

# Diphenylamine

sc-205995



The Power to Question

## Material Safety Data Sheet

Hazard Alert Code  
Key:

EXTREME

HIGH

MODERATE

LOW

## Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

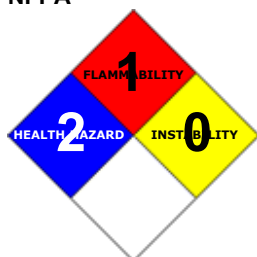
### PRODUCT NAME

Diphenylamine

### STATEMENT OF HAZARDOUS NATURE

CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

### NFPA



### SUPPLIER

Company: Santa Cruz Biotechnology, Inc.

Address:

2145 Delaware Ave

Santa Cruz, CA 95060

Telephone: 800.457.3801 or 831.457.3800

Emergency Tel: CHEMWATCH: From within the US and

Canada: 877-715-9305

Emergency Tel: From outside the US and Canada: +800 2436

2255 (1-800-CHEMCALL) or call +613 9573 3112

### PRODUCT USE

Used as rubber antioxidants and accelerators; stabiliser for solid propellants and nitrocellulose; in pesticides, dyes, pharmaceuticals, veterinary medicines; storage preservation in apples; in analytical chemistry for the detection of NO<sub>2</sub> and ClO<sub>3</sub>. Intermediate

### SYNONYMS

C12-H11-N, C<sub>6</sub>H<sub>5</sub>-NH-C<sub>6</sub>H<sub>5</sub>, DPA, "aniline, N-phenyl", "aniline, N-phenyl", "N-phenyl aniline", "N-phenyl aniline", anilinobenzene, "benzenamine, N-phenyl(9CI)", "benzene, anilino", "benzene, (phenylamino)-", phenylamino-benzene, "C.I. 10355", "N, N-diphenylamine", "N, N-diphenylamine", N-phenylaniline, N-phenylaniline, N-phenylbenzenamine, N-phenylbenzenamine

## Section 2 - HAZARDS IDENTIFICATION

### CANADIAN WHMIS SYMBOLS



### EMERGENCY OVERVIEW

#### RISK

Danger of cumulative effects.

Toxic by inhalation, in contact with skin and if swallowed.

Irritating to eyes, respiratory system and skin.

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

### POTENTIAL HEALTH EFFECTS

#### ACUTE HEALTH EFFECTS

#### SWALLOWED

■ Toxic effects may result from the accidental ingestion of the material; animal experiments indicate that ingestion of less than 40 gram may be fatal or may produce serious damage to the health of the individual.

■ The material can produce chemical burns within the oral cavity and gastrointestinal tract following ingestion.

■ The substance and/or its metabolites may bind to hemoglobin inhibiting normal uptake of oxygen. This condition, known as "methemoglobinemia", is a form of oxygen starvation (anoxia).

Symptoms include cyanosis (a bluish discoloration skin and mucous membranes) and breathing difficulties. Symptoms may not

be evident until several hours after exposure.

At about 15% concentration of blood methemoglobin there is observable cyanosis of the lips, nose and earlobes. Symptoms may be absent although euphoria, flushed face and headache are commonly experienced. At 25-40%, cyanosis is marked but little disability occurs other than that produced on physical exertion. At 40-60%, symptoms include weakness, dizziness, lightheadedness, increasingly severe headache, ataxia, rapid shallow respiration, drowsiness, nausea, vomiting, confusion, lethargy and stupor. Above 60% symptoms include dyspnea, respiratory depression, tachycardia or bradycardia, and convulsions. Levels exceeding 70% may be fatal.

- Industrial poisoning due to diphenylamine may manifest itself in bladder symptoms, tachycardia, hypertension and eczema.

#### EYE

- This material can cause eye irritation and damage in some persons.
- The material can produce chemical burns to the eye following direct contact. Vapors or mists may be extremely irritating.
- If applied to the eyes, this material causes severe eye damage.

#### SKIN

- Skin contact with the material may produce toxic effects; systemic effects may result following absorption.
- The material can produce chemical burns following direct contact with the skin.
- Open cuts, abraded or irritated skin should not be exposed to this material.
- Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.
- Diphenylamine is an irritant and may cause reddening and blistering of the skin. Patch tests using 1% diphenylamine were conducted on 1000 eczema patients. Positive reaction was noted in 3 patients and was attributed to cross-sensitivities with p-phenylenediamine.
- This material can cause inflammation of the skin on contact in some persons.

#### INHALED

- Persons with impaired respiratory function, airway diseases and conditions such as emphysema or chronic bronchitis, may incur further disability if excessive concentrations of particulate are inhaled.
- Exposure to diphenylamine by absorption through the skin, inhalation of the dust or ingestion causes fatigue, headache and increased blood pressure. Cyanosis may occur.
- Inhalation of vapors or aerosols (mists, fumes), generated by the material during the course of normal handling, may produce toxic effects.
- The material can cause respiratory irritation in some persons. The body's response to such irritation can cause further lung damage.

#### CHRONIC HEALTH EFFECTS

- Repeated or long-term occupational exposure is likely to produce cumulative health effects involving organs or biochemical systems.

Repeated or prolonged exposure to corrosives may result in the erosion of teeth, inflammatory and ulcerative changes in the mouth and necrosis (rarely) of the jaw. Bronchial irritation, with cough, and frequent attacks of bronchial pneumonia may ensue. Gastrointestinal disturbances may also occur. Chronic exposures may result in dermatitis and/or conjunctivitis.

There is limited evidence that, skin contact with this product is more likely to cause a sensitization reaction in some persons compared to the general population.

Long term exposure to high dust concentrations may cause changes in lung function i.e. pneumoconiosis; caused by particles less than 0.5 micron penetrating and remaining in the lung. Prime symptom is breathlessness; lung shadows show on X-ray.

Prolonged or repeated exposure to diphenylamine can cause bladder injury, high pulse rate, hypertension and eczema. Based on animal tests overexposure may cause reproductive disorders. Kidney damage produced in newborn offspring of pregnant rats gavaged with technical grade diphenylamine, was subsequently attributed to the presence of the impurity N,N,N'-triphenyl-p-triphenylamine which occurs in "aged" diphenylamine.

Histopathological lesions and pathological changes were found in dogs fed on a diet of 1% diphenylamine over 2-years. These included peripherolobular fatty change in the liver with marked increases in liver weight, a mild haemosiderosis of the spleen, kidneys and bone marrow, and a slight increase in kidney. Moderate hepatic injury was also demonstrated by a decreased clearance of sulfobromophthalein.

Pure diphenylamine is not, in itself, carcinogenic. However, N-nitroso diphenylamine is a known carcinogen and can be formed directly in the human stomach from diphenylamine and endogenous or dietary inorganic nitrate.

**WARNING:** This material may contain very low levels of 4-aminobiphenyl impurity which has been classified as a **CONFIRMED HUMAN CARCINOGEN**. Worker exposure by all routes should be carefully controlled.

The material is not subject to regulation if the 4-aminobiphenyl content is below 0.1%.



Most arylamines are powerful poisons to the blood-making system. High chronic doses cause congestion of the spleen and tumor formation.

## Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

### HAZARD RATINGS

	Min	Max	
Flammability:	1		
Toxicity:	3		
Body Contact:	3		
Reactivity:	1		
Chronic:	2		

Min/Nil=0  
Low=1  
Moderate=2  
High=3  
Extreme=4



NAME	CAS RN	%
diphenylamine	122-39-4	>98
<a href="#">2-aminodiphenyl</a>	90-41-5	
<a href="#">4-aminodiphenyl</a>	92-67-1	
<a href="#">aniline</a>	62-53-3	

## Section 4 - FIRST AID MEASURES

### SWALLOWED

- For advice, contact a Poisons Information Center or a doctor at once.

- Urgent hospital treatment is likely to be needed.
- If swallowed do NOT induce vomiting.
- If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.
- Observe the patient carefully.
- Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious.
- Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink.
- Transport to hospital or doctor without delay.

