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NATIONAL INDUSTRIAL CHEMICALS NOTIFICATION AND ASSESSMENT SCHEME

FULL PUBLIC REPORT

COPOLYMER OF VINYL ACETATE, BUTYL MALEATE AND ISOBORNYL ACRYLATE IN ETHANOL

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Director
Chemicals Notification and Assessment

COPOLYMER OF VINYL ACETATE, BUTYL MALEATE AND ISOBORNYL ACRYLATE IN ETHANOL

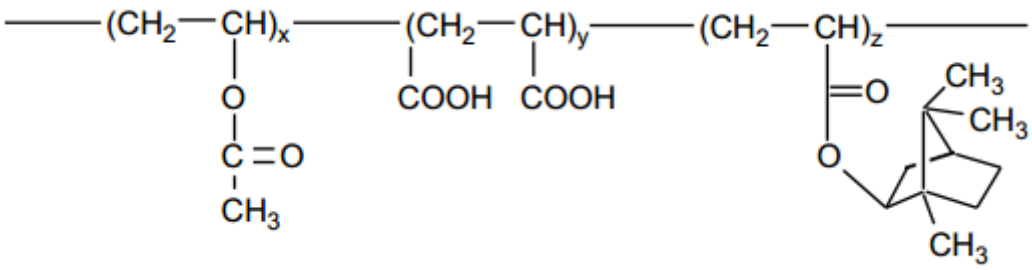
1. APPLICANT

ISP (Australasia) Pty Ltd, 73-75 Derby Street, Silverwater, NSW 2141.

2. IDENTITY OF THE CHEMICAL

Chemical name:	Copolymer of vinyl acetate, butyl maleate and isobornyl acrylate in ethanol
Chemical Abstracts Service (CAS) Registry No.:	136392-68-2
Trade names:	Advantage CP; Polymer ACV-4009 (Advantage CP and Polymer ACV-4009 are identical high molecular weight copolymers of differing molecular weights.)
Other name(s):	Agent AT 1212; Polymer AT 1212; (applicable only to Polymer Advantage CP; Resin Advantage CP) Solution
Molecular formula:	$(C_4H_6O_2)_x(C_8H_{12}O_4)_y(C_{13}H_{20}O_2)_z$

Structural formula:



Number-average molecular weight:	25000 (Advantage CP) 27100 (Polymer ACV-4009)
Weight-average molecular weight:	79000 (Advantage CP) 154000 (Polymer ACV-4009)
Polydispersity:	3.17 (Advantage CP) 5.71 (Polymer ACV-4009)
Maximum percentage of low molecular weight species	(mol. wt < 1000):<2% (Advantage CP) <1% (Polymer ACV-4009)

Monomers:

a)	**Chemical name:**	monobutyl maleate
	CAS No.:	925-21-3
b)	**Chemical name:**	vinyl acetate
	Synonym:	acetic acid, vinyl ester
	CAS No.:	9003-20-7
c)	**Chemical name:**	isobornyl acetate
	CAS No.:	5888-33-5

Other reactants used:

Initiator:

Chemical name:	di(2-ethylhexyl) peroxidicarbonate
Weight percentage:	2.08%

Solvent:

Chemical name:	acetone
Synonyms:	dimethylformaldehyde; dimethyl ketone; 2-propanone
CAS No:	67-64-1

The polymerisation reaction takes place in acetone. The initiator decomposes and remains in acetone which is then solvent exchanged with ethanol.

Method of detection and determination:

Structure elucidation: Infra-red Spectroscopy; Nuclear Magnetic Resonance Spectroscopy

Spectral data:

Infra-red spectral data: (KBr disc)

Major absorption wavenumbers for identification (cm^{-1}):

Advantage CP: 3449; 2982; 2878; 1745; 1381; 1231; 1163; 1036; 945

Polymer ACV-4009: 3443; 2976; 2886; 1751; 1381; 1236; 1177; 1036; 951

Nuclear Magnetic Resonance spectral data were also provided.

3. PHYSICAL AND CHEMICAL PROPERTIES

The notified polymer was not isolated for testing. The following data were obtained from tests on a 50% solution of the notified polymer in ethanol (Advantage CP or Polymer ACV-4009) or were based on ethanol alone, as indicated.

