

Benzophenone-3,3',4,4'-tetracarboxylic dianhydride

sc-239309



The Power to Question

Material Safety Data Sheet

Hazard Alert Code
Key:

EXTREME

HIGH

MODERATE

LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

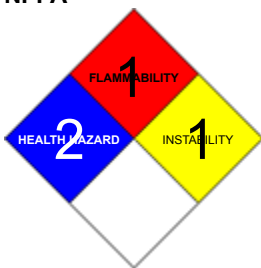
PRODUCT NAME

Benzophenone-3,3',4,4'-tetracarboxylic dianhydride

STATEMENT OF HAZARDOUS NATURE

CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

NFPA



SUPPLIER

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2145 Delaware Avenue
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EMERGENCY

ChemWatch
Within the US & Canada: 877-715-9305
Outside the US & Canada: +800 2436 2255
(1-800-CHEMCALL) or call +613 9573 3112

SYNONYMS

C17-H6-O7, "4, 4' -carbonyldiphthalic anhydride", BTDA

Section 2 - HAZARDS IDENTIFICATION

CHEMWATCH HAZARD RATINGS

		Min	Max
Flammability	1		
Toxicity	0		
Body Contact	3		Min/Nil=0 Low=1 Moderate=2 High=3 Extreme=4
Reactivity	1		
Chronic	2		



CANADIAN WHMIS SYMBOLS



EMERGENCY OVERVIEW

RISK

May cause SENSITISATION by inhalation and skin contact.
Irritating to eyes, respiratory system and skin.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

- The material has NOT been classified as "harmful by ingestion".
This is because of the lack of corroborating animal or human evidence.

EYE

- This material can cause eye irritation and damage in some persons.
- If applied to the eyes, this material causes severe eye damage.

SKIN

- This material can cause inflammation of the skin on contact in some persons.
- The material is not thought to produce adverse health effects or skin irritation following contact (as classified using animal models).

Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable gloves be used in an occupational setting.

- 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.

INHALED

- The material can cause respiratory irritation in some persons.
The body's response to such irritation can cause further lung damage.
- 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.

CHRONIC HEALTH EFFECTS

- Skin contact with the material is more likely to cause a sensitization reaction in some persons compared to the general population.
- Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.

Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.

Exposure to the material may cause concerns for human fertility, on the basis that similar materials provide some evidence of impaired fertility in the absence of toxic effects, or evidence of impaired fertility occurring at around the same dose levels as other toxic effects, but which are not a secondary non-specific consequence of other toxic effects.

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.

Respiratory sensitization may result in allergic/asthma like responses; from coughing and minor breathing difficulties to bronchitis with wheezing, gasping.

There is some evidence that inhaling this product is more likely to cause a sensitization reaction in some persons compared to the general population.

Benzophenones are used in medicines, UV stabilisers, aroma retention agents. The family is listed among the "the chemicals suspected of having endocrine disrupting effects" Benzophenone, itself does not exhibit estrogenic activity; in contrast the benzophenones often exhibit estrogenic or anti-androgenic activity in various assays.

Hydroxylation at the 3 or 4-position produces substantial estrogenic activity while substitution elsewhere produces negative or weakly positive activity. Hydroxylation at the 2-position may enhance anti-androgenic activity.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
Benzophenone-3,3',4,4'-tetracarboxylic dianhydride	2421-28-5	>98

Section 4 - FIRST AID MEASURES

SWALLOWED

-
- Immediately give a glass of water.
- First aid is not generally required. If in doubt, contact a Poisons Information Center or a doctor.

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.

SKIN

- If skin or hair contact occurs
- Flush skin and hair with running water (and soap if available).
- Seek medical attention in event of irritation.

INHALED

-
- If fumes or combustion products are inhaled remove from contaminated area.
- Lay patient down. Keep warm and rested.

NOTES TO PHYSICIAN

- Treat symptomatically.

