Swimming Pools

U.S. DEPARTMENT OF LABOR
Occupational Safety & Health Administration
MATERIAL SAFETY DATA SHEET

SECTION I

MANUFACTURER'S NAME: E. I. du Pont de Nemours & Co. (Inc.)	EMERGENCY TELEPHONE NO.: (302) 774-7500
ADDRESS (Number, Street, City, State, and ZIP Code): Wilmington DE 19898	
CHEMICAL NAME AND SYNONYMS: Hydrochloric acid, muriatic acid	TRADE NAME AND SYNONYMS: Hydrochloric Acid Reagent
CHEMICAL FAMILY: Mineral Acid	FORMULA: HCl

SECTION II HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS	%	TLV (Units)	ALLOYS AND METALLIC COATINGS	%	TLV (Units)
PIGMENTS			BASE METAL		
CATALYST			ALLOYS		
VEHICLE			METALLIC COATINGS		
SOLVENTS			FILLER METAL PLUS COATING OR CORE FLUX		
ADDITIVES			OTHERS		
OTHERS					

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)
N. A. *		

SECTION III PHYSICAL DATA

BOILING POINT (°F.)	123	SPECIFIC GRAVITY (H_2O=1)	1.19
VAPOR PRESSURE (mm Hg.)	160	PERCENT VOLATILE BY VOLUME (%)	100
VAPOR DENSITY (AIR=1)	1.27	EVAPORATION RATE (butyl acetate = 1)	greater than 1
SOLUBILITY IN WATER	complete		

APPEARANCE AND ODOR: Clear, colorless to light yellow fuming liquid with a pungent odor

SECTION IV FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	FLAMMABLE LIMITS	Lel	Uel
N. A. (non-flammable)	N. A.		

EXTINGUISHING MEDIA: Water, dry chemical, carbon dioxide, foam

SPECIAL FIRE FIGHTING PROCEDURES: Neutralize with chemically basic substances such as soda ash or slaked lime. Wear full protective clothing. Cool tank with water if exposed to fire.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Contact with common metals produces hydrogen gas which may form explosive mixtures with air.

* not applicable

NOTICE FROM DU PONT

The data in this Material Safety Data Sheet relates only to the specific material designated herein and does not relate to use in combination with any other material or in any process.

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SECTION V HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE
5 ppm (maximum allowable concentration according to ACGIH)

EFFECTS OF OVEREXPOSURE
Causes burns. Inhalation of fumes results in coughing and choking sensation.

EMERGENCY AND FIRST AID PROCEDURES
Flush skin or eyes with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. For inhalation, leave contaminated area. If not breathing apply artificial respiration, oxygen. Call a physician.

SECTION VI REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	

INCOMPATABILITY *(Materials to avoid)*
Corrosive to most metals with evolution of hydrogen gas.

HAZARDOUS DECOMPOSITION PRODUCTS
Hydrogen chloride vapors, hydrogen

HAZARDOUS POLYMERIZATION	MAY OCCUR		CONDITIONS TO AVOID
	WILL NOT OCCUR	X	

SECTION VII SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Remove sources of ignition. Stay upwind of spill. If necessary to enter spill area, wear self contained breathing apparatus and full protective clothing including boots.

WASTE DISPOSAL METHOD
Flush thoroughly with water applied to entire spill. Washings should be neutralized with soda ash or lime before discharging to a sewer.

SECTION VIII SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)*
None for normal use

VENTILATION	LOCAL EXHAUST: Maintain adequate ventilation	SPECIAL: Maintain acid vapor in air at 10 ppm or less.
	MECHANICAL *(General)*: Unknown	OTHER

PROTECTIVE GLOVES
Long rubber or plastic coated gloves

EYE PROTECTION
Chemical safety goggles or face shield

OTHER PROTECTIVE EQUIPMENT
Rubber gauntlets, rubber apron, rubber boots, hard hat, long sleeve shirt

SECTION IX SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING
Protect against physical damage. Store in cool, open or well-ventilated places, separated from all oxidizing materials. Keep container closed.

OTHER PRECAUTIONS
Wash clothing before re-use. Keep containers out of sun and away from heat. Never use pressure to empty.

A-79892 For more information refer to: 6/72

Du Pont Hydrochloric Acid Bulletin A-76719
Manufacturing Chemists Association SD-39
National Fire Protection Association, Manuals 49, 491M
American Conference of Governmental Industrial Hygienists
Threshold Limit Values for 1971

Product Specification

HiPURE
CHEMICALS INC.