Appearance :	clear viscous liquid
Odour:	ethanolic odour
Boiling point:	78.5^{O}C (ethanol)
Specific gravity:	0.970 (Advantage CP) 0.989 (Polymer ACV-4009)
Vapour pressure:	5.93 kPa at 20˚C (ethanol)
Water solubility:	<1 g/L; the ethanol solvent is miscible with water in all proportions but the notified polymer precipitates on contact with water. If the ethanol is allowed to evaporate, the remaining polymer is stated to be water insoluble.
Partition coefficient: log $P_{o/w}$	not provided as the notified polymer is insoluble in water
Hydrolysis:	manufacture of the notified polymer takes place at 63^{O}C and pH 1.5-2.0 with no observable hydrolysis.
Adsorption/Desorption:	not provided as the notified polymer is insoluble in water
Dissociation constant:	not provided as the notified polymer is insoluble in water
Flash point:	8^{O}C (closed cup) (ethanol)
Flammability limits:	(ethanol) by volume: upper 19.0 lower 3.5
Combustion products:	carbon monoxide, carbon dioxide
Autoignition temperature:	363^{O}C (ethanol)
Explosive Potential:	moderate explosion hazard (ethanol)

Reactivity: stable at room temperature and pressure; hazardous polymerisation will not occur; incompatible with concentrated nitric acid and sulphuric acids, and oxidising agents; avoid heat, flame and ignition sources.

Comments on physico-chemical data

No data were provided for Partition coefficient, Adsorption/Desorption and Dissociation constant on the grounds that the notified polymer is insoluble. The high molecular weight of the notified polymer is likely to prevent it from crossing biological membranes. The determination of the octanol-water partition coefficient would be difficult to perform and interpret. The molecular weight of the notified polymer and its expected negligible water solubility suggests that the polymer is likely to be immobile in soil. Again the measurement and interpretation of a result for this property would be difficult due to the complexity of the substance. The polyester, due to its nature, may dissociate as it contains a carboxylic acid functionality.

4. PURITY OF THE CHEMICAL

Degree of purity of the notified polymer: >95.3% (as used in Advantage CP)
>97.3% (as used in Polymer ACV-4009)

Toxic or hazardous impurities: (applicable to Advantage CP and Polymer ACV-4009)

a) **Chemical name:** acetone
Synonyms: dimethylformaldehyde; dimethylketone; 2-propanone
CAS No: 67-64-1
Maximum residual: <0.4%
Toxic properties: tumorigen; mutagen; reproductive-effector; skin and eye irritant (1)

Residual monomer:

b)	**Chemical name:**	vinyl acetate
	Synonym:	acetic acid, vinyl ester
	CAS No.:	9003-20-7
	Maximum residual:	<0.1%
	Toxic properties:	tumorigen (1)

Other impurities: (applicable to Advantage CP and Polymer ACV-4009)

. **Residual monomers:**

a)	**Chemical name:**	monobutyl maleate
	CAS No.:	925-21-3
	Maximum residual:	<0.1%
	Toxic properties:	unknown

b)	**Chemical name:**	isobornyl acrylate
	CAS No:	5888-33-5
	Maximum residual:	<0.1%
	Toxic properties:	unknown

. **Low molecular weight polymers** (mol. wt. <1000)

Maximum residual :	<4% (as used in Advantage CP) (in the notified <2% (as used in Polymer ACV-polymer-4009)
Toxic properties:	unknown

Additive:

50% by weight of ethanol is added to 50% by weight of the notified polymer to form the commercial products, Advantage CP and Polymer ACV-4009.

5. INDUSTRIAL USES

Advantage CP and Polymer ACV-4009 will be imported for use exclusively as a fixative in hairspray products, generally at less than 20% by weight. This means that less than 10% by weight of the notified polymer will be present in the hairspray.

It is estimated that in the first five years, between 10 and 100 tonnes per annum each of Advantage CP or Polymer ACV-4009 will be imported. After importation, the notified polymer will be compounded with other ingredients into hairspray products, by cosmetics and toiletries manufacturers.

Advantage CP and Polymer ACV-4009 have been manufactured in the United States for less than 12 months and have recently been marketed in the United States, China, Spain and Taiwan.

