

24% Hydrogen Bromide Solutions Safety Guide and General Information

Chemtura Corporation



•Chemtura is one of the largest publicly traded specialty chemical companies in the United States and a leader in several global markets, providing products and services in 100+ countries with manufacturing worldwide. 2009 annual sales were \$2.5 billion.

•Chemtura, previously as Great Lakes Chemical, is a major global producer of bromine and brominated derivative chemicals like hydrobromic acid. Chemtura has been producing these chemicals in our South Arkansas facilities for over 50 years.

Enviro Tech Chemical Services, Inc

- **Food Safety Specialty Products R & D**
- **Supplier to the Industry for Specialty FDA and FSIS-approved chemistries such as HBr (hydrogen bromide) and PAA (peroxyacetic acid)**
- **Hydrogen bromide patent filed with US Patent Office (for meat/poultry and water treatment)**
- **Close Relationship with Chemtura and their mfg. and product support abilities.**

Facts About 24% Hydrogen Bromide Solutions

•Have I used anything like 24% HBr?

•A: Many household products like muriatic acid for cleaning cement, lime-scale removers, drain opening chemicals, toilet bowl cleaners, and pH adjustment chemicals for pools and spas have similar characteristics to 24% HBr.

•Is HBr used in large quantities?

•A: HBr is used in many applications like as a catalyst for PTA for polyester PET (beverage bottles) and is used in tens of thousands of tons at 2X the concentration (24% vs. 48%). It is also used as solder flux, as a chemical intermediate to make bromide chemicals, and to make other polymers.

•What qualities should I be concerned about and can this chemical be handled safely?

•A: HBr is an inorganic acid with acidic pH. At 24% concentration, it has very manageable physical properties, and by using proper procedures and PPE protocols, can and has been handled safely and in an environmentally responsible manner for decades.

(cont.) 24% Hydrogen Bromide Solutions

•What are the major concerns if I am working with 24% Hydrogen Bromide?

•A: As an aqueous acid, the biggest concern would be for contact with skin or eyes due to the acidic pH, but PPE has proven effective in preventing contact. The low vapor pressure of HBr should not readily result in emission of vapors. Incompatible materials should not come in contact with HBr.

•Is the equipment for storage and transfer and personal protective equipment reliable and well-known?

•A: Materials of construction have been in use for many years with 48% solutions, and equipment is reliable and proven for use with hydrogen bromide. There are various materials used for PPE that have been well tested and proven for use with inorganic acids. Much of this equipment is used for other chemicals as well. Chemtura and Enviro Tech can assist you by allowing you to benefit from our years of experience with this chemical.

10-15% Sodium Hypochlorite PPE

•Personal protective equipment

- Eye protection : Eyewash stations and safety showers. Chemical resistant goggles
- Skin and body protection : Boots. Full protective suit. Wear protective gloves.
- Respiratory protection : NIOSH approved respirator if PEL conditions for air emission are possible.
- Hygiene measures : General industrial hygiene practice.
- Suitable Materials for PPE:
 - Neoprene, Butyl-rubber, PVC, Viton[®], Saranex[®]

Similar requirements for 24% Hydrogen Bromide solutions.

24% HBr Solution Physical Characteristics

Boiling Point of 24.8% HBr solution	107.5 °C (226 °F) at 760 mm pressure
Molecular/Chemical Formula	HBr with H₂O
Molecular Weight	80.9 g/mol
Odor	Mild “musty” odor
Reactivity with water	Not reactive with water, miscible
Solubility in water (Total HBr)	66% Sat'd sol'n at 25 °C (77 °F)
Density	~1.19 g/cm³ at 20 °C (68 °F)
Vapor Pressure of 24% HBr solution	10 mmHg at 20 °C (68 °F) Water = 17.5 mm Hg at 20 °C
Weight per gallon	~10.0 lbs./gallon

Relative Acidity of Common Acids

Acid	Concentration (moles/L)
Phosphoric Acid (75%)	38.7 (assumes 3 protons)
Sulfuric Acid (97%)	36.4
Nitric Acid (70%)	15.7
Hydrochloric Acid (37%)	12.0
Muriatic Acid (32%) (pool acid)	9.8
Hydrobromic Acid (48%) (HBr)	8.8
Hydrogen Bromide (24%) (HBr)	3.6 (2.7 times less acidic than pool acid)

