

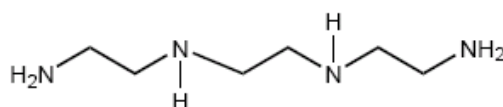
Technical Bulletin

TRIETHYLENETETRAMINE (TETA)

TRIETHYLENETETRAMINE is a mixture of four TETA ethyleneamines with close boiling points including linear, branched and two cyclic molecules.

These compounds are:

- TETA (CAS #000112-24-3, N,N'-bis (2-aminoethyl)-1,2-ethanediamine)
- Bis AEP (CAS #006531-38-0, N,N'-bis-(2-aminoethyl)piperazine)
- PEEDA (CAS #024028-46-4, N-[(2-aminoethyl)2-aminoethyl]piperazine)
- Branched TETA (CAS #004097-89-6, tris-(2-aminoethyl)amine)



APPLICATIONS

- Asphalt additives
- Corrosion inhibitors
- Epoxy curing agents
- Hydrocarbon purification
- Lube oil and fuel additives
- Mineral processing aids
- Polyamide resins
- Surfactants
- Textile additives

SALES SPECIFICATIONS

<u>Property</u>	<u>Specifications</u>	<u>Test Method*</u>
Amines, mol wt < TETA, wt. %	2.0 max.	ST-35.219
Assay, TETA, wt. %	97.0 min.	ST-35.219
Color, Pt-Co	50 max.	ST-30.12
Water, wt. %	0.50 max.	ST-31.53, 6

*Methods of Test are available from Huntsman Corporation upon request.

ADDITIONAL INFORMATION

<u>Regulatory Information</u>			
DOT/TDG Classification	Triethylenetetramine	Heat of vaporization, BTU/lb	160.2
HMIS Code	3-1-0	Heat of combustion, BTU/lb	14297
WHMIS Classification	D1B, D2A, D2B, E	Ionization constants, K_b , 1	6.7E-5
		Ionization constants, K_b , 2, 25°C	7.0E-6
		Kinematic viscosity, cSt, 25°C	21.4
		Kinematic viscosity, cSt, 40°C	10.3
<u>Chemical Control Laws</u>		Molecular weight, Linear component	146.24
Canada, DSL	Listed	Molecular weight, Typical product	151
United States, TSCA	Listed	Nitrogen content, %	37.0
		pH (1 wt. % solution)	10
<u>Typical Physical Properties</u>		Refractive index, n_D^{20}	1.496
Amine value, mg KOH/g	1443	Specific gravity, 25/25°C	0.983
Boiling point, °C (°F)	260 (500)	Specific heat, cal/g °C, 20°C	0.482
Coefficient of expansion, 1/°C, 20°C	0.00075	Surface tension, dynes/cm, 20°C	22.2
Density, g/ml, 20°C	0.981	Thermal conductivity,	
Dielectric constant, 25°C and 1 kHz	11.4	cal/cm-sec-°C, 20°C	0.000450
Electrical conductivity, μmhos/cm, 24°C	0.038	Vapor pressure, mm Hg, 20°C (68°F)	<0.1
Flash point, PMCC, °C (°F)	118 (245)	Viscosity, cP, 20°C	13.9
Freezing point, °C (°F)	-35 (-31)	Water solubility (%)	>10
Heat of formation, kcal/mol	-17.6		

TOXICITY AND SAFETY

Because of the fragility of eye tissue, almost any eye contact with any ethyleneamine may cause irreparable damage, even blindness. A single, short exposure to ethyleneamines, may cause severe skin burns, while a single, prolonged exposure may result in the material being absorbed through the skin in harmful amounts. Exposures have caused allergic skin reactions in some individuals. Single dose oral toxicity of ethyleneamines is low. The oral LD₅₀ for rats is in the range of 1000 to 4500 mg/kg for the ethyleneamines.

The principal hazards that arise in working with triethylenetetramine (TETA) are those associated with similar organic amines; namely, a corrosive action on skin and eyes. Precautions should be taken to prevent contact with these parts of the body such as by use of protective clothing and chemical goggles. If contact occurs, immediately flush the exposed area with plenty of water for at least 15 minutes. Eye exposures should be examined by a physician. Contaminated clothing should be laundered before reuse. If ingestion occurs, do not induce vomiting. Have the individual drink a large amount of water (or milk, if it is readily available) and transport them to a medical facility immediately.

For additional information on the toxicity and safe handling of this product, consult the Material Safety Data Sheet (Safety Data Sheet in Europe) prior to use of this product.

HANDLING AND STORAGE

In order to maintain the high degree of purity with which triethylenetetramine (TETA) is manufactured and shipped, the following storage and handling considerations are recommended:

Dry Inert Gas Blanket

This product should be stored under a dry inert gas blanket, such as nitrogen, to minimize contamination resulting from contact with air and water.

Materials of Construction

If slight coloration of the ethyleneamine is acceptable, storage tanks may be made of carbon steel or black iron, provided they are free of rust and mill scale. However, if the amine is stored in such tanks, color may develop due to iron contamination. If iron contamination cannot be tolerated, tanks constructed of types 304 or 316 stainless steel should be used. (Note: Because they are quickly corroded by amines, do not use copper, copper alloys, brass, or bronze in tanks or lines.) Recommended storage construction for TETA is stainless steel.

Storage Temperature

Triethylenetetramine (TETA) has a pour point of -35.1°C. To avoid freezing, the product should be maintained above this temperature.

Spills or Leaks

Small spills should be covered with inorganic absorbents and disposed of properly. Organic absorbents have been known to ignite when contaminated with amines in closed containers. Certain cellulosic materials used for spill cleanup such as wood chips or sawdust have shown reactivity with ethyleneamines and should be avoided. Large spills should be contained and recovered. Water may be used for clean-up purposes, but avoid disposing of the material into sewers or natural water bodies. Disposal should be in accordance with all federal, state and local laws, regulations, and ordinances. Ethyleneamine leaks will frequently be identified by the odor (ammoniacal) or by the formation of a white, solid, waxy substance (amine carbamates). Inorganic absorbents or water may be used to clean up the amine waste.

AVAILABILITY

Triethylenetetramine (TETA) is available in bulk and in 55-gallon drums of 200 Kg net weight. Samples are available by contacting our sample department at 1-800-662-0924.

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