6. PUBLIC EXPOSURE

Under normal use conditions, the potential for public exposure to the notified polymer will be widespread as it will be used in hairsprays. The major route of exposure will be dermal but the use pattern also implies probable ocular exposure and possibly exposure through inhalation. As the notified polymer will be present at less than 10% by weight of the hairspray product, exposure during normal use is expected to be low. Due to its high molecular weight, the notified polymer is not likely to cross biological membranes to bring about systemic effects.

Some polymer will enter the sewerage system from process equipment washings and also from the washing of hair.

7. OCCUPATIONAL EXPOSURE

Reformulation

Advantage CP and Polymer ACV-4009 which contain the notified polymer in ethanol will be reformulated into hairspray products by 10 cosmetics or toiletries manufacturers in Australia.

The notifier has not provided details on the equipment and compounding processes to be used in the manufacture of the hairspray products. However, it is known that plant operators will weigh, add and mix the raw materials 2 hours per day, 48 times a year. Mixing will be carried out as a cold process. After reformulation, the product will be filled into containers and packed, this operation will take 2 hours per day, 48 hours per year. Quality assurance officers will sample the drums and test the raw materials 2 hours a day, 12 times per year. They will also sample and test the hairspray products 1.5 hours per day, 48 days per year. Product development will also be carried out and the time taken to do this is estimated to be 1 hour per day, 12 days per year.

Advantage CP and Polymer ACV-4009 will be transported and stored in accordance with dangerous goods legislation. Therefore, significant risk of exposure during transport and storage is not anticipated.

If engineering controls, personal protection measures and good work practices are not implemented in the work environment, workers may come into direct contact with the notified polymer. These workers are most likely to be involved with the production and filling of the hairspray formulation. After reformulation, exposure to the notified polymer will be reduced as it will be present at less than 10% by weight of the hairspray product. The exposure of quality assurance officers and product development chemists is likely to be very low due to the small amounts of chemical handled. The exposure of packers of the hairspray products is expected to be negligible.

In the factory environment, the major route of direct contact with the notified polymer will be dermal as the polymer itself has a high molecular weight and is therefore not expected to be volatile. Due to its high molecular weight, it is unlikely to cross biological membranes.

Use of the notified polymer in hairdressing salons

Hairdressing salon workers will be exposed to the notified polymer through the use of hairsprays. Routes of exposure will be through the skin, the eyes and via inhalation. Precautions to minimise contact (see label recommendations in Section 14 of this report) will help reduce worker exposure.

8. ENVIRONMENTAL EXPOSURE

8.1 Release

The notified polymer will be compounded into hairspray products in at least three major cities and is expected to be sold Australia-wide providing a wide exposure of the chemical to the environment.

The average usage per site of the commercial form of the notified polymer in ethanol (Advantage CP/Polymer ACV-4009), is expected to be 10 tonnes per annum based on the maximum estimated import quantities of 100 tonnes per annum and 10 companies likely to be involved in reformulation into hairspray products. Given the high cost of the notified polymer, reformulators are expected to minimise waste levels, with an estimated 0.5% remaining unused in the drums and 0.25% remaining as residue in the batch processing equipment.

Drum residues amounting to 25 kg per year per site (50 kg total and 50% polymer) will be disposed of to landfill. Residues from the batch processing equipment amounting to 12.5 kg per year per site will be washed into the plant sewer and precipitated in the sludge of the solids separating system. The dried sludge is expected to be disposed of to landfill.

The notified polymer is intended solely for use in hairspray products and, as such, would be expected to be released to the environment via consumer use through washing the residual polymer (assumed to be 100% of that applied) from the hair and into the sewerage system. It is envisaged that the notified polymer will replace existing hairspray polymers which have similar properties resulting in no net environmental effect. Due to its insoluble nature, the notified polymer is likely to be associated with the sludge/solids compartment of sewage where it is expected to be incinerated or spread onto agricultural land. If the notified polymer remains suspended in sewage water, a predicted environmental concentration (PEC) for the polymer in sewage water throughout Australia can be estimated from the assumptions, 100 tonnes maximum annual production, an Australian population of 17 million and a daily per capita water usage volume of 150 L. This provides a PEC of 0.1 ppm in sewage water which would be swiftly reduced to insignificant levels (likely to be below 10 ppb) by precipitation or dilution in rivers, lakes and oceans which act

as receiving waters to nearly all sewage treatment plants in Australia.

8.2 Fate

The notifier states that by nature of its application, the notified polymer is required to be stable under a wide range of conditions. It will form water vapours and oxides of carbon on combustion.