#### EYE

- If this product comes in contact with the eyes:
  - Immediately hold eyelids apart and flush the eye continuously with running water.
  - Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
  - Continue flushing until advised to stop by the Poisons Information Center or a doctor, or for at least 15 minutes.
  - Transport to hospital or doctor without delay.
  - Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

#### SKIN

- If skin or hair contact occurs:
  - Immediately flush body and clothes with large amounts of water, using safety shower if available.
  - Quickly remove all contaminated clothing, including footwear.
  - Wash skin and hair with running water. Continue flushing with water until advised to stop by the Poisons Information Center.
  - Transport to hospital, or doctor.

#### INHALED

- - If fumes or combustion products are inhaled remove from contaminated area.
  - Lay patient down. Keep warm and rested.
  - Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
  - Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.
  - Transport to hospital, or doctor, without delay.

#### NOTES TO PHYSICIAN

- For acute or short-term repeated exposures to highly alkaline materials:
    - Respiratory stress is uncommon but present occasionally because of soft tissue edema.
    - Unless endotracheal intubation can be accomplished under direct vision, cricothyroidotomy or tracheotomy may be necessary.
    - Oxygen is given as indicated.
    - The presence of shock suggests perforation and mandates an intravenous line and fluid administration.
    - Damage due to alkaline corrosives occurs by liquefaction necrosis whereby the saponification of fats and solubilization of proteins allow deep penetration into the tissue.
- Alkalis continue to cause damage after exposure.

#### INGESTION:

- Milk and water are the preferred diluents
- No more than 2 glasses of water should be given to an adult.
- Neutralizing agents should never be given since exothermic heat reaction may compound injury.
- \* Catharsis and emesis are absolutely contra-indicated.
- \* Activated charcoal does not absorb alkali.
- \* Gastric lavage should not be used.

Supportive care involves the following:

- Withhold oral feedings initially.
- If endoscopy confirms transmucosal injury start steroids only within the first 48 hours.
- Carefully evaluate the amount of tissue necrosis before assessing the need for surgical intervention.
- Patients should be instructed to seek medical attention whenever they develop difficulty in swallowing (dysphagia).

#### SKIN AND EYE:

- Injury should be irrigated for 20-30 minutes.
- Eye injuries require saline. [Ellenhorn & Barceloux: Medical Toxicology]

The material may induce methemoglobinemia following exposure.

- Initial attention should be directed at oxygen delivery and assisted ventilation if necessary. Hyperbaric oxygen has not demonstrated substantial benefits.
- Hypotension should respond to Trendelenburg's position and intravenous fluids; otherwise dopamine may be needed.
- Symptomatic patients with methemoglobin levels over 30% should receive methylene blue. (Cyanosis, alone, is not an indication for treatment). The usual dose is 1-2 mg/kg of a 1% solution (10 mg/ml) IV over 50 minutes; repeat, using the same dose, if symptoms of hypoxia fail to subside within 1 hour.

BIOLOGICAL EXPOSURE INDEX - BEI These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

Determinant	Index	Sampling Time	Comment
1. Methemoglobin in blood	1.5% of hemoglobin	During or end of shift	B, NS, SQ

B: Background levels occur in specimens collected from subjects NOT exposed

NS: Non-specific determinant; also observed after exposure to other materials

SQ: Semi-quantitative determinant - Interpretation may be ambiguous; should be used as a screening test or confirmatory test.

## Section 5 - FIRE FIGHTING MEASURES

Vapor Pressure (mmHg):	0.75 @ 100C
Upper Explosive Limit (%):	Not available.
Specific Gravity (water=1):	1.16 @ 20-24C
Lower Explosive Limit (%):	Not available.

#### EXTINGUISHING MEDIA

- - Foam.
  - Dry chemical powder.
  - BCF (where regulations permit).

- Carbon dioxide.
- Water spray or fog - Large fires only.

### FIRE FIGHTING

- Alert Emergency Responders and tell them location and nature of hazard.
- Wear full body protective clothing with breathing apparatus.
- Prevent, by any means available, spillage from entering drains or water course.
- Use fire fighting procedures suitable for surrounding area.
- DO NOT approach containers suspected to be hot.
- Cool fire exposed containers with water spray from a protected location.
- If safe to do so, remove containers from path of fire.
- Equipment should be thoroughly decontaminated after use.

### GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

- Combustible solid which burns but propagates flame with difficulty.
- Avoid generating dust, particularly clouds of dust in a confined or unventilated space as dusts may form an explosive mixture with air, and any source of ignition, i.e. flame or spark, will cause fire or explosion. Dust clouds generated by the fine grinding of the solid are a particular hazard; accumulations of fine dust may burn rapidly and fiercely if ignited.
- Dry dust can be charged electrostatically by turbulence, pneumatic transport, pouring, in exhaust ducts and during transport.
- Build-up of electrostatic charge may be prevented by bonding and grounding.
- Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.

Combustion products include: carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), nitrogen oxides (NO<sub>x</sub>), other pyrolysis products typical of burning organic material.

May emit poisonous fumes.

### FIRE INCOMPATIBILITY

- Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

### PERSONAL PROTECTION

Glasses:

Full face- shield.

Gloves:

Respirator:

Type AK-P Filter of sufficient capacity

## Section 6 - ACCIDENTAL RELEASE MEASURES

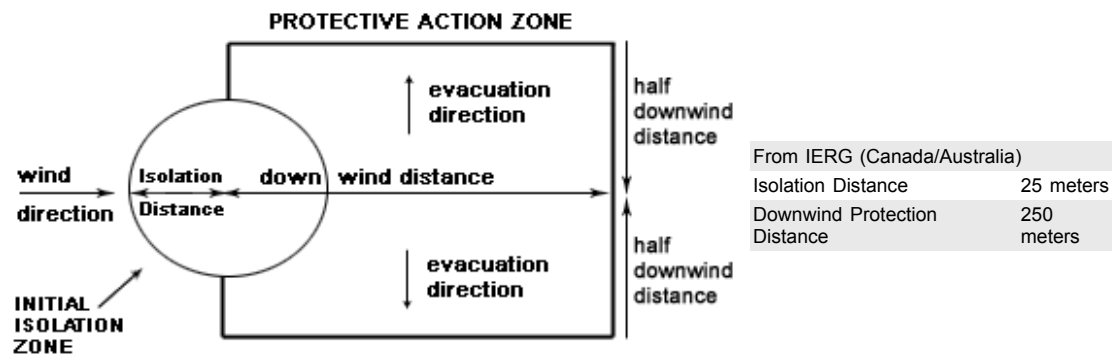
### MINOR SPILLS

- Clean up waste regularly and abnormal spills immediately.
- Avoid breathing dust and contact with skin and eyes.
- Wear protective clothing, gloves, safety glasses and dust respirator.
- Use dry clean up procedures and avoid generating dust.
- Vacuum up or sweep up. NOTE: Vacuum cleaner must be fitted with an exhaust micro filter (HEPA type) (consider explosion-proof machines designed to be grounded during storage and use).
- Dampen with water to prevent dusting before sweeping.
- Place in suitable containers for disposal.

### MAJOR SPILLS

- Clear area of personnel and move upwind.
- Alert Emergency Responders and tell them location and nature of hazard.
- Wear full body protective clothing with breathing apparatus.
- Prevent, by any means available, spillage from entering drains or water course.
- Stop leak if safe to do so.
- Contain spill with sand, earth or vermiculite.
- Collect recoverable product into labeled containers for recycling.
- Neutralize/decontaminate residue.
- Collect solid residues and seal in labeled drums for disposal.
- Wash area and prevent runoff into drains.
- After clean up operations, decontaminate and launder all protective clothing and equipment before storing and re-using.
- If contamination of drains or waterways occurs, advise emergency services.

