



CAMEO Chemicals




Chemical Datasheet

NITRIC ACID, OTHER THAN RED FUMING



Chemical Identifiers

CAS Number7697-37-2 **UN/NA Number**

2031

DOT Hazard LabelCorrosive
Oxidizer**USCG CHRIS Code**

none





NIOSH Pocket Guide

Nitric acid

International Chem Safety Card

NITRIC ACID

NFPA 704

Diamond	Hazard	Value	Description
0 4 0 OX	 Health	4	Can be lethal.
	 Flammability	0	Will not burn under typical fire conditions.
	 Instability	0	Normally stable, even under fire conditions.
	 Special	OX	Possesses oxidizing properties.

(NFPA, 2010)

General Description

A pale yellow to reddish brown liquid with reddish brown vapors and a suffocating odor. Very toxic by inhalation. Corrosive to metals or tissue. Accelerates the burning of combustible material and may cause ignition of combustible materials upon contact. Prolonged exposure to low concentrations or short term exposure to high concentrations may result in adverse health effects. Density 12 lb / gal.

Hazards

Reactivity Alerts

Strong Oxidizing Agent
Known Catalytic Activity
Water-Reactive

Air & Water Reactions

Fumes in air. Fully soluble in water with the release of heat. Reacts violently with water with the production of heat, fumes, and spattering.

Fire Hazard

Excerpt from ERG Guide 157 [Substances - Toxic and/or Corrosive (Non-Combustible / Water-Sensitive)]:

Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes. UN1802, UN2032, UN3084, UN3093, UN1796 (above 50%), UN1826 (above 50%), and UN2031 (above 65%) may act as oxidizers. Also consult ERG Guide 140. Vapors may accumulate in confined areas (basement, tanks, hopper/tank cars, etc.). Substance may react with water (some violently), releasing corrosive and/or toxic gases and runoff. Corrosives in contact with metals may evolve flammable hydrogen gas. Containers may explode when heated or if contaminated with water. (ERG, 2024)

Health Hazard

Excerpt from ERG Guide 157 [Substances - Toxic and/or Corrosive (Non-Combustible / Water-Sensitive)]:

TOXIC and/or CORROSIVE; inhalation, ingestion or contact (skin, eyes) with vapors, dusts or substance may cause severe injury, burns or death. Reaction with water or moist air may release toxic, corrosive or flammable gases. Reaction with water may generate much heat that will increase the concentration of fumes in the air. Fire will produce irritating, corrosive and/or toxic gases. Runoff from fire control or dilution water may be corrosive and/or toxic and cause environmental contamination. (ERG, 2024)

Reactivity Profile

NITRIC ACID ignites upon contact with alcohols, amines, ammonia, beryllium alkyls, boranes, dicyanogen, hydrazines, hydrocarbons, hydrogen, nitroalkanes, powdered metals, silanes, or thiols [Bretherick 1979. p.174]. The reaction of finely divided antimony and nitric acid can be violent [Pascal 10:504. 1931-34]. Bromine pentafluoride reacts violently with strong nitric acid and strong sulfuric acid [Mellor 2, Supp. 1:172. 1956]. Fuming nitric acid reacts with hydrogen selenide with incandescence [Berichte 3:658]. Fuming nitric acid reacts with hydrogen sulfide with incandescence [Berichte 3:658]. A mixture of finely divided magnesium and nitric acid is explosive [Pieters 1957. p. 28]. Nitric acid oxidizes magnesium phosphide with incandescence [Mellor 8:842. 1946-47]. Experiments show that mixtures of over 50% nitric acid by weight in acetic anhydride may act as detonating explosives [BCISC 42:2. 1971]. An etching agent of equal portions of acetone, nitric acid, and 75% acetic acid exploded four hours after it was prepared and placed in a closed bottle. This is similar to a formulation for the preparation of tetranitromethane a sensitive explosive [Chem. Eng. News 38: 56. 1960]. Phosphine is violently decomposed by concentrated nitric acid, and flame is produced. Warm fuming nitric acid, dropped in a container of phosphine gas produces an explosion [Edin. Roy. Soc. 13:88. 1835]. An explosion occurs when nitric acid is brought into contact with phosphorus trichloride [Comp. Rend. 28:86]. The exothermic nitration of phthalic acid or phthalic anhydride by fuming nitric acid-sulfuric acid may give mixtures of the potentially explosive phthaloyl nitrates or nitrites or their nitro derivatives [Chem. & Ind. 20:790. 1972]. The reaction of sodium azide and strong nitric acid is energetic [Mellor 8, Supp 2:315. 1967]. Nitric acid can react with uranium with explosive violence [Katz and Rabinowitch 1951]. Reacts violently with water with the production of heat, fumes, and spattering.