Section 5 - FIRE FIGHTING MEASURES

Vapour Pressure (mmHG)	Negligible
Upper Explosive Limit (%)	16.0
Specific Gravity (water=1)	1.57
Lower Explosive Limit (%)	4.2

EXTINGUISHING MEDIA

- Foam.
- Dry chemical powder.

FIRE FIGHTING

- Alert Emergency Responders and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves.

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.

Combustion products include carbon monoxide (CO), carbon dioxide (CO₂), other pyrolysis products typical of burning organic material.

May emit poisonous fumes.

May emit corrosive fumes.

FIRE INCOMPATIBILITY

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

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Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

- Clean up all spills immediately.
- Avoid breathing dust and contact with skin and eyes.

MAJOR SPILLS

Moderate hazard.

- CAUTION Advise personnel in area.
- Alert Emergency Responders and tell them location and nature of hazard.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.

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

- Polyethylene or polypropylene container.
- Check all containers are clearly labelled and free from leaks.

STORAGE REQUIREMENTS

- Store in original containers.
- Keep containers securely sealed.

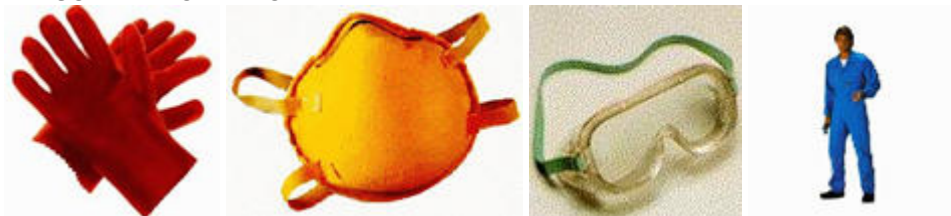
Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m³	STEL ppm	STEL mg/m³	Peak ppm	Peak mg/m³	TWA F/CC	Notes
Canada - Ontario Occupational Exposure Limits	3,3',4,4'- benzophenonetetracarboxylic dianhydride (Particles (Insoluble or Poorly Soluble) Not Otherwise)		10 (I)						
Canada - British Columbia Occupational Exposure Limits	3,3',4,4'- benzophenonetetracarboxylic dianhydride (Particles (Insoluble or Poorly Soluble) Not Otherwise Classified (PNOC))		10 (N)						
Canada - Ontario Occupational Exposure Limits	3,3',4,4'- benzophenonetetracarboxylic dianhydride (Specified (PNOS) / Particules (insolubles ou peu solubles) non précisées par ailleurs)		3 (R)						
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	3,3',4,4'- benzophenonetetracarboxylic dianhydride (Particulates not otherwise regulated Respirable fraction)		5						
US - California Permissible Exposure Limits for Chemical Contaminants	3,3',4,4'- benzophenonetetracarboxylic dianhydride (Particulates not otherwise regulated Respirable fraction)		5						(n)
US - Oregon Permissible Exposure Limits (Z-1)	3,3',4,4'- benzophenonetetracarboxylic dianhydride (Particulates not otherwise regulated (PNOR) (f) Total Dust)	-	10						Bold print identifies substances for which the Oregon Permissible Exposure Limits (PELs) are different than the federal Limits. PNOR means “particles not otherwise regulated.”
US - Michigan Exposure Limits for Air Contaminants	3,3',4,4'- benzophenonetetracarboxylic dianhydride (Particulates not otherwise regulated, Respirable dust)		5						

US - Oregon Permissible Exposure Limits (Z-1)	3,3',4,4'- benzophenonetetracarboxylic dianhydride (Particulates not otherwise regulated (PNOR) (f) Respirable Fraction)	-	5	Bold print identifies substances for which the Oregon Permissible Exposure Limits (PELs) are different than the federal Limits. PNOR means “particles not otherwise regulated.”
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	3,3',4,4'- benzophenonetetracarboxylic dianhydride (Particulates not otherwise regulated (PNOR)(f)- Respirable fraction)		5	
Canada - Prince Edward Island Occupational Exposure Limits	3,3',4,4'- benzophenonetetracarboxylic dianhydride (Particles (Insoluble or Poorly Soluble) [NOS] Inhalable particles)		10	See Appendix B current TLV/BEI Book

PERSONAL PROTECTION



RESPIRATOR

•Particulate. (AS/NZS 1716 & 1715, EN 1432000 & 1492001, ANSI Z88 or national equivalent)

EYE

- Safety glasses with side shields.
- Chemical goggles.