The notified polymer is unlikely to be mobile after landfill given its water insolubility and stated chemical stability.

9. EVALUATION OF TOXICOLOGICAL DATA

The following toxicity tests were carried out on Agent AT-1212 which is the notified polymer used in Advantage CP.

9.1 Acute Toxicity

Table 1 Summary of the acute toxicity of Agent AT-1212

Test	Species	Outcome	Ref
Oral	rat	LD_{50}: >5000 mg/kg	2
Dermal	rabbit	LD_{50}: >2000 mg/kg	3
Skin irritation	rabbit	non-irritant	4
Eye irritation	rabbit	moderate to severe irritant	5
Skin sensitisation	guinea pig	non-sensitising	6

9.1.1 Oral Toxicity (2)

This study was carried out in accordance with the *OECD Guidelines for Testing of Chemicals No: 401* (7).

A single dose of 5000 mg/kg of Agent AT-1212 in corn oil was administered by gavage to 10 Sprague-Dawley rats (five males and five females). The animals were observed for 14 days. No deaths were observed during the study. Gain in bodyweight was unaffected. Diarrhoea was observed in all males and 3 females. It is likely that diarrhoea was caused by corn oil. Decreased activity (2/5) and rales (1/5) were also observed in female rats. No necropsy was performed.

The results of this study indicate an acute oral LD_{50} of >5000 mg/kg for Agent AT-1212 in male and female rats.

9.1.2 Dermal Toxicity (3)

A single dose of 2000 mg/kg of Agent AT-1212 was administered by occlusive application to the shaved backs of six (three males and three females) New Zealand White rabbits for 24 hours. The skin of three (two males and one female) animals was abraded before treatment with the test substance. The animals were observed 1, 3, 6 and 24 hours post-exposure and thereafter daily for 14 days. No deaths were noted during the study. Gain in bodyweight was unaffected. Diarrhoea was observed in one male and one female animal. No skin reactions were observed at the application site. Necropsy revealed no gross changes.

The results of this study indicate an acute dermal LD_{50} >2000 mg/kg for Agent AT-1212 in male and female rabbits.

9.1.3 Skin Irritation (4)

A single dose of 0.5 g of Agent AT-1212 moistened with 0.5 ml physiological saline was administered by occlusive application to the intact and abraded dorsal skin of each of six New Zealand White rabbits for 24 hours. The application sites were examined at 24 and 72 hours post-exposure. Effects were graded according to Draize (8). No signs of irritation or abnormal clinical signs were observed. All animals survived the study period. No necropsy was performed.

The results of this study indicate that Agent AT-1212 is not a skin irritant in rabbits at the concentration tested.

9.1.4 Eye Irritation (5)

A single dose of 0.1 g of Agent AT-1212 in powder form was instilled into the conjunctival sac of one eye of each of nine New Zealand White rabbits. Three of the eyes were immediately washed with physiologic saline; the other six eyes were unwashed. The untreated eye of each rabbit served as the control. Both eyes of each rabbit were tested with fluorescein dye and were examined for staining 24, 48 and 72 hours post-exposure and thereafter at seven days post-exposure. Effects were graded according to Draize (9). Slight corneal opacity, slight to moderate conjunctival redness, slight to severe conjunctival chemosis and slight to severe conjunctival discharge were observed in the unwashed eyes. Some degree of conjunctivitis was observed in all unwashed eyes on the seventh day post-exposure. Five unwashed eyes demonstrated blistering of the conjunctiva within the first three days post-exposure. Washing of the eyes was palliative.

Results of this study indicate that Agent AT-1212 is a moderate to severe eye irritant in rabbits at the concentration tested.

9.1.5 Skin Sensitisation (6)

This study was carried out in accordance with the *OECD Guidelines for Testing of Chemicals No: 406* (**10**).

The Buehler method (11) was used. Effects were graded according to Draize (8).

Induction and Challenge study

A previously determined maximal non-irritant concentration of 0.5 g of Agent AT-1212 (100% concentration) was administered by occlusive application to the shaved backs of 10 Hartley guinea pigs for six hours. This procedure was repeated thrice weekly for three weeks. Two weeks after the last induction application, each animal was challenged for six hours at the original test site and a virgin site with the same maximal non-irritant

concentration of Agent AT-1212. The challenge sites were examined at 6 and 24 hours post-exposure.