Belongs to the Following Reactive Group(s)

- Acids, Strong Oxidizing

Potentially Incompatible Absorbents

Use caution: Liquids with this reactive group classification have been known to react with the absorbents listed below.

- Cellulose-Based Absorbents
- Expanded Polymeric Absorbents

Response Recommendations

Isolation and Evacuation

Excerpt from ERG Guide 157 [Substances - Toxic and/or Corrosive (Non-Combustible / Water-Sensitive)]:

IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.

SPILL: Increase the immediate precautionary measure distance, in the downwind direction, as necessary.

FIRE: If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

Firefighting

Excerpt from ERG Guide 157 [Substances - Toxic and/or Corrosive (Non-Combustible / Water-Sensitive)]:

Note: Some foams will react with the material and release corrosive/toxic gases.

SMALL FIRE: CO₂ (except for Cyanides), dry chemical, dry sand, alcohol-resistant foam.

LARGE FIRE: Water spray, fog or alcohol-resistant foam. If it can be done safely, move undamaged containers away from the area around the fire. Avoid aiming straight or solid streams directly onto the product. Dike runoff from fire control for later disposal.

FIRE INVOLVING TANKS, RAIL TANK CARS OR HIGHWAY TANKS: Fight fire from maximum distance or use unmanned master stream devices or monitor nozzles. Do not get water inside containers. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks in direct contact with flames. (ERG, 2024)

Non-Fire Response

Excerpt from ERG Guide 157 [Substances - Toxic and/or Corrosive (Non-Combustible / Water-Sensitive)]:

ELIMINATE all ignition sources (no smoking, flares, sparks or flames) from immediate area. All equipment used when handling the product must be grounded. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Stop leak if you can do it without risk. A vapor-suppressing foam may be used to reduce vapors. **DO NOT GET WATER INSIDE CONTAINERS.** Use water spray to reduce vapors or divert vapor cloud drift. Avoid allowing water runoff to contact spilled material. Prevent entry into waterways, sewers, basements or confined areas.

SMALL SPILL: Cover with DRY earth, DRY sand or other non-combustible material followed with plastic sheet to minimize spreading or contact with rain. Use clean, non-sparking tools to collect material and place it into loosely covered plastic containers for later disposal. (ERG, 2024)

Protective Clothing

Excerpt from NIOSH Pocket Guide for Nitric acid:

Skin: PREVENT SKIN CONTACT - Wear appropriate personal protective clothing to prevent skin contact.

Eyes: PREVENT EYE CONTACT - Wear appropriate eye protection to prevent eye contact.

Wash skin: WHEN CONTAMINATED - The worker should immediately wash the skin when it becomes contaminated.

Remove: WHEN WET OR CONTAMINATED - Work clothing that becomes wet or significantly contaminated should be removed and replaced.

Change: No recommendation is made specifying the need for the worker to change clothing after the workshift.

Provide:

- EYEWASH (PH<2.5) - Eyewash fountains should be provided in areas where there is any possibility that workers could be exposed to the substances; this is irrespective of the recommendation involving the wearing of eye protection. (pH<2.5)
- QUICK DRENCH (PH<2.5) - Facilities for quickly drenching the body should be provided within the immediate work area for emergency use where there is a possibility of exposure. [Note: It is intended that these facilities provide a sufficient quantity or flow of water to quickly remove the substance from any body areas likely to be exposed. The actual determination of what constitutes an adequate quick drench facility depends on the specific circumstances. In certain instances, a deluge shower should be readily available, whereas in others, the availability of water from a sink or hose could be considered adequate.] (pH<2.5) (NIOSH, 2024)

DuPont Tychem® Suit Fabrics

Normalized Breakthrough Times (in Minutes)

Chemical	CAS Number	State	QS	QC	SL	C3	TF	TP	RC	TK	RF
Nitric acid (50%)	7697-37-2	Liquid						>480			
Nitric acid (70%)	7697-37-2	Liquid	203	>480	>480		>480	105*/140	>480	>480	>480
Nitric acid (90%)	7697-37-2	Liquid				>480			>480	>480	>480
Nitric acid (>95%)	7697-37-2	Liquid					46			390	

> indicates greater than.
* indicates based on lowest single value.

