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April 2000

**NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION
AND ASSESSMENT SCHEME**

FULL PUBLIC REPORT

Polymer in Setalux C-71761 VB-60

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Director
Chemicals Notification and Assessment

FULL PUBLIC REPORT**Polymer in Setalux C-71761 VB-60****1. APPLICANT**

Amtrade International Pty Ltd of Level 2, 570 St Kilda Road ST KILDA VIC 3004 has submitted a Polymer of Low Concern notification statement in support of their application for an assessment certificate for Polymer in Setalux C-71761 VB-60.

2. IDENTITY OF THE CHEMICAL

The chemical name, CAS number, molecular and structural formulae, molecular weight, spectral data and details of the polymer composition have been exempted from publication in the Full Public Report.

Other Names: Setalux XL 1026

Marketing Name: Setalux C-71761 VB-60 (60% notified polymer)

Characterisation as a Synthetic Polymer of Low Concern**Number-Average**

Molecular Weight (NAMW): > 1000

Maximum Percentage of Low**Molecular Weight Species**

Molecular Weight < 500: 3.5%

Molecular Weight < 1 000: 6.5%

Polymer Stability

Under normal conditions of storage, the polymer is not expected to undergo degradation.

Reactivity

Stable

Charge Density

The polymer is not polycationic.

Reactive Functional Groups

The polymer contains the low concern groups aliphatic hydroxyl and carboxylic acid.

Method of Detection and Determination: The polymer was detected by infrared (IR) spectroscopy and characterised by gel permeation chromatography.

The polymer meets the criteria for assessment as a synthetic polymer of low concern under Regulation 4A of the *Industrial Chemicals (Notification and Assessment) Act* (1989).

3. PHYSICAL AND CHEMICAL PROPERTIES

Appearance at 20°C and 101.3 kPa: White liquid (solvent solution).

Particle Size Not applicable. The polymer is imported as a component of a solvent solution.

Melting Point: -20°C (solvent solution).

Density: 1.0 g/cm³ (solvent solution).

Water Solubility Not determined. The polymer has a lack of substantial polar functionality and is not expected to have significant water solubility.

Vapour Pressure: Not determined.

Partition Co-efficient (n-octanol/water): Not determined due to low expected water solubility. The polymer is expected to partition into *n*-octanol rather than water.

Hydrolysis as a Function of pH: Not determined. The polymer is not expected to undergo hydrolysis in the environmental pH range of between 4 and 9 due to the expected low water solubility.

Adsorption/Desorption: Not determined due to low expected water solubility. The polymer is expected to become associated with the organic component of soil and sediments.

Dissociation Constant: pK_a = 4.87 (based on propenoic acid).

Flash Point: Not determined.

Flammability Limits: Combustible. Solvent solution is flammable.

Autoignition Temperature: 340°C

Explosive Properties: Not determined.

Reactivity/Stability: Under normal conditions of storage, the polymer is not expected to undergo degradation.

Comments on Physico-Chemical Properties

No additional comments.

4. PURITY OF THE CHEMICAL

Degree of Purity: > 99%

Hazardous Impurities: Residual monomers all < 0.2%.

Non-hazardous Impurities (> 1% by weight): None

Additives/Adjuvants:

The material safety data sheet (MSDS) identifies the following solvent components of the polymer solution which are classified as hazardous substances:

Chemical name: Aromatic hydrocarbon solvent
CAS No.: 64742-95-6
Weight percentage: 39% (< 0.1% benzene) in polymer solution.
Toxic properties: R65 Harmful: may cause lung damage if swallowed (National Occupational Health and Safety Commission, 1999b).

Chemical name: n-butanol
CAS No.: 71-36-3
Weight percentage: 1% in polymer solution.
Regulatory controls: NOHSC exposure standard 80ppm (350mg/m³) TWA, 150ppm (655mg/m³) STEL (National Occupational Health and Safety Commission, 1995).

5. USE, VOLUME AND FORMULATION

The notified polymer will be used as a component of an automotive paint clearcoat at up to 10% w/w. It will be applied over basecoated external surfaces of motor vehicle bodies. The polymer will be imported initially as a component of an automotive clearcoat but then as a solvent solution at up to 70% w/w (Setalux C-71761 VB-60). Twelve tonnes of the notified polymer per year will be imported for 5 years.

