Health Canada Santé Canada

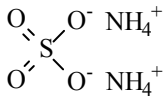
Evaluation Report for Category A, Subcategory 1.1 Application

Application Number:	2011-5354	2011-5355
Product:	R-51024	Nalco 60620
Application:	New active ingredient - domestic registration	
Registration Number:	31167	31168
Active ingredients (a.i.):	ammonia (present as ammonium sulfate)	
PMRA Document Number:	**2505757**	

1.0 Purpose of Application

The purpose of this application was to register the technical active, R-51024, containing the technical grade active ingredient ammonia (present as ammonium sulfate), and the end-use product, Nalco 60620, for use as a slimicide for the control of bacteria and fungi in the process water used in the manufacture of paper and paperboard products that do not contact food.

2.0 Chemistry Assessment

Active substance	Ammonium sulfate
Function	Slimicide
Chemical name	
1. International Union of Pure and Applied Chemistry (IUPAC)	Diammonium sulfate
2. Chemical Abstracts Service (CAS)	Ammonium sulfate
CAS number	7783-20-2
Molecular formula	$(NH_4)_2SO_4$
Molecular weight	132.13
Structural formula	
Purity of the active ingredient	25.8% ammonia (present as ammonium sulfate)

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Physical and Chemical Properties of the Active Ingredient and End-Use Product

Technical Product— R-51024 (Ammonium Sulfate Technical)

Property	Result
Colour and physical state	White solid
Odour	Ammoniacal
Melting range	Decomposition begins between 150-280°C and is complete at 336-357°C
Boiling point or range	N/A
Density	1.77 g/cm^3
Vapour pressure	4.053×10^{-7} Pa (partial pressure of ammonia over solid ammonium sulfate at 25°C)
Ultraviolet (UV)-visible spectrum	No significant absorbance at $\lambda > 300$ nm
Solubility in water at 20°C	764 g/L
Solubility in organic solvents	Insoluble in ethanol; not expected to be soluble in most organic solvents. Solubility increases in very polar solvents such as glycol.
n-Octanol-water partition coefficient (K_{OW})	Log K_{ow} = -5.1
Dissociation constant (pK_a)	9.21 ammonium-ion (conjugate base NH_3) -3 sulfuric acid (conjugate base HSO_4^-) 1.92 hydrogen sulfate (conjugate base SO_4^{2-})
Stability (temperature, metal)	The product starts to decompose between 150-280°C. No signs of corrosion or other changes were noted for stainless steel after 12 months at room temperature.

End-Use Product—NALCO 60620

Property	Result
Colour	Expected to be colourless
Odour	Expected to have a slight ammonia odour
Physical state	Liquid
Formulation type	Solution
Guarantee	5.2% ammonia (present as ammonium sulfate)
Container material and description	Tote (PTFE, polytetrafluoroethylene, plastic): 1000 L or 1103 kg Bulk packaging container (metal): maximum load 18764 or 20640 kg
Density	1.1 g/mL at 22.8°C
pH of 1% dispersion in water	5.52

Oxidizing or reducing action	Segregate from alkalies and alkalizing substances; segregate from nitrites and alkaline substances.
Storage stability	The product is stable for one year when stored at room temperature in its commercial packaging materials, plastic (polypropylene) and stainless steel.
Corrosion characteristics	The product is non-corrosive to the packaging materials.
Explodability	The product is not potentially explosive.

Directions for Use

This product is intended for use as a slimicide for the control of bacteria and fungi in the process water used in the manufacture of paper and paperboard products that do not contact food. Nalco 60620 must be used in conjunction with: 1) a 12.5% sodium hypochlorite solution to produce chloramine; and 2) the OxiPRO delivery system at a pH of >8.5. The products are blended to achieve a molar ratio of 0.8-1.2 to 1.0 of ammonium sulfate to sodium hypochlorite.

INITIAL DOSE:
When the system is noticeably fouled, add the appropriate amount of chloramine to the system to obtain from 1 to 10 ppm total chlorine in excess of the system oxidant demand. Repeat until control is achieved. Badly fouled systems must be cleaned before treatment is begun.

SUBSEQUENT DOSE:

SLUG FEED METHOD

Use rates up to 10 ppm. When microbial control is evident, resume intermittent or continuous feed treatments.

