is consistent with the measured partition coefficient (log Po/w) of 4.8. This, coupled with the molecular weight being less than 1000, indicates that skin absorption is possible with this substance. Therefore, skin contact with the notified chemical should be avoided.

Cyagard UV-1164L contains xylene (31%) as an additive to reduce its viscosity. Xylene is an eye and respiratory irritant. Therefore, eye contact and respiratory exposure to Cyagard UV-1164L containing xylene should be avoided.

Animal studies showed that neat Cyagard UV-1164L had low acute oral and dermal toxicity. It did not cause skin irritation or sensitisation, but it did cause slight eye irritation. There were no apparent signs of toxicity with repeated dosing with the notified chemical for up to 29 days. Cyagard UV-1164L was found not to be mutagenic in a bacterial assay.

The estimated import volume and the use pattern of the notified chemical indicate that worker and public exposure will be relatively low.

Based on the low intrinsic hazard of the notified chemical and the low exposure, Cyagard UV-1164L is expected to be of low risk to worker and public health.

13. RECOMMENDATIONS

To minimise occupational exposure to Cyagard UV-1164L the following guidelines and precautions should be observed:

- . if engineering controls and work practices are insufficient to reduce exposure to Cyagard UV-1164L to a safe level, the following personal protective equipment should be used:
 - . a respirator complying with AS 1716 (7) and AS 1715 (8);
 - . safety glasses or goggles complying with AS 1337 (9) and AS 1336 (10);
 - . gloves complying with AS 2161 (11); and
 - . protective clothing complying with AS 3765.2 (12) and AS 3765.3 (13);
- . good personal hygiene should be practiced;
- . spills should be cleaned up promptly using suitable absorbent material; and
- . a copy of the Material Safety Data Sheet should be easily accessible to employees.

14. MATERIAL SAFETY DATA SHEET

The Material Safety Data Sheet (MSDS) for Cyagard UV-1164L (Attachment 1) was provided in Worksafe Australia format (14). This MSDS was provided by Cyanamid Australia Pty Ltd as part of their notification statement. It is reproduced here as a matter of public record. The accuracy of this information remains the responsibility of Cyanamid Australia Pty Ltd.

15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under the *Industrial Chemicals (Notification and Assessment) Act 1989* (the Act), secondary notification of Cyagard UV-1164L shall be required if any of the circumstances stipulated under subsection 64(2) of the Act arise.

As no ecotoxicity and biodegradation data were provided, secondary notification containing such data will be required if the usage pattern for Cyagard UV-1164L indicates greater exposure to the aquatic compartment.

16. REFERENCES

1. Sax N. I. and Lewis R. J. *Dangerous Properties of Industrial Materials*, Van Nostrand Reinhold, New York, p 3495, 1989.
2. National Occupational Health and Safety Commission, *Exposure Standards for Atmospheric Contaminants in the Occupational Environment*, 2nd. edition, AGPS, Canberra, 1991.
3. Randall P M, *Journal of Hazardous Materials*, **29**, p275, 1992.

4. American Cyanamid Company, NJ, USA, *Acute Toxicity Testing of CAYAGARD UV-1164L Light Stabilizer*, Report No. CT-391-89-003, 1992. Data on file.
5. American Cyanamid Company, NJ, USA, *Subchronic Toxicity Testing of Neat UV-1164L Light Stabilizer*, Report No. CT-391-89-005, 1992. Data on file.
6. American Cyanamid Company, NJ, USA, *Genetic Toxicity Testing of CAYAGARD UV-1164L Light Stabilizer*, Report No. CT-391-89-004, 1992. Data on file.
7. Australian Standard 1716-1991, *Respiratory Protective Devices*, Standards Association of Australia Publ., Sydney 1991.
8. Australian Standard 1715-1991, *Selection, Use and Maintenance of Respiratory Protective Devices*, Standards Association of Australia Publ., Sydney 1991.
9. Australian Standard 1336-1982, *Recommended Practices for Eye Protection in the Industrial Environment*, Standards Association of Australia Publ., Sydney, 1982.
10. Australian Standard 1337-1984, *Eye Protectors for Industrial Applications*, Standards Association of Australia Publ., Sydney, 1984.
11. Australian Standard 2161-1978, *Industrial Safety Gloves and Mittens (excluding Electrical and Medical Gloves)*, Standards Association of Australia Publ., Sydney, 1978.
12. 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.
13. 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.
14. National Occupational Health and Safety Commission, *Guidance Note for the Completion of a Material Safety Data Sheet*, 2nd. edition, AGPS, Canberra, 1990.