6. OCCUPATIONAL EXPOSURE

Import, Transport and Storage

The notified polymer will be imported initially as a component of a finished automotive paint at up to 10% w/w in 200L steel drums in containers. After commercial viability is established, the polymer solution will be imported similarly in 200L steel drums and transported by road to a single customer site for paint manufacture. Approximately 6 waterside and transport personnel each working 4-6 hours per year for 5-10 days/year will handle the paints and polymer solution. Since the polymer is imported and stored in sealed drums, exposure during initial import, transport and storage would only occur following accidental puncture of the drums.

Paint Manufacture

At the customer site, Setalux C-71761 VB-60 will be weighed and pumped from steel drums into a 10,000L stainless steel mixer. During connection and disconnection of hoses between the import drums and mixer, 6 paint manufacturing staff working 4 hours/day for 200 days/year may be exposed to the polymer at up to 70% w/w. After automatic, enclosed blending with other paint resins, stabilisers and solvents, paint samples will be decanted manually by laboratory staff for quality assurance testing.

The paint is then filtered by gravity feed into 200L steel drums. During these operations, three filling operators working 4 hours/day for 200 days/year may be exposed to the polymer at up to 10% w/w. The above blending, filtration and storage operations are conducted under local exhaust ventilation and the dilution of the polymer with other paint ingredients, the anticipated nonvolatile nature of the polymer and the engineering controls used to limit exposure makes inhalation exposure to the polymer at these stages unlikely. These controls make inhalation exposure to the solvents and other paint ingredients also unlikely. However, there is some potential for spillage during decanting and mixing procedures and occupational exposure to the notified polymer and other ingredients may occur, predominantly via the skin and eyes. To control this exposure, workers should wear impervious gloves, anti-static coveralls, anti-static footwear and eye protection conforming to the relevant Australian Standards. These controls for exposure to the polymer will also be sufficient to control exposure to solvents and other paint components.

Laboratory Testing

Laboratory development and testing occur with the polymer emulsion and paints and during these handling stages a total of 3 workers may be exposed each for 8 hours per day for 80 days per year. Worker exposure to the notified polymer, solvents and other paint ingredients in the laboratory environment is controlled by ventilated fume cupboards and personal protective equipment consisting of coveralls/laboratory coats, impervious gloves and eyewear.

End Use (Paint Application)

The final paint coating containing up to 10% notified polymer will be sold and shipped in

200L drums by road transport to automotive original equipment manufacturers (OEMs) at which approximately 90% of the paint coatings will be applied by electrostatic atomised spray and 10% by manual spray. A total of three workers will pump the final paint coating to an open circulation tank in a mixing room and will be potentially exposed to the polymer for 2 hours per day for 200 days per year. For spray painting, 20 workers each spending 16 hours per day for 200 days per year are expected to be involved in applying the coating and 8 workers for 2 hours per day for 200 days per year will be involved in cleaning spray equipment. Given transfer efficiencies of approximately 35% and 80% for manual and automatic electrostatic spray applications respectively, it is at the point of manual application and cleaning of spray equipment that occupational exposure to the notified polymer (at up to 10% w/w) and polymer solvents may be considered most likely. Exposure may occur by spillage to skin and eyes but also by inhalation of aerosols.

Typically, the spray painters who potentially will be exposed to the notified polymer will be fully TAFE trained and coating of automobile components will be conducted in a laminar flow downdraft spray booth which is designed to rapidly remove aerosol particles and solvent vapours from the atmosphere. Several possible booth designs may be used. In a dry floor booth, overspray will be collected in filters contained in the floor of the booth and any unremoved particulates will reach the exhaust stack with the solvent vapours. In a wet floor booth, overspray will collect in a pool of water below the grill floors or in a wet scrubber in the exhaust and will be removed in a filter. The residual solids will be disposed of to secure landfill. The spray booths are subject to Australian/New Zealand Standards (AS/NZS/4114.1: 1995 Spray Painting Booths – Design, Construction and Testing (Standards Australia/Standards New Zealand, 1995a) and AS/NZS/4114.2: 1995 Spray Painting Booths – Selection, Installation and Maintenance (Standards Australia/Standards New Zealand, 1995b).