### PROTECTIVE ACTIONS FOR SPILL



### FOOTNOTES

<sup>1</sup> PROTECTIVE ACTION ZONE is defined as the area in which people are at risk of harmful exposure. This zone assumes that random changes in wind direction confines the vapour plume to an area within 30 degrees on either side of the predominant wind direction, resulting in a crosswind protective action distance equal to the downwind protective action distance.

2 PROTECTIVE ACTIONS should be initiated to the extent possible, beginning with those closest to the spill and working away from the site in the downwind direction. Within the protective action zone a level of vapour concentration may exist resulting in nearly all unprotected persons becoming incapacitated and unable to take protective action and/or incurring serious or irreversible health effects.

3 INITIAL ISOLATION ZONE is determined as an area, including upwind of the incident, within which a high probability of localised wind reversal may expose nearly all persons without appropriate protection to life-threatening concentrations of the material.

4 SMALL SPILLS involve a leaking package of 200 litres (55 US gallons) or less, such as a drum (jerrican or box with inner containers). Larger packages leaking less than 200 litres and compressed gas leaking from a small cylinder are also considered "small spills". LARGE SPILLS involve many small leaking packages or a leaking package of greater than 200 litres, such as a cargo tank, portable tank or a "one-tonne" compressed gas cylinder.

5 Guide 154 is taken from the US DOT emergency response guide book.

6 IERG information is derived from CANUTEC - Transport Canada.

## ACUTE EXPOSURE GUIDELINE LEVELS (AEGL) (in ppm)

aniline					
AEGL Type	10 min	30 min	60 min	4 hr	8 hr
AEGL 1	48	16	8	2	GALSYN~
AEGL 2	72	24	12	3	GALSYN~
AEGL 3	120	40	20	5	GALSYN~

AEGL 1: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL 2: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL 3: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

## Section 7 - HANDLING AND STORAGE

### PROCEDURE FOR HANDLING

- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.
- DO NOT enter confined spaces until atmosphere has been checked.
- DO NOT allow material to contact humans, exposed food or food utensils.
- Avoid contact with incompatible materials.
- When handling, DO NOT eat, drink or smoke.
- Keep containers securely sealed when not in use.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately.
- Launder contaminated clothing before re-use.
- Use good occupational work practice.
- Observe manufacturer's storing and handling recommendations.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Empty containers may contain residual dust which has the potential to accumulate following settling. Such dusts may explode in the presence of an appropriate ignition source.

- Do NOT cut, drill, grind or weld such containers
- In addition ensure such activity is not performed near full, partially empty or empty containers without appropriate workplace safety authorisation or permit.

### RECOMMENDED STORAGE METHODS

- Glass container.
- Lined metal can, Lined metal pail/drum
- Plastic pail
- Polyliner drum
- Packing as recommended by manufacturer.
- Check all containers are clearly labeled and free from leaks.

For low viscosity materials

- Drums and jerricans must be of the non-removable head type.
- Where a can is to be used as an inner package, the can must have a screwed enclosure.

For materials with a viscosity of at least 2680 cSt. (23 deg. C) and solids (between 15 C deg. and 40 deg C.):

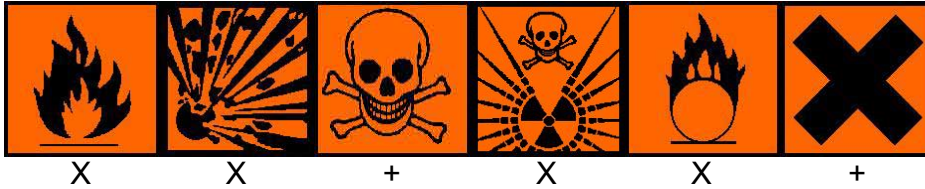
- Removable head packaging;
- Cans with friction closures and
- low pressure tubes and cartridges may be used.

- Where combination packages are used, and the inner packages are of glass, there must be sufficient inert cushioning material in contact with inner and outer packages \* . - In addition, where inner packages are glass and contain liquids of packing group I and II there must be sufficient inert absorbent to absorb any spillage \*. - \* unless the outer packaging is a close fitting molded plastic box and the substances are not incompatible with the plastic.

### STORAGE REQUIREMENTS

- 
- Store in original containers.
- Keep containers securely sealed.
- Store in a cool, dry, well-ventilated area.
- Store away from incompatible materials and foodstuff containers.
- Protect containers against physical damage and check regularly for leaks.
- Observe manufacturer's storing and handling recommendations.

### SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS



X: Must not be stored together  
 O: May be stored together with specific preventions  
 +: May be stored together

## Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

### EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m <sup>3</sup>	STEL ppm	STEL mg/m <sup>3</sup>	Peak ppm	Peak mg/m <sup>3</sup>	TWA F/CC	Notes
Canada - British Columbia Occupational Exposure Limits	diphenylamine (Diphenylamine)		10						
Canada - Ontario Occupational Exposure Limits	diphenylamine (N,N-Diphenylamine)		10						
Canada - Alberta Occupational Exposure Limits	diphenylamine (Diphenylamine)		10						
US ACGIH Threshold Limit Values (TLV)	diphenylamine (Diphenylamine)		10						TLV Basis: liver & kidney damage; hematologic effects
US NIOSH Recommended Exposure Limits (RELs)	diphenylamine (Diphenylamine)		10						
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	diphenylamine (Diphenylamine)		10						
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	diphenylamine (Diphenylamine)		10						
US - Minnesota Permissible Exposure Limits (PELs)	diphenylamine (Diphenylamine)		10						
US - California Permissible Exposure Limits for Chemical Contaminants	diphenylamine (Diphenylamine; N-phenylaniline)		10						
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	diphenylamine (Diphenylamine)		10						
US - Hawaii Air Contaminant Limits	diphenylamine (Diphenylamine)		10		20				
US - Alaska Limits for Air Contaminants	diphenylamine (Diphenylamine)		10						
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	diphenylamine (Diphenylamine)		10		20				
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	diphenylamine (Diphenylamine)	-	10	-	20				
US - Washington Permissible exposure limits of air contaminants	diphenylamine (Diphenylamine)		10		20				
Canada - Nova Scotia Occupational Exposure Limits	diphenylamine (Diphenylamine)		10						TLV Basis: liver & kidney damage; hematologic effects
Canada - Prince Edward Island Occupational Exposure Limits	diphenylamine (Diphenylamine)		10						TLV Basis: liver & kidney damage; hematologic effects
Canada - Northwest Territories Occupational Exposure Limits (English)	diphenylamine (Diphenylamine)		10		20				
US - Michigan Exposure Limits for Air Contaminants	diphenylamine (Diphenylamine)		10						
US - Oregon Permissible Exposure Limits (Z1)	diphenylamine (Diphenylamine)		10						*
Canada - British Columbia Occupational Exposure Limits	4-aminodiphenyl (4-Aminodiphenyl)		(L)						Skin; A1, 1
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	4-aminodiphenyl (K 4-Aminodiphenyl - Skin)		(See Table 15)						
US - Minnesota Permissible	aniline (Aniline and	o		a					

Exposure Limits (PELs)	homologs)	4	0		
Canada - British Columbia Occupational Exposure Limits	aniline (Aniline)	2			Skin
Canada - Alberta Occupational Exposure Limits	aniline (Aniline)	2	7.6		
US - California Permissible Exposure Limits for Chemical Contaminants	aniline (Aniline)	2	7.6		
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	aniline (Aniline and homologs)	2	8		
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	aniline (Aniline and homologs)	5	19		
US - Idaho - Limits for Air Contaminants	aniline (Aniline)	5	19		
US ACGIH Threshold Limit Values (TLV)	aniline (Aniline)	2			TLV Basis: methemoglobinemia
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	aniline (Aniline)	2	4		Skin
US - Washington Permissible exposure limits of air contaminants	aniline (Aniline and homologues)	2	4		
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	aniline (Aniline (o-, p-isomers) - Skin)	5	19	5	19
US - Hawaii Air Contaminant Limits	aniline (Aniline and homologs)	2	8	5	20
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	aniline (Aniline)	2	7,6		
Canada - Prince Edward Island Occupational Exposure Limits	aniline (Aniline)	2			TLV Basis: methemoglobinemia
Canada - Nova Scotia Occupational Exposure Limits	aniline (Aniline)	2			TLV Basis: methemoglobinemia