H-4100

HYDROCHLORIC ACID

Electronic Grade
Meets A.C.S. Specifications

Assay (HCl)	36.5 to 38.0%
Specific Gravity at 60°/60°F.	1.185–1.192
Maximum Limits of Impurities	
Appearance	PACST
Color (APHA)	10 Max.
Residue after Ignition	0.0003 %
Bromide (Br)	0.005 %
Sulfate (SO_4)	0.00005 %
Sulfite (SO_3)	0.00008 %
Extractable Organic Substances	0.0005 %
Free Chlorine (Cl)	0.00004 %
Ammonium (NH_4)	0.0003 %
Arsenic (As)	0.0000005%
Heavy Metals (as Pb)	0.00001 %
Iron (Fe)	0.00001 %
Copper (Cu)	0.000005 %
Nickel (Ni)	0.000005 %

Electronic Grade

Rev. 1/3/78

Plant location - R. D. 3 (Edelman) Nazareth, Pa. 18064 P. O. Box 351, Nazareth, Pa. 18064 (215) 759-2702

Product Safety Information

HYDROCHLORIC ACID, AQUEOUS
(Muriatic Acid)

I. Physical and Chemical Properties

Formula: HCl (Aqua)

Physical State: Liquid
(70°F-14.7 psig)

Specific Gravity: 1.1417 to 1.1789
(water: 1.0)

Boiling Point (°F): 230°F - 20.25% HCl

Melting Point (°F): -43.6 to -86.3°

Flash Point (°F): non-flammable

Water Miscibility: complete

Color: clear, colorless to slightly yellow at STP

Odor: sharp, pungent, irritating

Vapor Pressure (mm Hg)
(32% HCl)

32°F: 5.7

70°F: 25.8

100°F: 72.6

II. Chemical Reactivity

Hydrochloric acid reacts with various metals and metal oxides, and with hydroxides to form the chlorides. It decomposes the zeolites, slags, and many other siliceous materials to yield silicic acid; reacts with carbonates liberating CO_2 and H_2O and is oxidized in the presence of oxygen and catalyst, or by electrolysis, to produce chlorine. HCl neutralizes alkaline solutions and acts as a hydrolyzing agent for carbohydrates, esters and other chemicals. It liberates free acids from soaps and salts.

Hydrochloric acid is also soluble in alcohols and aldehydes. It is also completely miscible with water.

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Stauffer CHEMICALS
STAUFFER CHEMICAL COMPANY
Industrial Chemical Division
NEW YORK, NEW YORK 10017

III. Stability

Hydrochloric acid will yellow upon exposure to iron, chlorine or organic substances. It has slight evidence of dissociation at temperatures above 1500°C. It is a relatively stable compound and with water it forms a maximum boiling azeotrope that boils at 108.58°C at 1 atm and contains 20.22% HCl.

IV. Fire Hazard

Hydrochloric acid is a non-flammable substance in the air, but if it is allowed to come in contact with various metals, its corrosive nature will cause a reaction and hydrogen will be evolved. This can develop into a dangerously explosive situation in combination with the air.

V. Firefighting Techniques

Fire involved with hydrochloric acid can be dealt with soda ash, flaked lime, carbon dioxide, dry chemical extinguishers or water.

VI. Health Hazards

Hydrogen chloride, both as a gas and in solution as hydrochloric acid, is a corrosive substance and can cause severe and painful burns on contact with any part of the body or if taken internally. The mucous membranes of the eyes and the upper respiratory tract are especially susceptible to the irritating effects of high atmospheric concentrations of hydrogen chloride. The gas or vapor is so penetrating and pungent that when high concentrations do occur, those exposed immediately leave the contaminated area.

1. Ingestion

When concentrated hydrochloric acid is swallowed, it causes severe burns of the mucous membranes of the mouth, esophagus and stomach. The lips and mouth usually turn white, and later brown. There is pain in the throat and stomach, difficulty in swallowing, intense thirst, nausea and vomiting, followed by diarrhea and, in severe cases, by collapse and unconsciousness.

2. Eye Effects

Contact of the eyes with hydrogen chloride, either as a gas or in solution, rapidly causes severe irritation and painful burns of the eyes and eyelids. If the acid is not quickly removed by thorough irrigation with water, there may be prolonged or permanent visual impairment or total loss of sight.

3. Dermal Effects

Concentrated solutions are destructive to clothing and, on contact with skin, causes severe burns unless promptly washed off. Repeated skin contact with dilute solutions may lead to the development of dermatitis. Exposure to the concentrated vapor of anhydrous hydrogen chloride may also result in burns or dermatitis.

4. Inhalation

Inhalation of excessive concentrations of hydrogen chloride vapors immediately produces severe irritation of the upper respiratory tract, resulting in coughing, burning of the throat, and a choking sensation. Reactions encountered in man have usually been limited to inflammation and occasional ulceration of the nose, throat and larynx. If inhaled deeply, edema of the lungs may occur.