Spray painters will wear personal protective equipment consisting of impervious nylon overalls, calico hoods, cartridge type respirators and nylon gloves conforming to the relevant Australian Standards.

After application of the paint coating, the automotive components are heated to cure the coating to form a stable film. After this stage, the notified polymer is immobilised within a resin matrix and not available for exposure to workers.

7. PUBLIC EXPOSURE

The automotive solvent borne clearcoats containing up to 10% notified polymer are applied on the external primed and basecoated surfaces of car bodies and then heat cured. During the heat curing process, the notified polymer reacts with other components in the paint formulation to form an integral part of the paint film. The resin and paint products will not be sold to the public and the end use will be restricted to the major car manufacturers. The hazard to the general public who is exposed to the stable paint film is negligible.

8. ENVIRONMENTAL EXPOSURE

Release

Initially the notified polymer will be imported in a finished clearcoat (paint). At a later date, the notified polymer will be imported in the product Setalux C-76761 VB-60 which will be reformulated into clearcoat paint products.

During reformulation (paint manufacture) of polymer solution into paint there is potential for release as spillage (approximately 2%). This may occur during filtration, blending, transfer activities, and in the course of cleaning transfer and mixing equipment. Based on the maximum import level of 12000 kg, this equates to approximately 240 kg of the notified polymer released per annum.

The notifier indicates that paint and solvent residues removed from spray equipment will be collected and reprocessed by a solvent reclamation company. Entrained polymer solids in the solvent would be recovered by suspension, steam stripping and solvent extraction to extract organic polar and non polar solvents. These solids can then be readily disposed of to landfill without the requirement of incineration. This solvent extraction method is known as the Dusol Process.

According to the notifier, approximately 10% of the paint will be applied by the manual method and 90% by the automatic method. Transfer efficiencies will be approximately 35% and 80% respectively. The notifier estimates that during spray application, an average of 25% of the notified polymer will be released as overspray which is captured in spray booth air and water filtration systems. The paint material removed in this way is treated in an in-house water scrubbing system whereby paint material is separated out in a treatment pond using flotation techniques (e.g. clarifiers, flocculants and surfactants). The sludge is then removed to landfill and the water recycled within the spray booth. Ultimately, however, all water will be sent to sewer via a holding pond. Assuming an import volume of 12000 kg and based on a worst case scenario of 25% overspray, this represents a release of approximately 3000 kg per annum. The notifier has calculated a Predicted Environment Concentration (PEC).

For both application and reformulation, all spills will be contained within the plant through bunding and collected by a licensed waste contractor. Established procedures and good work practices will minimise the risk of spillage.

Residues will also remain in the empty paint containers after use. It is estimated that up to 2% (240 kg) of the notified polymer will remain as residue in the containers which will be collected by a licensed waste contractor and disposed of to landfill.

Further release of the polymer may occur in the form of either inert flakes of cross linked paint or on objects painted with the new polymer when panels are consigned to metal reclamation or landfill.

Fate

Once applied to the metal panels of vehicles, the notified polymer will be incorporated in a hard, durable, inert film and would not present a significant hazard. Any fragments, chips and flakes of the lacquer will be of little concern as they are expected to be inert. The metal panels coated with the polymer are likely to be either recycled for steel reclamation or be placed into landfill at the end of their useful life. When recycled the polymer would be

destroyed in furnaces and converted to water vapour and oxides of carbon and nitrogen.

The solid waste generated during manufacturing, formulation and application of the coating will be disposed to landfill. The polymer is recovered from cleaning wastewater as an insoluble solid and will be disposed of to landfill. The containers and their residues will also be disposed of in this manner. Leaching of the polymer from landfill sites is unlikely, given the expected solid nature of the waste substance and cross linking in paint matrix. Polymer disposed of in this way could be expected to degrade slowly via biotic and abiotic processes.