The following materials had no OELs on our records

- 2-aminodiphenyl: CAS:90-41-5

#### EMERGENCY EXPOSURE LIMITS

Material	Revised IDLH Value (mg/m3)	Revised IDLH Value (ppm)
aniline		100 [Unch]

#### MATERIAL DATA

##### DIPHENYLAMINE:

- For diphenylamine:

Odour Threshold Value: 0.022-0.025 ppm (recognition)

The TLV has been derived from ingestion studies due to lack of inhalation data. The lowest daily dose that produced no-adverse toxicological effects in female rats was 0.025% dietary diphenylamine fed over 226 days. The no-effect inhalation dose for a 70 kg worker with a respiratory exchange of 10 m3 during an 8 hour workday and 100% absorption was estimated to be 83 mg/m3. The TLV-TWA is thought to be protective against the significant risk of liver, kidney, cardiovascular, haematological and other systemic effects

Odour Safety Factor(OSF)

OSF=0.91 (diphenylamine).

##### 2-AMINODIPHENYL:

- It is the goal of the ACGIH (and other Agencies) to recommend TLVs (or their equivalent) for all substances for which there is evidence of health effects at airborne concentrations encountered in the workplace.

At this time no TLV has been established, even though this material may produce adverse health effects (as evidenced in animal experiments or clinical experience). Airborne concentrations must be maintained as low as is practically possible and occupational exposure must be kept to a minimum.

NOTE: The ACGIH occupational exposure standard for Particles Not Otherwise Specified (P.N.O.S) does NOT apply.

Exposure limits with "skin" notation indicate that vapor and liquid may be absorbed through intact skin. Absorption by skin may readily exceed vapor inhalation exposure. Symptoms for skin absorption are the same as for inhalation. Contact with eyes and mucous membranes may also contribute to overall exposure and may also invalidate the exposure standard.

CEL TWA: 0.1 mg/m3 (skin)

##### 4-AMINODIPHENYL:

This compound is one of the most potent of the known bladder carcinogens. Workers exposed to the chemical should be properly equipped to eliminate to the fullest possible extent all exposures.

##### ANILINE:

- For aniline:

Odour Threshold Value: 0.58-10 ppm (detection)

Threshold odour concentration, 50% recognition is >0.1 ppm, identification at 1 ppm.

NOTE: Detector tubes for aniline, measuring in excess of 0.5 ppm are commercially available.

Increased levels of methaemoglobin are detected in the blood of animals exposed at 5 ppm and following skin exposure by humans. The TLV-TWA is thought to provide protection against the significant risk of systemic effects.

Odour Safety Factor(OSF)

OSF=0.91 (ANILINE).

#### PERSONAL PROTECTION





Consult your EHS staff for recommendations

## EYE

- Chemical goggles.
- Full face shield.
- Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

## HANDS/FEET

■ Wear chemical protective gloves, eg. PVC.

Wear safety footwear or safety gumboots, eg. Rubber.

NOTE: The material may produce skin sensitization in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact.

Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:

- frequency and duration of contact,
- chemical resistance of glove material,
- glove thickness and
- dexterity

Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739).

- When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374) is recommended.
- When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374) is recommended.
- Contaminated gloves should be replaced.

Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.

## OTHER

- Overalls.
- Eyewash unit.
- Barrier cream.
- Skin cleansing cream.
- Respirators may be necessary when engineering and administrative controls do not adequately prevent exposures.
- The decision to use respiratory protection should be based on professional judgment that takes into account toxicity information, exposure measurement data, and frequency and likelihood of the worker's exposure - ensure users are not subject to high thermal loads which may result in heat stress or distress due to personal protective equipment (powered, positive flow, full face apparatus may be an option).
- Published occupational exposure limits, where they exist, will assist in determining the adequacy of the selected respiratory . These may be government mandated or vendor recommended.
- Certified respirators will be useful for protecting workers from inhalation of particulates when properly selected and fit tested as part of a complete respiratory protection program.
- Use approved positive flow mask if significant quantities of dust becomes airborne.
- Try to avoid creating dust conditions.

## RESPIRATOR

■ Selection of the Class and Type of respirator will depend upon the level of breathing zone contaminant and the chemical nature of the contaminant. Protection Factors (defined as the ratio of contaminant outside and inside the mask) may also be important.

Breathing Zone Level ppm (volume)	Maximum Protection Factor	Half-face Respirator	Full-Face Respirator
1000	10	AK-1 P	-
1000	50	-	AK-1 P
5000	50	Airline*	-
5000	100	-	AK-2 P
10000	100	-	AK-3 P
	100+		Airline* *

\* - Continuous Flow \*\* - Continuous-flow or positive pressure demand.

The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required.

Use appropriate NIOSH-certified respirator based on informed professional judgement. In conditions where no reasonable estimate of exposure can be made, assume the exposure is in a concentration IDLH and use NIOSH-certified full face pressure demand SCBA with a minimum service life of 30 minutes, or a combination full facepiece pressure demand SAR with auxiliary self-contained air supply. Respirators provided only for escape from IDLH atmospheres shall be NIOSH-certified for escape from the atmosphere in which they will be used.

## ENGINEERING CONTROLS

- Local exhaust ventilation is required where solids are handled as powders or crystals; even when particulates are relatively large, a certain proportion will be powdered by mutual friction.
- Exhaust ventilation should be designed to prevent accumulation and recirculation of particulates in the workplace.
- If in spite of local exhaust an adverse concentration of the substance in air could occur, respiratory protection should be considered. Such protection might consist of:

(a): particle dust respirators, if necessary, combined with an absorption cartridge;

(b): filter respirators with absorption cartridge or canister of the right type;

(c): fresh-air hoods or masks

- Build-up of electrostatic charge on the dust particle, may be prevented by bonding and grounding.
- Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.

Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to efficiently remove the contaminant.

Type of Contaminant:

Air Speed:



direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion) 1-2.5 m/s (200-500 f/min.)

grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion). 2.5-10 m/s (500-2000 f/min.)

Within each range the appropriate value depends on:

Lower end of the range Upper end of the range

1: Room air currents minimal or favorable to capture 1: Disturbing room air currents

2: Contaminants of low toxicity or of nuisance value only 2: Contaminants of high toxicity

3: Intermittent, low production. 3: High production, heavy use

4: Large hood or large air mass in motion 4: Small hood-local control only

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 4-10 m/s (800-2000 f/min) for extraction of crusher dusts generated 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.

## Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

### PHYSICAL PROPERTIES

Solid.  
Does not mix with water.  
Sinks in water.  
Alkaline.

State	Divided solid	Molecular Weight	169.23
Melting Range (°F)	125.6- 131	Viscosity	Not Applicable
Boiling Range (°F)	575.6	Solubility in water (g/L)	Immiscible
Flash Point (°F)	306.86	pH (1% solution)	Not applicable.
Decomposition Temp (°F)	Not available.	pH (as supplied)	Not applicable
Autoignition Temp (°F)	1173.2	Vapor Pressure (mmHg)	0.75 @ 100C
Upper Explosive Limit (%)	Not available.	Specific Gravity (water=1)	1.16 @ 20-24C
Lower Explosive Limit (%)	Not available.	Relative Vapor Density (air=1)	5.82
Volatile Component (%vol)	Not applicable.	Evaporation Rate	Not applicable

### APPEARANCE

Colourless to greyish crystalline solid in the form of a powder, with a characteristic floral odour. Soluble in carbon disulfide, benzene, alcohol and ether. Insoluble in water. In the presence of H<sub>2</sub>SO<sub>4</sub>, turns a deep-blue colour.