INTERMITTENT FEED METHOD

When microbial control is evident, add the appropriate amount of chloramine to the system to obtain a 1 - 5 ppm total chlorine residual.

CONTINUOUS FEED METHOD

When microbial control is evident, start a continuous feed of chloramine to maintain a 1 – 5 ppm total chlorine residual.

Mode of Action

The ammonium sulfate in Nalco 60620 provides a source of ammonia to be mixed with sodium hypochlorite in a dispensing device. Ammonia and ammonium compounds will react *in situ* with sodium hypochlorite to form chloramines. The reaction is closely controlled in the device in term of pH to form only monochloramine, which is known to kill cells by damaging cell walls as well as inhibiting enzymes. Chloramine has a greater persistence than hypochlorous acid in waters with high oxidant demand, which provides a longer contact time with the contaminants when compared to the use of chlorine alone.

Methods of Analysis

Methods for Analysis of the Active Ingredient

The methods provided for the analysis of the active ingredient and the impurities in Ammonium Sulfate Technical (R-51024) have been assessed to be acceptable for the determinations.

Method for Formulation Analysis

The method provided for the analysis of the active ingredient in the formulation has been assessed to be acceptable for use as an enforcement analytical method.

Methods for Residue Analysis

The active ingredient and the major transformation products are simply ammonia/ammonium ion, nitrogen, nitrate ion, chloride ion and chloramine which can be analyzed using well-established methods such as those found in *Standard Methods for the Examination of Water and Wastewater*; these methods are acceptable for enforcement purposes without validation.

3.0 Impact on Human and Animal Health

3.1 Toxicology Summary

A detailed review of the submitted toxicology information, data waiver rationales, and publicly available information for the active ingredient ammonia (present as ammonium sulfate) was conducted. The scientific quality of the data is acceptable and the database is sufficiently complete to define the majority of the toxic effects that may result from exposure resulting from the intended use of this pest control product.

The acute toxicity of ammonia and ammonium sulfate has been well characterized in publicly available scientific literature. Available information suggests that the active ingredient is of low acute toxicity by the oral, dermal, and inhalation routes of exposure. Ammonia (present as ammonium sulfate) is minimally irritating to the skin, slightly irritating to the eyes, and is not considered a dermal sensitizer.

Based on information for short-term toxicity, prenatal developmental toxicity, genotoxicity, and chronic toxicity available for ammonia (present as ammonium sulfate) at the time of evaluation, coupled with a long history of safe use as a household cleaning agent, it appears unlikely that short-term or long-term toxicity will result from exposure to ammonia (present as ammonium sulfate) from the intended use.

3.1.1 Incident Reports

Since April 26, 2007, registrants have been required by law to report incidents, including adverse effects to health and the environment, to the PMRA within a set time frame. Information on the reporting of incidents can be found on the Health Canada website. Incidents from Canada were

searched and reviewed for the active ingredient ammonia (present as ammonium sulfate). As of October 7, 2013, there have been no human incident reports for products containing ammonia (present as ammonium sulfate) in Canada.

3.2 Food Residue Exposure Assessment

The slimicide, monochloramine, which results when combining Nalco 60620 with sodium hypochlorite, is used in the process of treating paperboard products which are intended for non-food uses. Dietary exposure to monochloramine or any unreacted Nalco 60620 is not expected. Likewise, no risk due to exposure from drinking water is anticipated.

3.3 Occupational and Residential Risk Assessment

3.3.1 Use Description / Exposure Scenario

The proposed commercial use for Nalco 60620 is as a slimicide product for pulp and paper making systems. Nalco 60620 is to be delivered in a sealed plastic or metal bulk container ranging from 1000 – 20 000 L in size, and either connected to the OxiPRO delivery system, or transferred to an onsite storage container connected to the delivery system by a trained technician. This is an enclosed process with no anticipated exposure to the operator except when the bulk container is hooked up to the delivery system, and during the removal of the spent container. Nalco 60620 is mixed with 12.5% sodium hypochlorite at the rate of 1.3 L Nalco 60620 to 1.0 L of sodium hypochlorite, intended to achieve a measured concentration of 1 – 5 ppm residual biocide expressed as total chlorine. Mixing will occur through the OxiPRO delivery system, with the resulting monochloramine solution fed directly into the pulp and paper process water. When the system is noticeably fouled, it may be necessary to slug feed to a concentration of up to 10 ppm expressed as total chlorine to obtain desired control.