The polymer is not expected to cross biological membranes, due to the anticipated low solubility and high molecular weight, and as such should not bioaccumulate (Connell, 1989).

9. EVALUATION OF TOXICOLOGICAL DATA

No toxicology data were submitted.

10. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were submitted.

11. ASSESSMENT OF ENVIRONMENTAL HAZARD

Approximately 25% of the notified polymer may be discharged into the in-house water treatment system as a result of equipment cleaning and overspray. The notifier has claimed that approximately 80% of this waste will be removed as sludge (based on USEPA factors). The remaining 20% will be released into the sewage system. A PEC submitted by the notifier assumed discharge at three sites (discharging 0.59 kg/day/site) and daily water discharge into the sewer system from each automotive manufacturing site approximately 1.2 ML and dilution factor of 1:50. The predicted PEC was 9.8 µg/L.

As the product will be used initially at a single site and sent to a sewage treatment plant in a city location, a PEC based on metropolitan use has been calculated using the maximum projected level of use:

Maximum Import Volume per annum	12000 kg
Amount of overspray	3000 kg
Amount discharged from automotive plant*	600 kg
Volume discharged from plant per day	1.64 kg
Sewer inflow per day**	460 ML
Concentration in Sewage Treatment Plant	3.5 µg/L
Further diluted (1:10) in receiving waters	0.35 µg/L

*Assuming 80% adsorption to sewage sludge in in-house sewage treatment plant.

**Sewer inflow based on average, dry weather sewage inflow from western sewage catchment

of Melbourne.

Within the metropolitan sewage treatment plant, it is expected that the polymer will further bind to sewage sludge and be removed to landfill prior to discharge to receiving waters.

Ecotoxicity data are not available for the notified polymer. Anionic polymers that have a NAMW >1000 and are soluble or miscible in water are considered to be a potential concern for aquatic ecotoxicity (Nabholz et al., 1993). These polymers may indirectly inhibit algal growth via over chelation of nutrient elements but carboxylates need to be on alternate carbons of the polymer back bone for maximum toxicity (approx. 1 mg/L). However, in the worst case scenario described above, concentrations of the notified polymer in receiving waters is considered to be low and is expected to be further attenuated by adsorption to sewage sludge.

The majority of the waste polymer is expected to ultimately be released to landfill. The polymer is unlikely to be mobile in the soil environment and would be expected to slowly degrade to gases such as carbon dioxide through abiotic and biotic processes. The environmental hazard of the notified polymer in landfill is expected to be low.

In the event of release of the polymer into waterways, the polymer is expected to disperse into the water then gradually settle out onto sediments where it would slowly degrade. The environmental hazard of the notified polymer in the aquatic environment is expected to be low.

The polymer's large molecular weight and expected low water solubility should prevent bioaccumulation. Given the above, the overall environmental hazard is expected to be low.

12. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

Hazard Assessment

No toxicological data have been provided for the notified polymer and therefore the substance cannot be classified in accordance with the NOHSC Approved Criteria for Classifying Hazardous Substances (National Occupational Health and Safety Commission, 1999a). However, the systemic toxicity of the notified polymer is likely to be low, given its high molecular weight and consequent low bioavailability.

Some of the monomers from which the polymer is produced are hazardous substances with associated health effects such as dermal and ocular irritation and dermal sensitisation. However, the residual monomers are present at low concentrations (all < 0.2% w/w) and so are expected not to contribute to a health risk.

Occupational Health and Safety

Import, transport and storage of the final paint and polymer solution will be in sealed 200L drums. Occupational exposure to the notified polymer would only be envisaged following accidental puncture of the drums, and the health risk is assessed as low.

Should initial import establish commercial viability, manufacture of paints incorporating the notified polymer is to occur locally. During filtration and storage of the polymer solution containing up to 70% w/w notified polymer and blending, filtration and storage of paints containing up to 10% w/w of notified polymer, there exists potential for spillage and occupational exposure predominantly via the skin and eyes. Mixing and filling are conducted using exhaust ventilation and these measures combined with the involatile nature of the polymer makes inhalation exposure unlikely. Exposure will be controlled also by personal protective equipment. Given these engineering and personal controls and the expected low toxicity of the notified polymer, the health risk to workers during paint manufacture would be assessed as low.