24% HBr Storage and Handling

- **Avoid direct sunlight and heat**
- **Do not store with incompatible materials such as strong oxidizers, alkalis and alkali metals**
- **Store with proper containment**
- **1 year drum or tote recommended storage max.**
- **Not subject to freezing**

24% HBr Shipping/Receiving

- Non-Flammable liquid
- Corrosive label
- Hazard class 8
- Packing group II
- Enviro Tech ships in drums, totes, and bulk
- Bulk tanks should be in containment



Materials of Construction – 24%

HBr

Resistant	Unacceptable
Tantalum	Carbon Steel
Hastelloy B (marginal)	Bronze, copper and zinc
Glass	Aluminum
Kynar™	Nylon 6, 11, & 66
Teflon™	Nitrile Buna-N
ETFE	
FEP	

24% HBr PPE Recommendations

- **Safety glasses with side shields or chemical goggles (face shield recommended)**
- **Rubber, acid resistant gloves and chemical resistant suit**
- **Ventilation for enclosed areas**
- **NIOSH/MSHA approved organic vapor/acid respirator (ex. - North 7583P100 Cartridge)**
 - Not typically required due to vapor pressure with good ventilation
 - May be required in fires or extreme conditions of poor ventilation
- **Best Practices – Eye wash stations/ chemical showers**

Examples of PPE for Proper Bulk Handling

Face Shield

Goggles or Minimal Safety Glasses with Side-shields

Rubber Acid-Resistant Gloves

Apron, coveralls, slicker suit or smock

Sleeves and trouser legs over gloves and boots

Rubber Boots



Recommended Procedures for Small Spills

- **Splashes, drips, or leaks from typical handling**
- **Contain the spill – spill pads or clay or kitty litter if larger; make sure spill pads are compatible materials**
- **Neutralize**
 - **Solutions of soda ash, caustic, or lime are acceptable**
 - **Soda ash and other weak bases are preferred due to exothermic reactions of stronger bases like caustic**
 - **Use dilute base solutions to have suitable heat sink or use additional water if using more concentrated strong bases like NaOH**
 - **Clean up or rinse to area for proper disposal**
- **Place soiled containment materials in an appropriate container for disposal**

Recommended Procedure for Large Spills

- Large spills would be tank or tote spills or spills of multiple gallons from equipment or lines
- Evacuate area and call your safety supervisor
- Protect yourself with proper PPE
- Contain the spill – dike with sand, dirt, or clay
- Neutralize
 - Solutions of soda ash, caustic, or lime are acceptable
 - Soda ash and other weak bases are preferred due to exothermic reactions of stronger bases like caustic
 - Use dilute base solutions to have suitable heat sink or use additional water if using more concentrated strong bases like NaOH
- Rinse material to dike or pump to proper containers for appropriate disposal
- Ventilate enclosed areas

Bulk Off-Loading Procedures

- **Chock the trailer in a containment area**
- **Put on appropriate PPE – Very Important**
- **Spill contingency equipment available – Know location and process for cleaning spill prior to unloading**
- **Hook-up with 2” or 3” 4 bolt flange fittings hose & 3/4” Chicago coupling – use proper tightening protocol**
- **Pressure transfer with <30 psig nitrogen or air (back flow protection) (Should take 45-60 minutes)**
- **Have ability to vent trailer according to regulations**
- **Driver will assist with connections on the trailer**
- **Be careful venting through pumps**

Trailer Configuration



Rubber-lined acid trailer

Flanged Tank Connection

2" or 3" 4-bolt connection



**Tighten Bolts using a
Criss-cross pattern**



**<30 psig
pressure**

**40 psig rupture disk on
trailer**



Chicago Coupler for Air/ Nitrogen Pressure

RESPECT HBr, BUT DO NOT FEAR IT!

Emergency Response Numbers

- CHEMTREC 1-800-424-9300 (U.S.)
- Enviro Tech 1-209-581-9576
- Chemtura 1-800-949-5167

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- DO NOT HESITATE TO CALL IF NEEDED!

Chemtura Safety Support

- **Manufacturing/ Plant Engineering**
- **R&D**
- **Customer Service - West Lafayette**
1-800-428-7947
- **Technical Service - Helpline**
1-800-378-9451
- **Quality Control & Assurance**

- Questions?

- Thank You.