3.3.2 Occupational Exposure Risk Assessment

Occupational exposure to Nalco 60620 may occur during loading, clean-up and repair. The predominant route of exposure would be dermal during these activities, although exposure by the inhalation route would also be possible. Accidental exposure to the eyes may occur if the product is splashed during handling. Personal protective equipment (PPE) requirements on the end-use product label instruct workers to wear protective eyewear (goggles or face shield), long pants, long sleeved shirt, chemical resistant footwear and chemical resistant gloves when handling the product and contacting treated process fluids. Additional precautionary and hygiene statements instruct workers to avoid contact with skin, eyes and clothing, to avoid breathing the vapour or spray mist, to wash thoroughly with soap and water after handling, and to remove contaminated clothing and wash before reuse. Exposure of workers to Nalco 60620 will be appropriately mitigated through the requirements for PPE, observing precautionary and hygiene statements, and the nature of the closed system where the end-use product will be used. Therefore, occupational exposure to Nalco 60620 is expected to be minimal when workers follow the label directions.

3.3.3 Bystander Exposure Risk Assessment

As Nalco 60620 is to be used in a closed system in a pulp and paper mill where bystanders are not expected to be present, no bystander exposure to the end-use product is expected to occur.

3.3.4 Post-Application Exposure

There is a potential for worker exposure to Nalco 60620 during post-application activities such as coupling or uncoupling transfer lines. However, post-application exposure to Nalco 60620 is expected to be minimal when workers follow the required PPE and precautionary and hygiene statements on the product label.

4.0 Environmental Assessment

For the purpose of this evaluation, information from the Environment Canada and Health Canada Priority Substance List Assessment Report for inorganic chloramines was used.

4.1 Fate and Behaviour in the Environment

Ammonia (present as ammonium sulphate in Nalco 60620) is mixed with sodium hypochlorite to form monochloramine, a relatively slow-acting oxidizing microbiocide for the control of bacteria and fungi in pulp and paper industrial process waters. Monochloramine is the substance that is the primary focus of this review. Other substances, which may be present initially as a result of the dissociation of this product in aqueous solution (such as sulfate ions or residual ammonia), are not expected to be found in significant amounts in the environment. Once formed, monochloramine will readily transform into multiple compounds (other inorganic chloramines, organic chloramines, ammonia, and free chlorine). This closely related group of reaction products is collectively referred to as monochloramine residuals, which are typically measured in terms of mg Cl_2/L (total chlorine). Thus, monochloramine is expected to be the substance of primary interest present in effluents and only aquatic systems are expected to be exposed.

The fate of monochloramine residuals once discharged into the environment will be influenced by various water-phase processes, including dilution, mixing, advection, chemical demand, benthic demand, photodegradation, volatilization, sediment adsorption and reaction, and sediment associated transport, deposition, burial and resuspension. Considering all processes, available data suggest that monochloramines have a half-life of 2 to 41 days in aqueous medium. As such, monochloramine residuals can be categorized as non-persistent to slightly persistent in aquatic systems.

4.2 Environmental Risk Characterization

The environmental risk assessment integrates the environmental exposure and ecotoxicology information to estimate the potential for adverse effects on non-target species. This integration is achieved by comparing exposure concentrations with concentrations to which adverse effects occur. Estimated environmental concentrations (EECs) are concentrations of pesticide in various environmental media. In the context of this assessment, water is the media of interest. Initially, a screening level risk assessment is performed to identify pesticides and/or specific uses that do not pose a risk to non-target organisms, and to identify those groups of organisms for which there may be a potential risk. The screening level risk assessment uses simple methods, conservative exposure scenarios and sensitive toxicity endpoints.