The final paint coating will then be sold and shipped in 200L drums by road transport to automotive OEMs who will apply the coating by manual and automatic electrostatic atomised spray application techniques. Given the open mixing process and the transfer efficiencies of approximately 35% and 80% for manual and automatic electrostatic spraying respectively, it is at this point of manual application that occupational exposure to the notified polymer may be considered most likely. The spraying procedure produces a dense aerosol of paint particles which may impact on human health even in the absence of additional hazardous solvents, stabilisers and other components.

During final paint preparation and spray painting procedures, worker exposure needs to be limited through a combination of engineering controls such as exhaust ventilated paint kitchens and laminar spray booths and personal protective equipment consisting of impervious nylon overalls, calico hoods, cartridge type respirators and nylon gloves. These controls are to conform to the relevant Australian Standards. Under these circumstances, given the expected low toxicity of the notified polymer and the equipment used to control exposure, the health risk is considered low.

It should be noted that the polymer solution and the final applied paint product contains extra ingredients including potentially toxic solvents such as aromatic hydrocarbons, butanol and xylene and it is important that appropriate measures are taken to include control of exposure to these components. Spray painting procedures should conform to appropriate occupational health and safety regulations such as the *NOHSC Spray Painting Guidance Material* (National Occupational Health and Safety Commission, 1999c). Employers should ensure that the exposure standards for the paint solvents are adhered to in the workplace.

Following curing of the paint, the polymer will be cross-linked with other paint components to form a high molecular weight stable film. In this form, the polymer is unavailable for absorption and thus the health risk to workers from the notified polymer after paint curing would be negligible.

Public Health

The public will come into contact with the notified polymer only after it has been applied to and becomes an integral part of a hard, durable coating on motor vehicles. This coating is formed by the reaction of this polymer as a cross-linking agent and others in the paint under the action of heat to form a very stable paint film. The paint film on the car is inert to the environment. Therefore, the risk to the public induced by the notified polymer is considered to be low.

13. RECOMMENDATIONS

To minimise occupational exposure to Polymer in Setalux C-71761 VB-60, the following guidelines and precautions should be observed:

- The paints containing the notified polymer should be applied in accordance with the National Guidance Material for Spray Painting (National Occupational Health and Safety Commission, 1999c);
- Employers should ensure that NOHSC exposure standards for ingredients in the polymer solution and the paint mix are not exceeded in the workplace;
- Safety goggles should be selected and fitted in accordance with Australian Standard (AS) 1336 (Standards Australia, 1994) to comply with Australian/New Zealand Standard (AS/NZS) 1337 (Standards Australia/Standards New Zealand, 1992); industrial clothing should conform to the specifications detailed in AS 2919 (Standards Australia, 1987) and AS 3765.2 (Standards Australia, 1990); impermeable gloves or mittens should conform to AS 2161 (Standards Australia/Standards New Zealand, 1998); all occupational footwear should conform to AS/NZS 2210 (Standards Australia/Standards New Zealand, 1994);
- Spillage of the notified chemical should be avoided. Spillages should be cleaned up promptly with absorbents which should then be put into containers for disposal;
- Good personal hygiene should be practised to minimise the potential for ingestion;
- A copy of the MSDS should be easily accessible to employees.

14. MATERIAL SAFETY DATA SHEET

The MSDS for the notified chemical was provided in accordance with the *National Code of Practice for the Preparation of Material Safety Data Sheets* (National Occupational Health and Safety Commission, 1994).

This MSDS was provided by the applicant as part of the notification statement. It is reproduced here as a matter of public record. The accuracy of this information remains the responsibility of the applicant.

15. REQUIREMENTS FOR SECONDARY NOTIFICATION

Under subsection 64(1) of the Act, secondary notification may be required if the polymer characteristics cease to satisfy the criteria under which it has been accepted as a Synthetic Polymer of Low Concern. Secondary notification of the notified polymer may be required if any of the circumstances stipulated under subsection 64(2) of the Act arise. No other specific conditions are prescribed.

16. REFERENCES

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