## Section 10 - CHEMICAL STABILITY

### CONDITIONS CONTRIBUTING TO INSTABILITY

- Presence of incompatible materials.
- Product is considered stable.
- Hazardous polymerization will not occur.

### STORAGE INCOMPATIBILITY

- Diphenylamine:
  - reacts violently when added to hexachloromelamine, trichloromelamine
  - is a base
  - is incompatible with strong acids (to form salts), aldehydes, acrylates, alcohols, alkylene oxides, substituted allyls, cellulose nitrate, cresols, caprolactam, epichlorohydrin, ethylene dichloride, glycols, organic anhydrides, isocyanates, ketones, nitrates, oxidisers, phenols, vinyl acetate
  - reacts with nitrogen oxides (Nox) to form N-nitrosodiphenylamine and mono-, and poly- nitro products
  - reacts exothermically with decomposition with maleic anhydride
  - increase the sensitivity of nitromethane
  - attacks light metals in the presence of moisture
  - Many arylamines (aromatic amines such as aniline, N-ethylaniline, o-toluidine, xylidine etc. and their mixtures) are hypergolic (ignite spontaneously) with red fuming nitric acid. When the amines are dissolved in triethylamine, ignition occurs at -60 deg. C. or less.
  - Various metal oxides and their salts may promote ignition of amine-red fuming nitric acid systems. Soluble materials such as copper(I) oxide, ammonium metavanadate are effective; insoluble materials such as copper(II) oxide, iron(II) oxide, potassium dichromate are also effective.
  - Avoid oxidizing agents, acids, acid chlorides, acid anhydrides.
  - Avoid contact with copper, aluminium and their alloys.

For incompatible materials - refer to Section 7 - Handling and Storage.

## Section 11 - TOXICOLOGICAL INFORMATION

diphenylamine

### TOXICITY AND IRRITATION

■ unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY

IRRITATION

Oral (Rat) LD50: 1120 mg/kg

Oral (Mouse) LD50: 1230 mg/kg

Oral (Guinea pig): LD50 300 mg/kg

■ Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance. Industrial bronchitis, on the other hand, is a disorder that occurs as result of exposure due to high concentrations of irritating substance (often particulate in nature) and is completely reversible after exposure ceases. The disorder is characterised by dyspnea, cough and mucus production.

Acute toxicity: Diphenylamine and its substituted derivatives all show a slight to moderate order of toxicity following oral administration, with LD50 values ranging from >500 to > 34,000 mg/kg. Overall, the acute dermal LD50 for these materials was greater than the 2000 mg/kg limit dose indicating a very low order of toxicity.

Mutagenicity: Of five substituted diphenylamines tested, there was one weakly positive mutagenic response with in the bacterial mutagenicity test, with diphenylamine (122-39-4). Overall weight of evidence for this material, as well as the category indicates a negative evaluation for bacterial mutagenicity.

Substituted diphenylamines have been tested for mutagenicity in tests for gene mutations and chromosomal aberrations. The assays included point mutations in bacterial cells, in vitro chromosomal aberrations in mammalian cells, and in vivo chromosomal aberrations. With one exception, the data consistently demonstrate no evidence of genotoxicity for this category of materials. This suggests that all members of the category lack genotoxicity due to their similarity in chemical structures and physicochemical properties

Repeat Dose Toxicity: Diphenylamine (122-39-4) was tested in a 28 day oral study with rats. A NOAEL of 111 mg/kg/day was identified. Diphenylamine is not only the common precursor for the materials of this category, but also theoretically the most toxic of the class since it is the smallest member of the class. The addition of alkyl groups onto the diphenylamine molecule results in even lower water solubility and, therefore, becomes less bioavailable. Diphenylamine, styrenated (68442-68-2) was tested in a 28day oral gavage study in rats. A NOAEL of 100 mg/kg/day was identified. Diphenylamine styrenated was tested in a 28-day gavage study in rats; 100 mg/kg/day was selected as the NOAEL. Diphenylamine-, reaction products with styrene and 2,4,4-trimethylpentene (68921-45-9) was tested in a 64 week rat dietary study; a LOEL of 2500 ppm was identified. .

Reproductive and Developmental Toxicity: Diphenylamine was administered in feed at 0.1, 0.25 or 0.5% (ca. 67, 167 or 333 mg/kg/day) to rats in a two-generation reproductive toxicity study. In general, the average size of the litters decreased as the concentration of dietary diphenylamine increased. A NOEL was not established. A developmental study was also conducted with diphenylamine in rabbits. The test article was administered by gavage at dose levels of 0, 33, 100 and 300 mg/kg/day for gestation days 7-19. The test article produced minimal effects (decreased food consumption and mean body weight) to maternal rats at 300 mg/kg during pregnancy; there were no other signs of maternal toxicity. NOAEL for maternal toxicity was established at 100 mg/kg/day. The NOAEL for teratogenicity/developmental effects was greater than 300 mg/kg/day.

ADI: 0.02 mg/kg/day

NOEL: 1.5 mg/kg/day

## CARCINOGEN

Diphenylamine	US ACGIH Threshold Limit Values (TLV) - Carcinogens	Carcinogen Category	A4
4-Aminobiphenyl	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group	1
4-Aminodiphenyl	US ACGIH Threshold Limit Values (TLV) - Carcinogens	Carcinogen Category	A1
4-AMINOBIPIHENYL	US Environmental Defense Scorecard Recognized Carcinogens	Reference(s)	P65
4-AMINOBIPIHENYL	US Environmental Defense Scorecard Suspected Carcinogens	Reference(s)	P65
4-Aminodiphenyl	US NIOSH Recommended Exposure Limits (RELs) - Carcinogens	Carcinogen	Ca
Aniline	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group	3
Nitrate or nitrite (ingested) under conditions that result in endogenous nitrosation	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group	2A
Aniline	US EPA Carcinogens Listing	Carcinogenicity	B2
Aniline	US ACGIH Threshold Limit Values (TLV) - Carcinogens	Carcinogen Category	B2
Aniline	US ACGIH Threshold Limit Values (TLV) - Carcinogens	Carcinogen Category	A3
ANILINE	US Environmental Defense Scorecard Recognized Carcinogens	Reference(s)	P65
ANILINE	US Environmental Defense Scorecard Suspected Carcinogens	Reference(s)	P65
Aniline	US Air Toxics Hot Spots TSD for Describing Available Cancer Potency Factors	IARC Class	3
Aniline and homologues	US NIOSH Recommended Exposure Limits (RELs) - Carcinogens	Carcinogen	Ca

## SKIN

4-aminodiphenyl	Canada - Ontario Occupational Exposure Limits - Skin	Notes	Skin; Toxic Agent
4-aminodiphenyl	US AIHA Workplace Environmental Exposure Levels (WEELs) - Skin	Notes	Skin; Toxic Agent
4-aminodiphenyl	Canada - Quebec Permissible Exposure Values for Airborne Contaminants - Skin (French)	Notes	Skin; Toxic Agent
4-aminodiphenyl	US ACGIH Threshold Limit Values (TLV) - Skin	Skin Designation	Yes
4-aminodiphenyl	Canada - British Columbia Occupational Exposure Limits - Skin	Notation	Skin; A1, 1

4-aminodiphenyl	US - California Permissible Exposure Limits for Chemical Contaminants - Skin	Skin	S
aniline	Canada - Ontario Occupational Exposure Limits - Skin	Notes	Skin
aniline	US AIHA Workplace Environmental Exposure Levels (WEELs) - Skin	Notes	Skin
aniline	Canada - Quebec Permissible Exposure Values for Airborne Contaminants - Skin (French)	Notes	Skin
aniline	US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants - Skin	Skin Designation	X
aniline	US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants - Skin	Skin Designation	X
aniline	US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants - Skin	Skin Designation	X
aniline	US - Washington Permissible exposure limits of air contaminants - Skin	Skin	X
aniline	US ACGIH Threshold Limit Values (TLV) - Skin	Skin Designation	Yes
aniline	Canada - British Columbia Occupational Exposure Limits - Skin	Notation	Skin
aniline	US - Minnesota Permissible Exposure Limits (PELs) - Skin	Skin Designation	X
aniline	US - Hawaii Air Contaminant Limits - Skin Designation	Skin Designation	X
aniline	ND	Skin Designation	X
aniline	US OSHA Permissible Exposure Levels (PELs) - Skin	Skin Designation	X
aniline	US - California Permissible Exposure Limits for Chemical Contaminants - Skin	Skin	X
aniline	US - California Permissible Exposure Limits for Chemical Contaminants - Skin	Skin	S
aniline	Canada - Alberta Occupational Exposure Limits - Skin	Substance Interaction	1

## Section 12 - ECOLOGICAL INFORMATION

Refer to data for ingredients, which follows:

ANILINE:

DIPHENYLAMINE:

■ Aromatic amines (arylamines), particularly primary aromatic amines, covalently and irreversibly bind to humic substances present in most natural waters.