Ecotoxicology information includes toxicity data for various organisms or groups of organisms including invertebrates, vertebrates, and plants. Toxicology endpoints in risk assessments may be adjusted by applying an uncertainty factor to account for potential differences in species sensitivity as well as varying protection goals (i.e., protection at the community, population, or individual level). A risk quotient (RQ) is calculated by dividing the exposure estimate by an appropriate toxicity value (RQ = exposure/toxicity), and the risk quotient is then compared to the level of concern (LOC; LOC = 1 for aquatic organisms). If the screening level RQ is below the LOC, the risk is considered negligible and no further risk characterization is necessary. If the screening level RQ is equal to or greater than the LOC, then a refined risk assessment is performed to further characterize the risk. A refined assessment takes into consideration more realistic exposure scenarios. If the generation of quantitative data is not practical for a particular active ingredient/product, a qualitative assessment may be more appropriate.

The risk assessment for R-51024 technical is quantitative (screening level risk assessment) and qualitative (refined risk assessment).

4.2.1 Risk to Terrestrial Organisms

Based on the proposed use pattern in industrial process waters, the use of Nalco 60620 is not expected to result in terrestrial exposure. Therefore, risk to non-target terrestrial species is expected to be limited.

4.2.2 Risk to Aquatic Organisms

The toxicity of inorganic chloramine to aquatic organisms as well as the screening level RQs are presented in Appendix I, Table 2.

Non-target aquatic organisms may be exposed to monochloramine residues through effluent discharge from pulp and paper facilities. These facilities may be located in proximity of either freshwater or marine water bodies and both environments were considered in the risk assessment. Through chemical reactions within the treatment system, and through biological degradation during secondary treatment, the amount of monochloramine discharged into the aquatic environment through the use of Nalco 60620 is expected to be below the level of detection, measured as total chlorine. The level of detection for total chlorine is typically 0.01 or 0.02 mg/L, depending on the analytical method that is used. Furthermore, based on Proposed

Wastewater Systems Effluent Regulations published in the Canada Gazette (SOR/2012-139 - Updated August 25, 2013), the levels of total residual chlorine (TRC), discharged to aquatic systems, should not exceed 0.02 mg Cl_2/L in wastewater systems with a daily flow rate of at least 10 m^3. Dechlorination of effluent is typically carried out to ensure that total chlorine levels do not exceed those prescribed by the reguations. The potential exposure of monochloramine to the aquatic environment was assessed based on screening level EECs of 0.02 mg/L for inorganic chloramines and was considered to be a conservative value suitable for the screening level risk assessment.

Even at very low concentrations, monochloramine residuals can be toxic to aquatic organisms. The screening level risk assessment compared toxicity values for groups of aquatic organisms to a concentration of 0.02 mg inorganic chloramines /L in undiluted effluent and indicates some risk to non-target aquatic organisms (Appendix I. Table 2).

The refined risk assessment took into consideration factors such as dilution and dechlorination of the effluent. Inorganic chloramines are expected to be quickly diluted to non-detectable levels (<10 µg/L) if rapid mixing occurs in a sufficient volume of surface water. If, however, dilution of the effluent is limited or if the current velocity is fast, complete mixing may not occur for several kilometres downstream from the source and concentrations of monochloramine residuals may persist for some distance. As a precaution to further mitigate the risk to aquatic organisms, label statements requiring dechlorination (to non-detectable concentrations, less than 0.01 or 0.02 mg/L) of industrial process water prior to discharge into the environment is required.

5.0 Value

5.1 Effectiveness Against Pests

Data from one laboratory trial and use history data were provided. The use history monitored various parameters such as monochloramine levels, oxidation-reduction potential (ORP), pH, adenosine triphosphate (ATP) levels, effect on optical brighteners, bacterial and fungal growth over several years (i.e. significant periods of time). The laboratory study and operational data demonstrated the ability of Nalco 60620 to control bacteria and fungi in pulp and paper mills under various conditions.

5.1.1 Acceptable Efficacy Claims

The acceptable claim for Nalco 60620 is to control bacterial and fungal growth in pulp and paper mill water systems.

5.2 Economics

When operating a pulp and paper mill, some economic losses can be due to bacterial and fungal growth, which reduce production rates due to an increased number of paper breaks and more frequent down time for the cleaning and maintenance of the machinery. Microbial contamination also causes higher production costs due to larger consumption of additives and biocides, reduction in the lifetime of the equipment as well as deterioration in the quality of the final product.

5.3 Sustainability

5.3.1 Survey of Alternatives

More than 40 different active ingredients or combinations of active ingredients are registered for use in pulp and paper mills in use-site category 17 (Industrial process fluids) (Appedix I, Table 3).