Very slight erythema was observed in two animals following the ninth (i.e last) application during the induction phase. No signs of irritation or abnormal clinical signs were seen in any animal after challenge. Necropsy revealed no gross changes.

The results of this study indicate that Agent AT-1212 is not a skin sensitiser in guinea pigs at the concentration tested.

9.2 Overall Assessment of Toxicological Data

Agent AT-1212 has very low acute oral toxicity (LD_{50} in rats: >5000 mg/kg) and low acute dermal toxicity (LD_{50} in rabbits: >2000 mg/kg). Animal tests show that it is a moderate to severe eye irritant but not a skin irritant nor a skin sensitiser.

10. ASSESSMENT OF CLINICAL EFFECTS

10.1 Skin irritation (12)

Twenty-five human volunteers (two males and 23 females; age range 20 to 64 years) were patch tested with a slurry of 5 g of Agent AT-1212 in alcohol for 48 hours. The patch sites were examined 20 minutes after patch removal. Effects were graded according to the numeric system described in (13). Slight erythema was observed in 20% of subjects.

The results of this study indicate that Agent AT-1212 may cause slight skin irritations in some individuals at the concentration tested but, it is possible for these reactions to be caused by alcohol.

10.2 Skin sensitisation - Repeated Insult Patch Test (14)

In the induction phase, 116 human volunteers (23 males and 94 females; age range 13 to 68 years) were patch tested on the left

upper back with 0.2 ml of Polymer Advantage CP in 10% ethanol for 24 hours, thrice a week for three weeks. Two weeks following the last (i.e ninth) induction application, each of these subjects was challenged on a virgin site for 24 hours. The challenge sites were observed at 24, 48 and 72 hours post-exposure. Effects were graded according to scoring system described in (13).

A total of 109 subjects completed the test. The remaining seven subjects discontinued because of personal reasons none of which were treatment-related.

Three cases each of skin dryness and minimal erythema, and one of hyperpigmentation were reported during the induction phase. Also reported during the induction phase was one case of oedema and intense erythema after the eighth application but when the patch site was changed, no reaction was observed on the new site. However, after challenge, this subject exhibited minimal erythema. After challenge, minimal erythema was also observed in three other subjects in whom a positive skin response was not found during induction. Altogether, <4% of patients exhibited a reaction after challenge.

The results of this study indicate that Polymer Advantage CP is not likely to be a sensitising as evidenced by the low frequency of occurence of such a reaction in the tested population. Moreover, the notified polymer is a high molecular weight polymer and is therefore not expected to cross biological membranes to bring about a systemic reaction.

10.3 Phototoxicity (15)

Ten fair-skinned human volunteers (three males and seven females; age range 30 to 64 years) were each patch tested on both volar forearms with 0.2 ml of Polymer Advantage CP in 10% ethanol for 24 hours. One arm was irradiated with ultraviolet A (UV-A) for 15 minutes (total dose = 3.3 Joules); an untested site on this arm also acts as an irradiated control. The other arm was not irradiated and was protected from light including sunlight by either a mitten or a long sleeve. Immediately after irradiation and at 48 and 72 hours thereafter, both arms were examined and the reaction graded according to a numeric system described in (15). All 10 subjects completed the test. One case of minimal erythema at the test site was reported which occurred immediately

after irradiation. The other subjects tested were not affected by treatment.

The results of this study indicate that Polymer Advantage CP is not likely to be phototoxic in humans at the concentration tested.

10.4 Photoallergy (16)

Induction Phase

Thirty fair-skinned human volunteers (six males and 24 females; age range 18 to 65 years) were each patch tested on both volar forearms with 0.2 ml of Polymer Advantage CP in 10% ethanol for 24 hours, twice a week for three weeks. At 24 hours, the test sites of both arms were examined and the response graded according to a numeric system described in (13). One arm was irradiated with ultraviolet A (UV-A) for 15 minutes followed by ultraviolet B (UV-B). UV-B irradiation was based on each subject's skin type and Minimal Erythema Dose (MED) as determined on the control arm prior to the first irradiation. It was set at the lesser of two MEDs (the time sufficient to achieve a 1.0 score) or 120 seconds. An untreated site on the irradiated arm served as the irradiated control. Immediately after irradiation, the test sites were graded according to a numeric system described in (13). The other treated arm was not irradiated and was protected from light including sunlight with either a mitten or a long sleeve.