Special Warning from DuPont: Tychem® and Tyvek® fabrics should not be used around heat, flames, sparks or in potentially flammable or explosive environments. Only...
(DuPont, 2024)

First Aid

Excerpt from NIOSH Pocket Guide for Nitric acid:

Eye: IRRIGATE IMMEDIATELY - If this chemical contacts the eyes, immediately wash (irrigate) the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately.

Skin: WATER FLUSH IMMEDIATELY - If this chemical contacts the skin, immediately flush the contaminated skin with water. If this chemical penetrates the clothing, immediately remove the clothing and flush the skin with water. Get medical attention promptly.

Breathing: RESPIRATORY SUPPORT - If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible.

Swallow: MEDICAL ATTENTION IMMEDIATELY - If this chemical has been swallowed, get medical attention immediately. (NIOSH, 2024)

Physical Properties

Chemical Formula: HNO3

Flash Point: data unavailable
Lower Explosive Limit (LEL): data unavailable
Upper Explosive Limit (UEL): data unavailable
Autoignition Temperature: data unavailable

Melting Point: -44°F (NIOSH, 2024)
Vapor Pressure: 48 mmHg (NIOSH, 2024)

Vapor Density (Relative to Air): data unavailable

Specific Gravity: 1.5 at 77°F (NIOSH, 2024) - Denser than water; will sink

Boiling Point: 181°F at 760 mmHg (NIOSH, 2024)

Molecular Weight: 63 (NIOSH, 2024)

Water Solubility: Miscible (NIOSH, 2024)

Ionization Energy/Potential: 11.95 eV (NIOSH, 2024)

IDLH: 25 ppm (NIOSH, 2024)


AEGLs (Acute Exposure Guideline Levels)


Final AEGLs for Nitric Acid (7697-37-2)

Exposure Period	AEGL-1	AEGL-2	AEGL-3
10 minutes	0.16 ppm	43 ppm	170 ppm
30 minutes	0.16 ppm	30 ppm	120 ppm
60 minutes	0.16 ppm	24 ppm	92 ppm
4 hours	0.16 ppm	6 ppm	23 ppm
8 hours	0.16 ppm	3 ppm	11 ppm

(NAC/NRC, 2024)

ERPGs (Emergency Response Planning Guidelines)

Chemical	ERPG-1	ERPG-2	ERPG-3
Nitric Acid WFNA (7697-37-2)	1 ppm 	10 ppm	78 ppm

 indicates that odor should be detectable near ERPG-1.

(AIHA, 2022)

PACs (Protective Action Criteria)

Chemical	PAC-1	PAC-2	PAC-3
Nitric acid (7697-37-2)	0.16 ppm	24 ppm	92 ppm

(DOE, 2024)

Regulatory Information

EPA Consolidated List of Lists

Regulatory Name	CAS Number/ 313 Category Code	EPCRA 302 EHS TPQ	EPCRA 304 EHS RQ	CERCLA RQ	EPCRA 313 TRI	RCRA Code	CAA 112(r) RMP TQ
Nitric acid	7697-37-2	1000 pounds	1000 pounds	1000 pounds	313		
Nitric acid (conc 80% or greater)	7697-37-2	1000 pounds	1000 pounds	1000 pounds	X		15000 pounds

"X" indicates that this is a second name for an EPCRA section 313 chemical already included on this consolidated list. May also indicate that the same chemical with the same CAS number appears on another list with a different chemical name.

(EPA List of Lists, 2024)

CISA Chemical Facility Anti-Terrorism Standards (CFATS)

Chemical of Interest	CAS Number	RELEASE			THEFT			SABOTAGE		
		Min Conc	STQ	Security Issue	Min Conc	STQ	Security Issue	Min Conc	STQ	Security Issue
Nitric acid	7697-37-2	80.00 %	15000 pounds	toxic	68.00 %	400 pounds	EXP/IEDP			

EXP/IEDP = explosives/improvised explosive device precursors.

(CISA, 2007)

OSHA Process Safety Management (PSM) Standard List

Chemical Name	CAS Number	Threshold Quantity (TQ)
Nitric Acid (94.5% by weight or greater)	7697-37-2	500 pounds

(OSHA, 2019)

Alternate Chemical Names

- NITRIC ACID, OTHER THAN RED FUMING