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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

NITROFAST BLUE 2B

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Director
Chemicals Notification and Assessment

NITROFAST BLUE 2B

1. IMPORTER

Sandoz Australia Pty Ltd, 675-685 Warrigal Road, Chadstone, Victoria 3148.

2. IDENTITY OF THE CHEMICAL

Trade names: Nitrofast Blue 2B
Nitrofast Blue 2B Paste

Other name: C.I. Solvent Blue 104

Spectral data: Not available

Molecular Weight: 474.6

Purity: - The notifier states that Nitrofast Blue 2B is 100% dye powder.

- Nitrofast Blue 2B Paste will contain 20% dye powder in water.

The notifier has applied for exemption from publication of the following items:

. chemical name;

. CAS number; and

. molecular and structural formulae.

Exemption from publication has been granted as the chemical is considered to be non-hazardous.

3. PHYSICAL AND CHEMICAL PROPERTIES

Nitrofast Blue 2B is a blue powder with a slight odour at room temperature and atmospheric pressure. Nitrofast Blue 2B Paste is a blue viscous paste with a mild odour.

The majority of the dye's chemical properties have not been measured. However the notifier has justified these omissions on the basis of low environmental exposure.

Melting Point: Not known. High molecular weight anthraquinone dyes generally decompose below their melting(1).

Density: **- powder** 1.17
- paste 1.04

Vapour Pressure: Not known, but expected to be low.

Water solubility: <2 ppm by colourimetric tests. A close structural analogue, CI Solvent Green 3, has a water solubility of less than 2 ppb (2).

Hydrolytic stability: The dye is not expected to be susceptible to hydrolysis under standard conditions.

Partition coefficient: (*n*-octanol/water) No data were provided. Anthraquinone dyes of this type generally have high partition coefficients, eg log K_{OW} for CI Disperse Blue 24 = 4.68 (3).

Soil adsorption: No data were provided, but given the sorptive properties of similar chemicals, the dye would be expected to adsorb very strongly to soil/sediment.

Dissociation constant: The notifier states that the dye is non-dissociating.

Thermal stability: Thermal stability is an essential property of dyes of this type.

4. METHOD OF DETECTION AND DETERMINATION

The notifier states that Nitrofast Blue 2B is routinely checked for colour and purity, but the methods used are not specified. An infrared spectrum for Nitrofast Blue 2B was provided.

5. ESTIMATED IMPORT VOLUME

The notifier estimates that 100 to 800 kg of Nitrofast Blue 2B will be imported for each of the first five years. The dye will initially be imported into Australia in paste form.

6. INDUSTRIAL USES

At present, paper containing Nitrofast Blue 2B is imported into Australia. The notifier intends to replace this imported paper with locally manufactured paper. Imported Nitrofast Blue 2B will be one of a number of dyes used in the stock dyeing of the paper in Australia. The dye will be incorporated by physical entrapment into paper at a concentration of 0.02%.

Reformulated Nitrofast Blue 2B will be transported to the paper mill in Schutz containers. Schutz containers are metal sheathed plastic containers and each will contain approximately 800 kg of mixed paste. The paste will be pumped directly into the papermaking process at the 'wet end' of the machine and incorporated into the paper. It is planned to hold a run one day per month for incorporating Nitrofast Blue 2B into paper. The paper is then cut and wound onto paper reels.

7. REFORMULATION PROCESS

Nitrofast Blue 2B will initially be imported into Australia as a water-based paste containing 20% dye powder. The paste will be reformulated by blending with one or more other dye pastes. Nitrofast Blue 2B Paste is to be imported in 25 L plastic drums, poured by workers into a 1000 L blending vat, mixed with the other dyes and repackaged into Schutz containers.

In the future, Sandoz intends to import the dye as a powder and mix it into a paste with other dry pigments in the blending vat. The powder will be imported in fibreboard containers with an inner plastic bag.

8. PUBLIC AND OCCUPATIONAL EXPOSURE

8.1 Public Exposure

The chemical is manufactured outside Australia and will be imported in the first instance as a paste and eventually as a powder. Transport to the customer will be in either plastic

drums or Schutz containers. The dye will be physically entrapped in a limited number of paper types at a very low concentration. Thus, under normal conditions, the potential for public exposure to Nitrofast Blue 2B is low.

Small amounts of dye will be released to the environment when used transport containers are dumped to landfill and when residue is discharged to the sewage disposal system at the reformulation plant and paper mill. The potential for public exposure to these amounts of residue dye in landfill and the sewage is expected to be low.

8.2 Worker Exposure

Reformulation

Reformulation of Nitrofast Blue 2B will be carried out at the dispersion plant. The dye will be blended with other dyes and the mixed paste repackaged into Schutz containers. Initially the dye will imported in paste form in 25 kg open head drums and workers will pour the paste into the blending vat and scrape out the drums. Workers will be required to wear gloves while handling the paste. Good housekeeping procedures will also be observed. As a result, worker exposure to the dye is expected to be low. Any contact with Nitrofast Blue 2B will be obvious due to its intense blue colour.