All metabolites with moieties of: anilines, benzidines and toluidines are of environmental concern. Anilines and benzidines are both acutely toxic and toxic depending on the specific aquatic species (except algae). Toluidines represent a similar concern. It has been speculated that aqueous solutions of aromatic amines can be oxidised by organic radicals, but there are no actual data on reaction rates. Based on a study of reaction rate data for these compounds an estimate of the half-life of aromatic amines in water is approximately 100 days, assuming a peroxy radical concentration of 10<sup>-10</sup> mole/L in sunlit, oxygenated water.

■ Very toxic to aquatic organisms.

2-AMINODIPHENYL:

ANILINE:

DIPHENYLAMINE:

■ Do NOT allow product to come in contact with surface waters or to intertidal areas below the mean high water mark. Do not contaminate water when cleaning equipment or disposing of equipment wash-waters.

Wastes resulting from use of the product must be disposed of on site or at approved waste sites.

2-AMINODIPHENYL:

4-AMINODIPHENYL:

ANILINE:

DIPHENYLAMINE:

■ DO NOT discharge into sewer or waterways.

4-AMINODIPHENYL:

2-AMINODIPHENYL:

■ PAHs travel through the atmosphere as a gas or attached to dust particles. They are carried by air currents and deposited by dry or wet (rain, dew, etc) deposition. When deposited in water they sink to the bottom of lakes and rivers. Some will move through the soil to contaminate groundwater.

Polycyclic aromatic hydrocarbons (PAHs) are ubiquitous in the marine environment, occurring at their highest environmental concentrations around urban centres.

Two factors, lipid and organic carbon, control to a large extent the partitioning behaviour of PAHs in sediment, water and tissue; the more hydrophobic a compound, the greater the partitioning to non-aqueous phases. These two factors, along with the octanol-water partition coefficient, are the best predictors of this partitioning and can be used to determine PAH behaviour and its bioavailability in the environment.

The lipid (fat) phase, of all organisms, contains the highest levels of PAHs: organic carbon associated with sediment or dissolved in water has a great influence on bioavailability resulting from its ability to adsorb.

Accumulation of PAHs occurs in all marine organisms; however there is a wide range in tissue concentrations resulting from variable environmental concentrations, level and time of exposure, and species ability to metabolize these compounds. PAHs generally partition in lipid-rich tissues and their metabolites are found in most tissues. In fish, bile and liver accumulate the highest levels of parent PAH and metabolites. In invertebrates, the highest concentrations can be found in the internal organs, such as the liver and pancreas; tissue concentrations appear to follow seasonal cycles which may be related to variations in lipid content or spawning cycles.

The primary mode of toxicity for PAHs in soil dwelling terrestrial invertebrates is non-specific non-polar narcosis. The uptake of PAHs by earthworms occurs primarily by direct contact with the soluble phase of soil solution (interstitial pore-water).

Microbial degradation of PAHs is a key process in soils. Biodegradation of PAHs may take place over a period of weeks to months. Mixed microbial populations in sediment/water systems may degrade some PAHs, with degradation progressively decreasing with increasing molecular weight. The rate of degradation is dependent on nutrient content and the bacterial community in soil.

PAHs in soils undergo a weathering process such that the lighter chain fractions are removed (primarily by volatilisation). Heavier fractions bind to soil organic matter and remain behind in the top soil horizon. As the mixture of PAHs age, bioavailability changes as the fraction remaining bind more tightly.

In general the more soluble a PAH, the higher the uptake by plants while the reverse is true for uptake by earthworms and

uptake in the gastrointestinal tract of animals.

**DIPHENYLAMINE:**

■ Half- life Soil - High (hours):	672
■ Half- life Soil - Low (hours):	168
■ Half- life Air - High (hours):	2.47
■ Half- life Air - Low (hours):	0.247
■ Half- life Surface water - High (hours):	672
■ Half- life Surface water - Low (hours):	31
■ Half- life Ground water - High (hours):	1344
■ Half- life Ground water - Low (hours):	336
■ Aqueous biodegradation - Aerobic - High (hours):	672
■ Aqueous biodegradation - Aerobic - Low (hours):	168
■ Aqueous biodegradation - Anaerobic - High (hours):	2688
■ Aqueous biodegradation - Anaerobic - Low (hours):	672
■ Aqueous biodegradation - Removal secondary treatment - High (hours):	99%
■ Aqueous biodegradation - Removal secondary treatment - Low (hours):	65%
■ Photolysis maximum light absorption - High (nano- m):	281.5
■ Photooxidation half- life water - High (hours):	2.47
■ Photooxidation half- life water - Low (hours):	0.247

/53#90diphenam

log Kow: 3.22-3.50

COD: 90%

ThOD: 2.39

Toxicity Fish: LC50(96)1.3-5.2mg/L

Toxicity invertebrate: LC50(48)0.73-3.65mg/L

Degradation Biological: sig

processes Abiotic: some oxid

2-AMINODIPHENYL:

■ Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

4-AMINODIPHENYL:

■ Hazardous Air Pollutant:	Yes
■ Half- life Soil - High (hours):	168
■ Half- life Soil - Low (hours):	24
■ Half- life Air - High (hours):	6
■ Half- life Air - Low (hours):	0.6
■ Half- life Surface water - High (hours):	168
■ Half- life Surface water - Low (hours):	24
■ Half- life Ground water - High (hours):	336
■ Half- life Ground water - Low (hours):	48
■ Aqueous biodegradation - Aerobic - High (hours):	168
■ Aqueous biodegradation - Aerobic - Low (hours):	24
■ Aqueous biodegradation - Anaerobic - High (hours):	672
■ Aqueous biodegradation - Anaerobic - Low (hours):	96
■ Photooxidation half- life water - High (hours):	3480
■ Photooxidation half- life water - Low (hours):	62.4
■ Photooxidation half- life air - High (hours):	6
■ Photooxidation half- life air - Low (hours):	0.6

**ANILINE:**

■ Hazardous Air Pollutant:	Yes
■ Fish LC50 (96hr.) (mg/l):	134
■ Daphnia magna EC50 (48hr.) (mg/l):	0.1- 0.65
■ log Kow (Sangster 1997):	0.9
■ log Pow (Verschuereen 1983):	0.90/0.98

■ For aniline:

log Kow: 0.90-0.98

Koc: 25.5

Half-life (hr) air: 3.3

Half-life (hr) H2O surface water: 52-520

Henry's Pa m<sup>3</sup> /mol: 0.136

BOD 5 1.42-2.26,62%

COD: 2.4,94%

ThOD: 2.41-3.18

BCF: <148

Log BCF: 0.6-0.78

Degradation Biological: v sig

Environmental fate:

Terrestrial Fate: If released on land, aniline will exhibit low to moderate sorption to soils with the sorption being stronger at lower pH. Binding to humic materials results in covalent bond formation and slow oxidation. It will also sorb to clay minerals and, again, the sorption will be stronger under acidic conditions. However, its sorption to colloidal organic matter is extremely high and may increase its rate of leaching into the ground water. Aniline is readily biodegraded aerobic conditions, especially after a short acclimation period, and substantial loss can be expected by this means. Aniline has only been reported in ground water associated with wastes.