HANDS/FEET

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

- 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, AS/NZS 2161.1 or national equivalent).

- 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, AS/NZS 2161.10.1 or national equivalent) 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, AS/NZS 2161.10.1 or national equivalent) 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.

Experience indicates that the following polymers are suitable as glove materials for protection against undissolved, dry solids, where abrasive particles are not present.

- polychloroprene
- nitrile rubber
- butyl rubber
- fluorocautchouc
- polyvinyl chloride

Gloves should be examined for wear and/ or degradation constantly.

OTHER

- Overalls.
- P.V.C. apron.
- Barrier cream.
- Skin cleansing cream.
- Eye wash unit.

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.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Solid.

State	Divided solid	Molecular Weight	322.23
Melting Range (°F)	435- 439	Viscosity	Not Applicable
Boiling Range (°F)	Not available	Solubility in water (g/L)	Reacts
Flash Point (°F)	Not available	pH (1% solution)	Not applicable
Decomposition Temp (°F)	Not available.	pH (as supplied)	Not applicable
Autoignition Temp (°F)	975	Vapour Pressure (mmHG)	Negligible
Upper Explosive Limit (%)	16.0	Specific Gravity (water=1)	1.57
Lower Explosive Limit (%)	4.2	Relative Vapor Density (air=1)	1.4
Volatile Component (%vol)	Negligible	Evaporation Rate	Not applicable

APPEARANCE

Powder; decomposed by water.

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

- Presence of incompatible materials.
- Product is considered stable.

STORAGE INCOMPATIBILITY

‡ Segregate from alcohol, water.

Avoid reaction with oxidizing agents.

- NOTE May develop pressure in containers; open carefully. Vent periodically.

Avoid strong bases, strong bases.

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

Section 11 - TOXICOLOGICAL INFORMATION

3,3',4,4'-benzophenonetetracarboxylic dianhydride

TOXICITY AND IRRITATION

3,3',4,4'-BENZOPHENONETETRACARBOXYLIC DIANHYDRIDE

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

■ 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.

for cyclic anhydrides

Low molecular weight carboxylic acid anhydrides are recognized to have similar toxicological properties. Of the more extensively studied anhydrides, phthalic anhydride is most structurally similar to the cyclic anhydrides. Toxicological analogy will be made to phthalic anhydride.

Acute toxicity Available data indicates that the cyclic anhydrides have a low acute toxicity, are respiratory and skin sensitizers and can cause corrosive eye damage. Since these compounds are considered to be sensitizers at low concentrations, exposures in the workplace are controlled to lowest possible levels.

Oral LD50s for cyclic anhydrides in rats are relatively high, ranging from 958 to 4460 mg/kg. Dermal toxicity is also relatively low as indicated by dermal LD50s of > 2000 mg/kg in rabbits for hexahydrophthalic anhydride (HHPA), methyltetrahydrophthalic anhydride (MTHPA), and Nadic methyl anhydride (NMA). These values suggest a low order of acute oral and dermal toxicity.

The four-hour inhalation LC50 for HHPA in rats is cited as > 1100 mg/m³ (aerosol). In a limited inhalation study on NMA, a concentration of 750 mg/m³ for 4 hours was lethal to 8 of 10 rats.