Challenge Phase

Two weeks after the last induction application, the subjects were challenged. The challenge patches were applied to virgin sites only, for 24 hours. At 24 hours, the test sites of both arms were examined and graded. The arm to be irradiated was irradiated with UV-A only and immediately thereafter, the test sites were graded. The other arm was not irradiated and was protected from light including sunlight with a mitten or a long sleeve. These test sites were examined at 48 and 72 hours post-challenge.

Results

Twenty-eight subjects completed the study. Two subjects left the study because of personal reasons none of which were treatment-related.

During induction, transient effects such as minimal erythema, slight oedema and tanning were observed. None of these responses were observed in the treated non-irradiated control arms. Most of the responses reported were seen at the irradiated treated and non-treated sites. Thus, these responses were likely to be due to the subject's sensitivity to UV irradiation. Photoallergy due to treatment was not evident.

After challenge, three subjects (11%) exhibited a positive challenge response such as minimal erythema, slight oedema, skin dryness or a combination of these symptoms on the treated and irradiated forearm. Two of these subjects also showed similar symptoms in the treated but non-irradiated arm. No reactions were observed on the non-treated irradiated forearm.

The results of this study indicate that Polymer Advantage CP at the concentration tested is not likely to be photoallergenic or photosensitising as evidenced by the low frequency of occurence of such a reaction in the tested population. Moreover, the notified polymer is a high molecular weight polymer and is therefore not expected to cross biological membranes to bring about a systemic reaction.

10.5 OVERALL ASSESSMENT OF CLINICAL EFFECTS

Trials on human subjects indicate that Polymer Advantage CP is not likely to be phototoxic, photoallergenic or sensitising but, in some individuals it may cause mild dermal irritations. The dermal irritations observed could be due to ethanol as alcohols when applied to the skin, are known to have a drying and flaking effect.

11. ASSESSMENT OF ENVIRONMENTAL EFFECTS

No ecotoxicological data were provided which is acceptable for polymers of number-average molecular weight greater than 1000 according to the *Industrial Chemicals Notification and Assessment Act* (the Act).

12. ASSESSMENT OF ENVIRONMENTAL HAZARD

The notified polymer is unlikely to present a hazard to the environment at any stage of its use, whether it be reformulated into hairspray products (resulting in an estimated 37.5 kg per year per site of reformulation waste disposed of to landfill) or when consumers wash the polymer residue from their hair, resulting in an estimated concentration of 0.1 ppm of the notified polymer released from the sewer system to receiving waters where further dilution to concentrations below 10 ppb are likely.

The notified polymer is not expected to exhibit toxic characteristics because large polymers of this nature are not readily absorbed to biota.

13. ASSESSMENT OF PUBLIC AND OCCUPATIONAL HEALTH AND SAFETY EFFECTS

The notified polymer is found in both Advantage CP and Polymer ACV-4009, the commercial forms of the notified polymer in ethanol. The notified polymer present in these two polymer products are of high molecular weight and differ in average molecular weight; polydispersity; maximum percentage of low molecular weight (<1000) species and density. As these differences are not large and taking into account all the similarities, it is expected that the toxicological profile of the two polymers will be similar.

The notified polymer is of high molecular weight and is unlikely to cross biological membranes to bring about systemic effects. The notified polymer in ethanol is not likely to be phototoxic,

photoallergenic or sensitising in humans but it has been shown to cause mild skin irritations in humans and moderate to severe eye irritations in animals. The latter effect implies that irritation of the upper respiratory tract is possible eventhough the polymer has negligible volatility, because it will be sprayed around the head area. No inhalation toxicity study has been carried out to study this effect. There is no information on the long term effects of the notified polymer following repeated exposure. It is concluded that the potential chronic hazards in humans have yet to be fully investigated. Due to its irritant properties, suitable precautions should be taken when handling the notified polymer or when the hairsprays are used. These precautions should be stated on the label (see Section 14 of this report).

So far, no work-related health effects have been reported. There are no known health conditions for which use of the notified polymer should be avoided. The above mentioned tests carried out on human subjects and animals show that at the indicated concentrations, the impurities present do not present any health hazard. It should be noted that current experience with the notified polymer is limited as the commercial products have been used for less than 12 months.