5.3.2 Information on the Occurrence or Possible Occurrence of the Development of Resistance

No resistance to monochloramine has been reported for this use in the pulp and paper industry. The proposed treatment is not set up to treat process waters or industrial systems to sterility, and it is acceptable that a certain level of microorganisms remains in the waters. If organisms proliferate that show increased resistance to the treatment and that have a negative impact on the efficacy of the treatment program, several options are possible, such as using the highest treatment dosage allowed, changing the treatment program (e.g. from continuous to intermittent, using variations on length and intensity of dosing shocks, etc.), and introduce an alternating treatment program of a different type (e.g. alternate a Nalco 60620 program with a biocide having a different mode of action).

6.0 Pest Control Product Policy Considerations

6.1 Toxic Substances Management Policy Considerations

The Toxic Substances Management Policy (TSMP) is a federal government policy developed to provide direction on the management of substances of concern that are released into the environment. The TSMP calls for the virtual elimination of Track 1 substances [those that meet all four criteria outlined in the policy, i.e., persistent (in air, soil, water and/or sediment), bio-accumulative, primarily a result of human activity and toxic as defined by the *Canadian Environmental Protection Act*].

During the review process, R-51024 technical, and reaction chemicals including monochloramine, were assessed in accordance with the PMRA Regulatory Directive DIR99-031 and evaluated against the Track 1 criteria. The PMRA has reached the following conclusions:

- R-51024 technical does not meet all Track 1 criteria, and is not considered a Track 1 substance. Ammonium sulfate is unstable in water and dissociates rapidly to ammonium and sulfate ions.
- Transformation products of R-51024 technical do not meet the Track 1 criteria. Available data suggest that monochoramines have a half-life of 2 to 41 days in water (non-persistent to slightly persistent).

[1] DIR99-03, *The Pest Management Regulatory Agency's Strategy for Implementing the Toxic Substances Management Policy*

6.2 Formulants and Contaminants of Health or Environmental Concern

During the review process, contaminants in the technical and formulants and contaminants in the end-use product are compared against the *List of Pest Control Product Formulants and Contaminants of Health or Environmental Concern* maintained in the *Canada Gazette*[2]. The list is used as described in the PMRA Notice of Intent NOI2005-01[3] and is based on existing policies and regulations including: DIR99-03; and DIR2006-02[4] and taking into consideration the Ozone-depleting Substance Regulations, 1998, of the *Canadian Environmental Protection Act* (substances designated under the Montreal Protocol). The PMRA has reached the following conclusions:

- The technical grade active ingredient, R-51024, and the end-use product, Nalco 60620 do not contain formulants of health or environmental concern as identified in the *Canada Gazette*, Part II, Volume 139, Number 24, pages 2641-2643: *List of Pest Control Product Formulants of Health or Environmental Concern*.

The use of formulants in registered pest control products is assessed on an ongoing basis through PMRA formulant initiatives and DIR2006-02.

7.0 Conclusion

Health Canada's PMRA, under the authority of the *Pest Control Products Act* and Regulations, has granted full registration for the sale and use of the technical active, R-51024, containing the technical grade active ingredient ammonia (present as ammonium sulfate), and the end-use product, Nalco 60620, for use as a slimicide for the control of bacteria and fungi in the process water used in the manufacture of paper and paperboard products that do not contact food.

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[2] *Canada Gazette*, Part II, Volume 139, Number 24, SI/2005-11-30) pages 2641-2643: *List of Pest Control Product Formulants and Contaminants of Health or Environmental Concern* and in the order amending this list in the *Canada Gazette*, Part II, Volume 142, Number 13, SI/2008-67 (2008-06-25) pages 1611-1613: *Part I Formulants of Health or Environmental Concern, Part 2 Formulants of Health or Environmental Concern that are Allergens Known to Cause Anaphylactic-Type Reactions and Part 3 Contaminants of Health or Environmental Concern.*

[3] Notice of Intent NOI2005-01, *List of Pest Control Product Formulants and Contaminants of Health or Environmental Concern under the New Pest Control Products Act*