In the future, the notifier intends to import the dye as a powder, which will increase the potential for worker exposure by inhalation of dust particles. To minimise exposure to the powder, workers will be required to wear face masks and protective hoods and the blending vat will be fitted with local exhaust ventilation. Under these conditions worker exposure to the dye is expected to be minimal.

Use

Reformulated Nitrofast Blue 2B will be used as a mixed paste in the manufacture of paper. The paste will be pumped into the 'wet' end of the process and physically incorporated into the paper. Very low worker exposure is expected during the paper making process.

Mill operators will be involved in the rewinding, shifting and cutting of the finished paper reels which contain 0.02% of the

Nitrofast Blue 2B. The machines used in these processes are fitted with dust suppression equipment, which will remove any released Nitrofast Blue 2B and worker exposure is expected to be minimal.

9. ENVIRONMENTAL EXPOSURE

9.1 Release

Reformulation

The containers used to import the powder and paste will be disposed of to landfill, resulting in an annual release of 100-200 g as container residues. Washing of the blending vats and occasional spillage are expected to release about 300 g of Nitrofast Blue 2B to the sewer from the paper mill for each blending operation, or an annual discharge of approximately 2 kg.

Use

Nitrofast Blue 2B will be incorporated into paper at the paper mill. After dyeing, suspended solids will be removed from the effluent stream and recycled to another machine which manufactures container board. Total discharge from a daily run utilising 40 kg of dye should not exceed 0.5 kg, and most of this discharge will be bound to sludge and removed during waste water treatment within the mill for disposal to landfill. As the dyeing process will be carried out once per month, the amount disposed of annually should not exceed 6 kg. A small fraction in solution and suspended on fine particles will be discharged to water as part of the mill's licensed clarified water discharge of up to 55 megalitres per day.

Dye may also enter the environment through disposal of paper, and this possibility will be explored in the following section.

9.2 Fate

Because of their required stability in use characteristics, dyestuffs generally can not be expected to be aerobically biodegradable, at least in short term tests (4). In the present case, the low solubility and high partition coefficient of Nitrofast Blue 2B is expected to result in substantial removal of

residue dye from effluent streams by sorption onto sludge during waste water treatment. Following release to the aquatic environment, the dye can be expected to be mainly associated with sediment and suspended solids.

Although generally aerobically stable, commonly used hydrophobic dyes have been found to degrade under the anaerobic conditions characteristic of sediment. While degradation pathways have yet to be elucidated, their efficiency is reflected in recorded half-lives for similar aminoanthraquinone dyes in sediment of less than 3 weeks (5). The toxic potential of Nitrofast Blue 2B degradation products is not known.

Hydrophobic chemicals released to water may bioaccumulate in aquatic biota. However, it has been shown that bioaccumulation of lipophilic dyestuffs in fish is unlikely if they are of large molecular size because such chemicals do not cross biological membranes readily. A molecular weight of 450 or a cross section of 1.05 nm have been proposed as limits for bioaccumulation potential (6). While the molecular weight of Nitrofast Blue 2B is borderline, experimental bioconcentration factors for two primary aminoanthraquinone dyes were of the order of 5 (6). Accordingly, the dye is unlikely to bioaccumulate due to limited persistence in sediment and large molecular size.

Dye consigned to landfill can be expected to remain immobile. Such consignment may occur through disposal of container residues, waste paper or sludge, the last originating either from the dyeing process or recycling of dyed paper. The dye would not be expected to undergo significant detachment from fibres if paper is recycled, but would be destroyed should paper be disposed of by incineration.

10. EVALUATION OF TOXICOLOGICAL DATA

10.1 Acute Toxicity

The notifier states that Nitrofast Blue 2B:

- exhibited low acute oral toxicity (Rat LD_{50}>5000 mg/kg) (7); and
- was a non irritant to the skin and eye of rabbits (7).

The above studies were performed in 1975 under the accepted methods of that time and not under the Principles of Good Laboratory Practice.

10.2 Overall Assessment of Toxicological Data

Independent assessment of the toxicological data was not possible, as information was not available on the original methodology and details of the test results were scant.

11. ASSESSMENT OF ENVIRONMENTAL EFFECTS

11.1 Assessment of Environmental Effects

Environmental effects testing is not required for small volume chemicals (<1 tonne). In general, acute toxic effects of dyestuffs to aquatic species are said to be found, if at all, at levels which are far in excess of anything which would be tolerated in terms of colour in natural waterways (6). However, exposure of rainbow trout to the closely related dye CI Solvent Green 3 at its solubility limit (<2 ppb) induced 50% mortality in 96 h, although no toxic effects were noted at 50% dilution. A reduction in algal growth (*Selenastrum capricornutum*) of 98-99% after five days exposure at the solubility limit was also recorded, but three other fish species and four aquatic invertebrates were unaffected (2).