5. Threshold Limit Value

The American Conference of Governmental Industrial Hygienists has assigned a threshold limit value of 5 ppm (7 milligrams per cubic meter) by volume in air as the maximum allowable concentration of chlorine vapor for exposures not exceeding a total of eight hours daily.

6. Warning Properties

The characteristic pungent and penetrating odor and the irritating properties of hydrogen chloride fumes is an adequate warning of its presence in the air.

VII. First Aid

In the event of injury resulting from over-exposure, remove the patient from source of contamination and apply the recommended first aid procedures. Respiration is of prime importance. If breathing has ceased, mouth-to-mouth artificial respiration should be performed. Never give anything by mouth to an unconscious person. Medical attention should be obtained as soon as possible after injury, even if the injury appears slight. The physician should be given a detailed account of the incident.

1. Ingestion

Obtain medical attention as soon as possible.

If the patient has swallowed hydrochloric acid and is concious, give large amounts of lime water or milk of magnesia. Plain water should be given if neither of these are available. Do not give sodium bicarbonate or make any attempt to induce vomiting.

If the patient is unconscious do not give anything but ensure there is no obstruction to breathing (his tongue should be kept forward and false teeth removed). He will be less likely to breathe in vomitus if he is placed in a face down position.

2. Eye Contact

Immediately flush the eyes with large quantities of running water for a minimum of 15 minutes. Hold the eyelids apart during the irrigation to ensure flushing of the entire surface of the eye and lids with water. Obtain medical attention as soon as possible. Do not attempt to neutralize the acid with chemicals. Oils or ointments should not be used unless directed by a physician. Continue the irrigation for an additional 15 minutes if the physician is not available.

3. Skin Contact

Immediately flush affected areas with water. Remove contaminated clothing under the shower. Continue washing with water--do not attempt to neutralize with chemical agents.

Severe or extensive burns may be caused by hydrochloric acid producing shock symptoms (rapid pulse, sweating and collapse). In these cases keep the patient on his back and comfortably warm. Obtain medical attention as soon as possible. Do not apply oils or ointments unless directed by a physician.

4. Inhalation

Remove from contaminated atmosphere.

If breathing has ceased, start mouth-to-mouth artificial respiration. Oxygen, if available, should only be administered by an experienced person when authorized by a physician. Keep patient warm and comfortable.

Call a physician immediately.

VIII. Precautions for Normal Use

A minor spill is defined as a small quantity which can be handled routinely considering the physical and hazardous properties of the product as well as the location of the spill.

Spills should be handled immediately by neutralizing and flushing the area with large amounts of water. The neutralizing agents suggested are soda ash or lime. If soda ash is used, ample ventilation should be provided.

Equipment lines should be flushed with water or an alkaline solution after use and an alkaline solution before maintenance. This is practiced with the recommendations of the Manufacturing Chemists Association, Inc. (21). Purging equipment with an inert gas such as CO_2 is another recommended method.

Spills which are not considered to be minor, which are considered to be an emergency, must be handled according to a predetermined plan. For assistance in developing such a plan, contact Stauffer's Technical Service Department.

IX. Recommended Safety Equipment

Safety Showers
Protective Respiratory Equipment
Chemical Safety Goggles
Rubber or Acid Resistant Aprons, Gloves and Boots
Face Shields
Protective Head Covering

X. Corrosivity to Materials of Construction

Hydrochloric acid is highly corrosive to most metals with the evolution of hydrogen gas, which is highly explosive when mixed with air.

XI. Storage Requirements

Storage should be located outdoors or in well ventilated areas whenever possible. Storage tanks should be vented with an adequately sized acid resistant pipe to the atmosphere at an elevation higher than the surroundings.

All containers should be stored away from highly flammable substances such as oil, gasoline, paint waste and other potential fire hazards; also away from elevators, gangways and all locations where moving objects may fall upon them. Store away from oxidizing agents such as nitric acid, and chlorates. Do not store near heating devices or in direct sunlight.

Storage capacity should be adequate enough to allow complete emptying of the tank truck plus an additional 25% allowance. Rubber lined steel tanks have been found to be the most satisfactory.

XII. Disposal of Unused Material

For assistance in disposing of unused material, contact Stauffer's Technical Service Department.

XIII. Disposal of Container

Not applicable--bulk containers used only.

XIV. References

MCA Chemical Safety Data Sheet SD-39 Hydrochloric Acid, Aqueous and Hydrochloric Acid, Anhydrous (1951).

Encyclopedia of Chemical Technology, Second Edition. Volume II. Hydrochloric Acid (1966).