Aquatic Fate: If released into water, aniline will extensively biodegrade, photodegrade, and to some extent adsorb to sediment and humic materials, especially in more acidic situations. Biodegradation rates most appropriate for natural systems include a

half-life of 6 days in a eutrophic pond, as well as 75-90% mineralisation in 21 days in an oligotrophic lake. Photodegradation will occur in surface waters with estimated half-lives ranging from hours to weeks. The only reported half-life in a natural aquatic ecosystem which included all loss processes was 2.3 days in an industrial river. Although aniline does not bioconcentrate in fish, it is taken up and metabolized in fish.

Atmospheric Fate: If released into the atmosphere, aniline will degrade primarily by reaction with photochemically produced hydroxyl radicals (estimated half-life 3.3 hr).

Ecotoxicity:

Fish LC50 (96 h): 134 mg/L

Toxicity invertebrate: cell mult. inhib. 24-130mg/L

Bioaccumulation: not sig

Nitrif. inhib: 75% inhib at 2.5-7.7mg/L

Effects on algae and plankton: decr. in BOD,tox-0.4-10mg/L,LD50-20ppm.

### Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
diphenylamine	LOW	LOW	LOW	MED
2-aminodiphenyl	HIGH		LOW	MED
4-aminodiphenyl	LOW	LOW	LOW	MED
aniline	HIGH		LOW	HIGH

## Section 13 - DISPOSAL CONSIDERATIONS

### US EPA Waste Number & Descriptions

B. Component Waste Numbers

When aniline is present as a solid waste as a discarded commercial chemical product, off-specification species, as a container residue, or a spill residue, use EPA waste number U012 (waste code I,T).

### Disposal Instructions

All waste must be handled in accordance with local, state and federal regulations.

! Puncture containers to prevent re-use and bury at an authorized landfill.

Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.

A Hierarchy of Controls seems to be common - the user should investigate:

- Reduction
- Reuse
- Recycling
- Disposal (if all else fails)

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.

DO NOT allow wash water from cleaning equipment to enter drains. Collect all wash water for treatment before disposal.

- Recycle wherever possible.
- Consult manufacturer for recycling options or consult Waste Management Authority for disposal if no suitable treatment or disposal facility can be identified.
- Dispose of by: Burial in a licensed land-fill or Incineration in a licensed apparatus (after admixture with suitable combustible material)
- Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.

## Section 14 - TRANSPORTATION INFORMATION



DOT:

Symbols:	None	Hazard class or Division:	6.1
Identification Numbers:	UN2811	PG:	III
Label Codes:	6.1	Special provisions:	IB8, IP3, T1, TP33
Packaging: Exceptions:	153	Packaging: Non-bulk:	213
Packaging: Exceptions:	153	Quantity limitations: Passenger aircraft/rail:	100 kg
Quantity Limitations: Cargo aircraft only:	200 kg	Vessel stowage: Location:	A
Vessel stowage: Other:	None		

Hazardous materials descriptions and proper shipping names:  
Toxic solids, organic, n.o.s.

### Air Transport IATA:

ICAO/IATA Class:	6.1	ICAO/IATA Subrisk:	None
UN/ID Number:	2811	Packing Group:	III
Special provisions:	A3		

Shipping Name: TOXIC SOLID, ORGANIC, N.O.S. \*(CONTAINS DIPHENYLAMINE)

### Maritime Transport IMDG:

IMDG Class:	6.1	IMDG Subrisk:	None
UN Number:	2811	Packing Group:	III
EMS Number:	F-A,S-A	Special provisions:	223 274 944

Limited Quantities: 5 kg

Shipping Name: TOXIC SOLID, ORGANIC, N.O.S.(contains diphenylamine)

## Section 15 - REGULATORY INFORMATION

### **diphenylamine (CAS: 122-39-4) is found on the following regulatory lists;**

"Canada - Alberta Occupational Exposure Limits","Canada - British Columbia Occupational Exposure Limits","Canada - Northwest Territories Occupational Exposure Limits (English)","Canada - Nova Scotia Occupational Exposure Limits","Canada - Ontario Occupational Exposure Limits","Canada - Prince Edward Island Occupational Exposure Limits","Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)","Canada - Saskatchewan Industrial Hazardous Substances","Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits","Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances","Canada Domestic Substances List (DSL)","Canada Ingredient Disclosure List (SOR/88-64)","Canada National Pollutant Release Inventory (NPRI)","Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)","Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (French)","GESAMP/EHS Composite List - GESAMP Hazard Profiles","IMO IBC Code Chapter 17: Summary of minimum requirements","OECD Representative List of High Production Volume (HPV) Chemicals","US - Alaska Limits for Air Contaminants","US - California Occupational Safety and Health Regulations (CAL/OSHA) - Hazardous Substances List","US - California Permissible Exposure Limits for Chemical Contaminants","US - Connecticut Hazardous Air Pollutants","US - Hawaii Air Contaminant Limits","US - Massachusetts Oil & Hazardous Material List","US - Michigan Exposure Limits for Air Contaminants","US - Minnesota Hazardous Substance List","US - Minnesota Permissible Exposure Limits (PELs)","US - New Jersey Right to Know Hazardous Substances","US - Oregon Permissible Exposure Limits (Z1)","US - Pennsylvania - Hazardous Substance List","US - Rhode Island Hazardous Substance List","US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants","US - Vermont Hazardous Constituents","US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants","US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants","US - Washington Dangerous waste constituents list","US - Washington Permissible exposure limits of air contaminants","US ACGIH Threshold Limit Values (TLV)","US ACGIH Threshold Limit Values (TLV) - Carcinogens","US DOE Temporary Emergency Exposure Limits (TEELs)","US EPA High Production Volume Program Chemical List","US EPA Master Testing List - Index I Chemicals Listed","US EPCRA Section 313 Chemical List","US FDA Indirect Food Additives: Adhesives and Components of Coatings - Substances for Use Only as Components of Adhesives - Adhesives","US List of Lists - Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-to-Know Act (EPCRA) and Section 112(r) of the Clean Air Act","US NIOSH Recommended Exposure Limits (RELs)","US RCRA (Resource Conservation & Recovery Act) - Appendix IX to Part 264 Ground-Water Monitoring List 1","US RCRA (Resource Conservation & Recovery Act) - Hazardous Constituents - Appendix VIII to 40 CFR 261","US RCRA (Resource Conservation & Recovery Act) - List of Hazardous Inorganic and Organic Constituents 1","US RCRA (Resource Conservation & Recovery Act) - Phase 4 LDR Rule - Universal Treatment Standards","US Toxic Substances Control Act (TSCA) - Inventory","US TSCA Section 12(b) - List of Chemical Substances Subject to Export Notification Requirements","US TSCA Section 4/12 (b) - Sunset Date/Status","US TSCA Section 8 (a) - Preliminary Assessment Information Rules (PAIR) - Reporting List","US TSCA Section 8 (d) - Health and Safety Data Reporting"

Regulations for ingredients

### **2-aminodiphenyl (CAS: 90-41-5) is found on the following regulatory lists;**

"Canada Non-Domestic Substances List (NDSL)","US - Pennsylvania - Hazardous Substance List","US Toxic Substances Control Act (TSCA) - Inventory"