As demonstrated by animal testing and human experience, anhydrides within the group can cause mild to moderate skin irritation and moderate to severe eye irritation with possible corrosive effects. For European labeling purposes (Directive 67/548/EEC, Annex I) risk (R) phrases for HHPA, methylhexahydrophthalic anhydride (MHHPA), MTHPA, and tetrahydrophthalic anhydride (THPA) are "Risk of serious damage to the eyes. May cause sensitization by inhalation and skin contact". Studies in rabbits indicate that NMA also causes severe eye irritation with the possibility of permanent damage. HHPA, MTHPA, THPA, and NMA all have caused mild skin irritation in rabbits. In one test, NMA was found to be moderately irritating and no studies were found indicating potential irritant effects MHHPA may have on the skin.

Repeated dose toxicity MTHPA, has been tested by oral gavage using OECD Method No. 422. Rats were dosed subchronically at 0, 30, 100 and 300 mg/kg/day. On terminal sacrifice, both male and female rats dosed at 300 mg/kg exhibited evidence of irritation at the site of administration, the forestomach.

Less severe indications of irritation were evident in male rats at 100 mg/kg. No irritation was evident in males dosed at 30 mg/kg/day or females dosed at 30 mg/kg/day or 100 mg/kg/day. Aside from transient salivation in the animals dosed at 300 mg/kg/day, no adverse effects on body weight, food consumption, or other clinical signs were apparent. At termination, blood chemistry determinations indicated decreased total cholesterol and BUN as well as increased triglyceride level and adrenal weight in males. Aside from irritation at the site of administration, no specific target organ for MTHPA was elucidated. The NOELs were reported to be 30 mg/kg/day for males and 100 mg/kg/day for females.

Sensitisation Specific serum IgE and IgG antibodies to a fairly large number of anhydrides have been found in exposed workers. Documentation for sensitization was available for all anhydrides within the group with the exception of NMA. Based on analogy to other acid anhydrides and verbal industrial reports, NMA is expected to produce sensitization.

Allergic response to cyclic anhydrides is triggered by the ability of cyclic anhydrides to bind covalently to free amino groups; in particular, to the amino group of lysine. An immunologic hapten-protein conjugate is formed

which stimulates specific immunological responses. PA and cyclic anhydrides have been associated with occupational asthma.

Similarity in mechanism for allergic response to cyclic anhydrides within this group is also demonstrated by cross-sensitisation potential. Workers sensitised to MTHPA, HHPA or HHPA/MHHPA have shown marked cross-reactivity to MTHPA-human serum albumin (HAS), HHPA-HAS, and MHHPA-HAS as demonstrated by radioallergosorbent test (RAST), RAST inhibition and skin prick tests. Ring structure, methyl group substituents and position of double bonds may all affect sensitising potential of cyclic anhydrides; however differences are quantitative rather than qualitative.

Reproductive/Developmental Toxicity A combined screening study (OECD Method No. 422) was conducted to assess repeated dose toxicity, reproductive performance and developmental toxicity potential on MTHPA. Results from this study indicates that at doses less than or equal to 300 mg/kg/day, MTHPA had no adverse effects on reproductive performance in either male or female rats and no indications of developmental toxicity were evident. Limited studies on other carboxylic acid anhydrides (i.e. phthalic anhydride) raise the question of possible reproductive toxicity concerns.

No significant acute toxicological data identified in literature search.

Section 12 - ECOLOGICAL INFORMATION

No data

Section 13 - DISPOSAL CONSIDERATIONS

Disposal Instructions

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

† 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.

Section 14 - TRANSPORTATION INFORMATION

NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS: DOT, IATA, IMDG

Section 15 - REGULATORY INFORMATION

3,3',4,4'-benzophenonetetracarboxylic dianhydride (CAS: 2421-28-5) is found on the following regulatory lists;

"Canada Domestic Substances List (DSL)", "US DOE Temporary Emergency Exposure Limits (TEELs)", "US EPA High Production Volume Chemicals 1994 List of Additions", "US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory"

Section 16 - OTHER INFORMATION

LIMITED EVIDENCE

- Cumulative effects may result following exposure*.
- Eye contact may produce serious damage*.
- May possibly affect fertility*.

* (limited evidence).

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■ Classification of the preparation 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.

■ 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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