11.2 Assessment of Environmental Hazard

By virtue of its low water solubility and strong sorption characteristics, Nitrofast Blue 2B disposed of to landfill can be expected to remain immobile. Thus hazards to the terrestrial environment from disposal of the dye are expected to be minimal. The same characteristics should ensure that amounts remaining in the aquatic environment following waste water treatment will be minimal, and dissolved concentrations extremely low as a result of strong sorption to sediment and suspended solids. Accumulation of Nitrofast Blue 2B in sediment is not expected because of the susceptibility of aminoanthraquinone dyes to anaerobic degradation (5). The predicted bioaccumulation potential is low as a result of the dye's fairly large molecular size (6).

The predicted environmental hazard associated with discharge of formulation wastes to the sewer at the reformulation plant is minimal, given the dye's sorption characteristics and the large dilution factors provided by other waste streams and the receiving ocean. However, the situation at the paper mill is less clear cut. Assuming as a worst case that all unreacted dye remains in solution, levels in the licensed clarified water discharge from the mill would be around 10 ppb (0.5 kg in $5x10^7$ L of effluent). This effluent stream receives treatment in an aerated lagoon and a polishing pond before discharge to the local river. Removal with sludge would be expected to reduce the above figure by an order of magnitude, and dilution in the receiving waters should further depress concentration to sub ppb levels.

It appears from the above that the safety margin between the estimated environmental concentration and potentially toxic level (in the low ppb range) could be fairly narrow, and every precaution should be taken to avoid accidental contamination of the aquatic environment.

12. Assessment of public and Occupational Health and Safety Effects

The potential for public exposure to the dye is expected to be low in normal circumstances due to its manner of use and disposal. Potential worker exposure is expected to be low under normal use conditions. Results of animal studies indicate that Nitrofast Blue 2B has a low acute oral toxicity and low irritating potential to the eyes and skin. Therefore, it is unlikely that Nitrofast Blue 2B will pose a significant acute health and safety hazard to the public and workers.

However, when Nitrofast Blue 2B is used as a powder in the reformulation process workers may have increased exposure to the dust by inhalation. To minimise exposure, workers should wear appropriate respiratory protection and local exhaust ventilation should be employed where possible.

13. ASSESSMENT OF MATERIAL SAFETY DATA SHEETS

The Material Safety Data Sheets (MSDS) for Nitrofast Blue 2B and Nitrofast 2B Paste are provided at Attachments 1 and 2. These MSDS were provided by Sandoz Australia Pty Ltd in Worksafe format as part of their notification statement. They are

reproduced here as a matter of record. The information and recommended control measures contained in these MSDS generally reflect the hazards associated with use of Nitrofast Blue 2B powder and paste. The accuracy of this information remains the responsibility of Sandoz Australia.

14. RECOMMENDATIONS FOR THE CONTROL OF PUBLIC AND WORKER EXPOSURE AND THE ENVIRONMENT

To minimise public and worker exposure to Nitrofast Blue 2B powder and paste the following guidelines and precautions should be observed:

. engineering control procedures such as local exhaust ventilation should be employed in areas where the dry powder dye is handled;

. a copy of the Material Safety Data Sheet should be made available to all personnel who may have exposure to Nitrofast Blue 2B;

. workers who may come into direct contact with Nitrofast Blue 2B powder or paste should:

- wear appropriate gloves (for example, impervious gloves);

- observe good personal hygiene practices at work; and

- wear dust masks when handling the powder;

- avoid the generation of a dust cloud; and

. all precautions should be taken to prevent spills from contaminating waterways.

15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under the *Industrial Chemicals (Notification and Assessment) Act 1989* (the Act), secondary notification of the Nitrofast Blue 2B shall be required by Sandoz Australia Pty Ltd if any of the circumstances stipulated under subsection 64(2) of the Act arise. No other specific conditions are prescribed.

16. REFERENCES

1. *Kirk-Othmer Encyclopedia of Chemical Technology*, 2nd Edition, John Wiley, New York, 1963, Vol 2, p517.

2. DT Burton, DJ Fisher and RL Paulson, *Chemosphere*, 1989, **19**, 1959-1970.

3. GL Baughman and TA Perenich, *Environmental Toxicology and Chemistry*, 1988, **7**, 183-199.

4. D Brown, *Ecotoxicology and Environmental Safety*, 1987, **13**, 139-147.

5. C-P Yen, TA Perenich and GL Baughman, *Environmental Toxicology and Chemistry*, 1991, **10**, 1009-1017.

6. R Anliker, P Moser, and D Poppinger, *Chemosphere*, 1988, **17**, 1631-1644.

7. Betrifft toxikologische Prufung der Substanz Nitroechtblau 2B, P. Wind and T. Coluccia, Sandoz Chemicals Ltd., Basel, Switzerland, Report no. F/C 77.