[4] Regulatory Directive DIR2006-02, *PMRA Formulants Policy*

List of Abbreviations

µg	microgram
a.i.	active ingredient
bw	body weight
CAS	Chemical Abstracts Service
cm	centimetres
EC_{50}	effective concentration of 50% of the population
EEC	estimated environmental concentration
g	gram
IUPAC	International Union of Pure and Applied Chemistry
kg	kilogram
K_{ow}	*n*-Octanol-water partition coefficient
L	litre
LC_{50}	lethal concentration 50%
LD_{50}	lethal dose 50%
LOC	level of concern
m	metre
mg	milligram
mL	millilitre
mm	millimetre
N/A	not applicable
nm	nanometre
p*K*a	dissociation constant
PMRA	Pest Management Regulatory Agency
PPE	personal protective equipment
ppm	parts per million
RQ	risk quotient
TSMP	Toxic Substances Management Policy
UV	ultraviolet

Appendix I Tables and Figures

Table 1 Summary of acute toxicity, irritative effects, and sensitization information for ammonium sulfate

STUDY	SPECIES/STRAIN AND DOSES	RESULT	TARGET ORGAN / SIGNIFICANT EFFECTS / COMMENTS	REFERENCE
Acute oral toxicity studies Exposure by gavage	Rat and mouse	LD_{50} (rats) > 4250 mg/kg bw LD_{50} (mice) > 2000 mg/kg bw **Low acute toxicity.**	No mortality occurred.	2350419
Acute dermal toxicity study	Rat and mouse	LD_{50} > 2000 mg/kg bw **Low acute toxicity.**	No mortality occurred.	2350419
Acute inhalation toxicity study	Rat	$_{8hr}LC_{50}$ > 1000 mg/m^3 **Low acute toxicity.**	No mortality occurred.	2350418
Eye Irritation Draize method	Rabbit – New Zealand White Dose: 50 mm^3 of neat ammonium sulfate.	**Slightly irritating.**	Slight edema and conjunctival redness was noted one hour after instillation. Slight redness present at 24 hours.	2350417
Dermal Irritation Draize method	Rabbit – New Zealand White	**Minimally irritating.**	Prolonged contact with skin may result in irritation. Symptoms may include redness, itching, and pain.	2350417

Dermal Sensitization	N/A	Long history of use involving dermal contact (*e.g.* fertilizers, household cleaners) suggests that ammonium sulfate is not a dermal sensitizer.	N/A	N/A

Table 2 Screening level risk assessment for inorganic chloramine for non-target aquatic organisms*

Organism	**Toxicity value**	**RA endpoint = <u>toxicity value</u> Uncertainty factor**	**EEC**	**RQ**
Freshwater invertebrate *Ceriodaphnia dubia*	Incipient LC_{50} = 0.018 mg/L	0.018/2 = 0.009 mg/L	0.02 mg/L	**2.2**
Marine invertebrate (*C. dubia* toxicity endpoint surrogate)	Incipient LC_{50} = 0.018 mg/L	0.018/2 = 0.009 mg/L	0.02 mg/L	**2.2**
Freshwater fish Chinook salmon	Incipient LC_{50} = 0.09 mg/L	0.09/10 = 0.009 mg/L	0.02 mg/L	**2.2**
Marine fish *Menidia menidia*	96 hour LC_{50} = 0.04 mg/L	0.04/10 = 0.004 mg/L	0.02 mg/L	**5**
Marine Alga *Porphyra yezoensis*	10 day EC_{50} (growth) = 0.014 mg/L	0.014/2 = 0.007 mg/L	0.02 mg/L	**2.9**

EEC = estimated environmental concentrations
RQ = risk quotient
*Toxicity values were obtained from PMRA# 2031195.

Table 3 Registered alternatives

More than 40 alternative actives ingredients or combination of a.i. are registered as slimicide for this type of use. The following is a table of some example of these alternatives.