In the work environment, the high ethanol content in the commercial products presents the main health and safety risks to workers. Exposure in excess of its exposure standard of TWA 1000 ppm (17) may cause headache; eyes, nose and throat irritation; and with prolonged exposure, drowsiness; lassitude; loss of appetite and the inability to concentrate (18). Workers with a history of liver damage should seek medical advice if there is likely to be prolonged exposure to ethanol present in the commercial products. Regular atmospheric monitoring of the air in the workplace is advisable to maintain the concentration of ethanol below its exposure standard of (TWA) 1000 ppm (17). Eye protection should be used. In case of prolonged exposure, impervious gloves should be worn. Respirators suitable for gases should be worn when ventilation is inadequate.

Ethanol is a highly volatile and flammable liquid thus creating potential fire and explosion hazards. Therefore, the workplace should be well ventilated and flame, sparks and heat should be eliminated.

Under normal use conditions when control measures and/or precautions to minimise contact are in place, the notified polymer is not expected to present any acute significant health or safety hazard to workers or the public.

14. RECOMMENDATIONS FOR THE CONTROL OF WORKER AND PUBLIC EXPOSURE

To minimise worker and public exposure to the notified polymer the following guidelines and precautions should be observed:

- enclosed systems should be used when splashings or spillages are anticipated;
- personal protection equipment which comply with Australian standards (AS) should be worn such as;
    - splash-proof safety goggles (AS 1337) - *Eye Protectors for Industrial Applications* (19); and
    - in the event of prolonged exposure, elbow length impervious gloves (AS 2161) - *Industrial Safety Gloves and Mittens (excluding Electrical and Medical Gloves)* (20);
- good work practices should be implemented to avoid spillages or splashings;
- storage should be in accordance with relevant State or Territory Dangerous Goods legislation due to the presence of ethanol;
- should there be an accidental spillage or leakage, eliminate sources of ignition and ventilate the area affected. For small spills, wash with plenty of water. For large spills, contain spill with an inert absorbent material and after the ethanol has evaporated, recover the residual polymer and dispose in accordance with local regulations. Flush the area affected with plenty of water;
- the label should include the following statements, the format of which should conform to the requirements in Part 2 of the National Health and Medical Research Council

publication *Standard for the Uniform Scheduling of Drugs and Poisons* (21):

. Irritates eyes and may irritate skin, minimise contact with eyes and skin.

. If sprayed into eyes or onto skin, wash immediately with water.

. Avoid inhaling spray mist.

. the workplace should be well ventilated and local exhaust ventilation should be used to ensure the exposure standard for ethanol is maintained;

. a copy of the Material Safety Data Sheet (MSDS) should be easily accessible to employees.

15. MATERIAL SAFETY DATA SHEET (MSDS)

The Material Safety Data Sheet (MSDS) for the commercial products, Advantage CP and Polymer ACV-4009, (Attachment 1 and 2) were provided in Worksafe Australia format (22).

16. REQUIREMENTS FOR SECONDARY NOTIFICATION

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

17. REFERENCES

1. Registry of Toxic Effects of Chemical Substances (RTECS) database, 1991.

2. GAF Corporation, USA, "Acute Oral Toxicity of Agent AT-1212 in Sprague-Dawley Rats". Data on file, FDRL Study No: 9086_A, 1986.

3. GAF Corporation, USA, "Acute Dermal Toxicity of Agent AT-1212 in Rabbits". Data on file, Experiment Reference No: 88038-2, 1988.

4. GAF Corporation, USA, "Primary Dermal Irritation Study of Agent AT-1212 in New Zealand White Rabbits". Data on file, FDRL Study No: 9086_A, 1986.

5. GAF Corporation, USA, "Primary Eye Irritation Study of Agent AT-1212 in New Zealand White Rabbits. Data on file, FDRL Study No: 9086_A, 1986.

6. GAF Corporation, USA, "Guinea Pig Sensitisation (Buehler)". Data on file, Experiment Reference No: 88038-3, 1988.

7. *OECD Guidelines for Testing of Chemicals*, "Acute Oral Toxicity" No: 401, 1981.

8. Draize, J.H., "Appraisal of the safety of chemicals in foods, drugs and cosmetics", Association of Food and Drug Officials of the United States, Topeka, Kansas, 1965.

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