### **4-aminodiphenyl (CAS: 92-67-1) is found on the following regulatory lists;**

"Canada - British Columbia Occupational Exposure Limits","Canada - Nova Scotia Occupational Exposure Limits","Canada - Ontario Occupational Exposure Limits","Canada - Prince Edward Island Occupational Exposure Limits","Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)","Canada - Saskatchewan Environmental Persistent or Chronic Hazardous Substances","Canada - Saskatchewan Occupational Health and Safety Regulations - Notifiable Chemical Substances","Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances","Canada ARET (Accelerated Reduction / Elimination of Toxics) Substance List","Canada Ingredient Disclosure List (SOR/88-64)","Canada Non-Domestic Substances List (NDSL)","International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs","International Chemical Secretariat (ChemSec) REACH SIN\* List (\*Substitute It Now!) 1.0","US - Alaska Limits for Air Contaminants","US - California Air Toxics ""Hot Spots"" List (Assembly Bill 2588) Substances for which emissions must be quantified","US - California Occupational Safety and Health Regulations (CAL/OSHA) - Hazardous Substances List","US - California Permissible Exposure Limits for Chemical Contaminants","US - California Proposition 65 - Carcinogens","US - California Proposition 65 - No Significant Risk Levels (NSRLs) for Carcinogens","US - California Toxic Air Contaminant List Category V","US - Connecticut Hazardous Air Pollutants","US - Hawaii Air Contaminant Limits","US - Idaho - Limits for Air Contaminants","US - Maine Chemicals of High Concern List","US - Michigan Exposure Limits for Air Contaminants","US - Minnesota Hazardous Substance List","US - Minnesota Permissible Exposure Limits (PELs)","US - New Jersey Right to Know Hazardous Substances","US - Oregon Permissible Exposure Limits (Z1)","US - Pennsylvania - Hazardous Substance List","US - Rhode Island Hazardous Substance List","US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants","US - Vermont Hazardous Constituents","US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants","US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants","US - Washington Class A toxic air pollutants: Known and Probable Carcinogens","US - Washington Dangerous waste constituents list","US - Washington General Occupational Health Standards - List of Carcinogens","US - Washington Permissible exposure limits of air contaminants","US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants","US ACGIH Threshold Limit Values (TLV)","US ACGIH Threshold Limit Values (TLV) - Carcinogens","US CERCLA Priority List of Hazardous Substances","US Clean Air Act - Hazardous Air Pollutants","US Department of Transportation (DOT) List of Hazardous Substances and Reportable Quantities - Hazardous Substances Other Than Radionuclides","US DOE Temporary Emergency Exposure Limits (TEELs)","US EPCRA Section 313 Chemical List","US List of Lists - Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-to-Know Act (EPCRA) and Section 112(r) of the Clean Air Act","US National Toxicology Program (NTP) 11th Report Part A Known to be Human Carcinogens","US NIOSH Recommended Exposure Limits (RELs)","US OSHA Carcinogens Listing","US OSHA Permissible Exposure Levels (PELs) - Table Z1","US RCRA (Resource Conservation & Recovery Act) - Appendix IX to Part 264 Ground-Water Monitoring List 1","US RCRA (Resource Conservation & Recovery Act) - Hazardous Constituents - Appendix VIII to 40 CFR 261","US RCRA (Resource Conservation & Recovery Act) - List of Hazardous Inorganic and Organic Constituents 1","US RCRA (Resource Conservation & Recovery Act) - Phase 4 LDR Rule - Universal Treatment Standards","US Toxic Substances Control Act (TSCA) - Inventory"

### **aniline (CAS: 62-53-3) is found on the following regulatory lists;**

"Canada - Alberta Occupational Exposure Limits","Canada - British Columbia Occupational Exposure Limits","Canada - Nova Scotia Occupational Exposure Limits","Canada - Prince Edward Island Occupational Exposure Limits","Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)","Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits","Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances","Canada ARET (Accelerated Reduction / Elimination of Toxics) Substance List","Canada Domestic Substances List (DSL)","Canada Environmental Quality Guidelines (EQGs) Water: Aquatic life","Canada Ingredient Disclosure List (SOR/88-64)","Canada National Pollutant Release Inventory (NPRI)","Canada Priority Substances List (PSL1, PSL 2)","Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)","Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (French)","GESAMP/EHS Composite List - GESAMP Hazard Profiles","IMO IBC Code Chapter 17: Summary of minimum requirements","IMO MARPOL 73/78 (Annex II) - List of Noxious Liquid Substances Carried in Bulk","International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs","International Chemical Secretariat (ChemSec) REACH SIN\* List (\*Substitute It Now!) 1.0","OECD Representative List of High Production Volume (HPV) Chemicals","US - California Occupational Safety and Health Regulations (CAL/OSHA) - Hazardous Substances List","US - California Permissible Exposure Limits for Chemical Contaminants","US - California Proposition 65 - Carcinogens","US - California Proposition 65 - No Significant Risk Levels (NSRLs) for



Carcinogens", "US - California Toxic Air Contaminant List Category II", "US - Connecticut Hazardous Air Pollutants", "US - Hawaii Air Contaminant Limits", "US - Idaho - Limits for Air Contaminants", "US - Maine Chemicals of High Concern List", "US - Massachusetts Oil & Hazardous Material List", "US - Minnesota Hazardous Substance List", "US - Minnesota Permissible Exposure Limits (PELs)", "US - New Jersey Right to Know Hazardous Substances", "US - Pennsylvania - Hazardous Substance List", "US - Rhode Island Hazardous Substance List", "US - Vermont Hazardous Constituents", "US - Vermont Hazardous wastes which are Discarded Commercial Chemical Products or Off-Specification Batches of Commercial Chemical Products or Spill Residues of Either", "US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants", "US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants", "US - Washington Class A toxic air pollutants: Known and Probable Carcinogens", "US - Washington Dangerous waste constituents list", "US - Washington Discarded Chemical Products List - ""U"" Chemical Products", "US - Washington Permissible exposure limits of air contaminants", "US ACGIH Threshold Limit Values (TLV)", "US ACGIH Threshold Limit Values (TLV) - Carcinogens", "US CAA (Clean Air Act) - HON Rule - Organic HAPs (Hazardous Air Pollutants)", "US Clean Air Act - Hazardous Air Pollutants", "US CWA (Clean Water Act) - List of Hazardous Substances", "US CWA (Clean Water Act) - Reportable Quantities of Designated Hazardous Substances", "US Department of Transportation (DOT) List of Hazardous Substances and Reportable Quantities - Hazardous Substances Other Than Radionuclides", "US DOE Temporary Emergency Exposure Limits (TEELs)", "US EPA Acute Exposure Guideline Levels (AEGs) - Final", "US EPA Carcinogens Listing", "US EPA High Production Volume Program Chemical List", "US EPA Master Testing List - Index I Chemicals Listed", "US EPA National Priorities List - Superfund Chemical Data Matrix (SCDM) - Hazard Ranking System - Hazardous Substance Benchmarks", "US EPCRA Section 313 Chemical List", "US List of Lists - Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-to-Know Act (EPCRA) and Section 112(r) of the Clean Air Act", "US Postal Service (USPS) Hazardous Materials Table: Postal Service Mailability Guide", "US RCRA (Resource Conservation & Recovery Act) - Appendix IX to Part 264 Ground-Water Monitoring List 1", "US RCRA (Resource Conservation & Recovery Act) - Hazardous Constituents - Appendix VIII to 40 CFR 261", "US RCRA (Resource Conservation & Recovery Act) - List of Hazardous Wastes", "US RCRA (Resource Conservation & Recovery Act) - Phase 4 LDR Rule - Universal Treatment Standards", "US SARA Section 302 Extremely Hazardous Substances", "US Toxic Substances Control Act (TSCA) - Inventory", "US TSCA Section 4/12 (b) - Sunset Date/Status", "US TSCA Section 8 (d) - Health and Safety Data Reporting"

## Section 16 - OTHER INFORMATION

### LIMITED EVIDENCE

- Eye contact may produce serious damage\*.
- Possible skin sensitizer\*.

\* (limited evidence).

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- Classification of the mixture and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.

A list of reference resources used to assist the committee may be found at:  
[www.chemwatch.net/references](http://www.chemwatch.net/references).

- The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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