Type of active ingredient	**Registration number of examples of an end-use product with this a.i.**

Alkyl Trimethylenediamines	19863
Hydantoins	26986
Isothiazolones	25660
Bronopol	21790
Quaternary ammonium compounds	25503
Glutaraldehyde	28686
Oxidizers (e.g. chlorine, bromine, etc.)	26166, 25258, 29408
Carbamates	18619

References

A. List of Studies/Information Submitted by Registrant

1.0 Chemistry

PMRA Document Number	Reference
2125347	2011, R-51024 Chemistry requirements for TGAI with CBI, DACO: 2.0,2.1, 2.11,2.11.1,2.11.2,2.11.3,2.11.4,2.2,2.3,2.3.1,2.4,2.5,2.6,2.7,2.8,2.9 CBI
2125352	2011, R-51024 Chemistry requirements for TGAI, DACO: 2.0,2.1,2.11, 2.11.1,2.11.2,2.11.3,2.11.4,2.2,2.3,2.3.1,2.4,2.5,2.6,2.7,2.8,2.9
2125353	2011, R-51024 Detailed Production Process, DACO: 2.11.3 CBI
2125354	2006, R-51024 [Privacy Information Removed] Product Description CBI, DACO: 2.11.4 CBI
2125361	2011, R-51024 Preliminary Analysis CBI, DACO: 2.13,2.13.1,2.13.2,2.13.3, 2.13.4 CBI
2125362	2011, R-51024 Preliminary Analysis Not CBI, DACO: 2.13,2.13.1,2.13.2, 2.13.3,2.13.4
2125364	2010, Lot 0113100403, DACO: 2.13.3 CBI
2125365	2010, Lot 0125100403, DACO: 2.13.3 CBI
2125366	2009, Lot 1231090403, DACO: 2.13.3 CBI
2125367	2011, Lot EL0A0712, DACO: 2.13.3 CBI
2125368	2011, Lot EL0A0720, DACO: 2.13.3 CBI
2125369	2011, R-51024 Phys/Chem properties CBI, DACO: 2.14,2.14.1,2.14.10, 2.14.11,2.14.13,2.14.2,2.14.3,2.14.4,2.14.5,2.14.6,2.14.7,2.14.8,2.14.9 CBI
2125370	2011, R-51024 Phys/Chem properties Not CBI, DACO: 2.14,2.14.1,2.14.10, 2.14.11,2.14.13,2.14.2,2.14.3,2.14.4,2.14.5,2.14.6,2.14.7,2.14.8,2.14.9
2125371	2011, R-51024 UV/Vis spectra, DACO: 2.14.12 CBI
2125372	2011, R-51024 Sample of Standard, DACO: 2.15
2228033	2012, R-51024 DACO 2.1 to 2.11 Updated with GAC, DACO: 2.1,2.11,2.11.1, 2.11.2,2.11.3,2.11.4,2.2,2.3,2.3.1,2.4,2.5,2.6,2.7,2.8,2.9 CBI
2228036	2012, Ammonia Sulfate manufacturing process, DACO: 2.11.3 CBI
2228037	2012, Ammonium Sulfate Preliminary Analysis, DACO: 2.13,2.13.1,2.13.2,2.13.3,2.13.4 CBI
2234915	2012, [CBI Removed] Statement of Ingredients, DACO: 2.11.2 CBI
2234917	2012, [CBI Removed] data sheet, DACO: 2.11.2 CBI
2125438	2011, 60620 Chemistry Requirements for End-Use Product, DACO: 3.0,3.1, 3.1.1,3.1.2,3.1.3,3.1.4,3.2,3.2.1,3.2.2,3.2.3,3.3.1,3.3.2,3.4,3.4.1,3.4.2,3.5,3.5.10,3.5 .11,3.5.12,3.5.13,3.5.14,3.5.15,3.5.2,3.5.4,3.5.5,3.5.6,3.5.7,3.5.8,3.5.9 CBI
2125439	2011, 60620 Chemistry Requirements for End-Use Product, DACO: 3.0,3.1, 3.1.1,3.1.2,3.1.3,3.1.4,3.2,3.2.1,3.2.2,3.2.3,3.3.1,3.3.2,3.4,3.4.1,3.4.2,3.5,3.5.10,3.5 .11,3.5.12,3.5.13,3.5.14,3.5.15,3.5.2,3.5.4,3.5.5,3.5.6,3.5.7,3.5.8,3.5.9
2125440	2011, 60620 Production Process, DACO: 3.2.2 CBI
2125441	2011, 60620 Enforcement Analytical Method, DACO: 3.4.1 CBI

2125442 2011, 60620 Storage Stability and Corrosion Characteristics, DACO: 3.5.10,3.5.14 CBI

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