



Ethyleneamines

TOSOH CORPORATION

Introduction



The Tosoh Group comprises more than 130 companies worldwide and a multiethnic workforce of over 12,000 people and net sales of ¥822 billion (US\$7.7 billion). Tosoh is a global supplier of inorganic chemicals, petrochemicals, and specialty materials. Here we are proud to introduce our ethyleneamines, one of the many product lines that make Tosoh's contribution to modern life ubiquitous and profound.

Tosoh's Organic Chemical Division commands the largest share in the Asian market for ethyleneamines and their derivatives. Commercially, ethyleneamines are produced from ethylene dichloride (EDC), ammonia and caustic soda.

Ethyleneamines are water soluble and viscous liquids with ammonia-like odor and chemical reactivities. Specific reactivity depends upon primary, secondary and tertiary amino groups in ethyleneamines.

Ethyleneamines are used in agricultural chemicals, paper additives, chelating agents, epoxy resin curing agents, lubricants for thermoplastic resin, oil additives, and bitumen chemicals.

Kinds of Ethyleneamines



Name	Abbreviated word	Structural formula (main component)
Ethylenediamine	EDA	<chem>NCCN</chem>
Diethylenetriamine	DETA	<chem>NCCNCCN</chem>
Triethylenetetramine	TETA	<chem>NCCNCCNCCN</chem>
Tetraethylenepentamine	TEPA	<chem>NCCNCCNCCNCCN</chem>
Pentaethylenhexamine	PEHA	<chem>NCCNCCNCCNCCNCCN</chem>
N-Aminoethylpiperazine	AEP	<chem>NCCN1CCNCC1</chem>
Piperazine	PIP	<chem>C1CCNCC1</chem>
Poly-8	P8	$H_2N-(CH_2CH_2-NH)_n-H$ $n \geq 5$

Sales Specifications



Name		Ethylene-diamine	Diethylene-triamine	Triethylene-tetramine	Tetraethylene-pentamine	Pentaethylene-hexamine	N-Aminoethyl-piperazine	Piperazine	Poly-8
Abbreviated word		EDA	DETA	TETA	TEPA	PEHA	AEP	PIP	P8
Apperance		Clear and free of suspended matters						White flake	Dark Brown
Color	APHA	max. 15	max. 20	max. 50	-	-	max. 30	-	-
	Gardner	-	-	-	max. 5	max. 10	-	-	-
Specific gravity	(20/20°C)	0.897 ~ 0.910	0.950 ~ 0.955	0.979 ~ 0.984	0.988 ~ 0.998	1.000 ~ 1.031	0.983 ~ 0.989	-	-
Distillation range	(°C)								
	I.B.P.* ^①	min. 115	min. 195	min. 260* ^③	min. 310* ^③	-	min. 210	-	-
	D.P.* ^②	max. 119	max. 215	max. 290	min. 320* ^④	-	max. 230	-	-
Purity GC	(%)	min. 99.0	min. 99.0	-	-	-	min. 98.0	min. 99.5	-
Amine value	(mgKOH/g)	-	-	1,410 ~ 1,480	1,290 ~ 1,370	1,200 ~ 1,280	-	-	min. 1,000
Total Nitrogen	(N-%)								min. 30
Water content	(%)								max. 1.5

① Initial boiling point ② Dry point ③ 5% distillate ④ 50% distillate

Applications



Uses	EDA	DETA	TETA	TEPA	PEHA	AEP	PIP	P8
Agricultural chemicals	●							
Ethylene urea resins	●							
Paper additives (Modifying Agents)		●	●					
Chelating agents	●	●						
Epoxy resin curing agents		●	●	●	●	●		
Corrosion inhibitors	●	●						
Rubber chemicals	●							
Reforming agents for soils	●							
Polyamide resins	●	●	●	●	●	●		
Lubricants for thermoplastic resin	●							
Oil additives	●	●	●	●	●			●
Insectifuges, Insecticides							●	
Surface-active agents	●	●	●	●				
Intermediates for textile finishing resins		●						
Ion exchange resins	●			●	●			
Bitumen chemicals								●

Physical Properties



Name	Ethylene-diamine	Diethylene-triamine	Triethylene-tetramine	Tetraethylene-pentamine	Pentaethylene-hexamine	N-Aminoethyl-piperazine	Piperazine	Poly-8	
Abbreviated word	EDA	DETA	TETA	TEPA	PEHA	AEP	PIP	P8	
Molecular weight	60.1	103.2	-	-	-	129.2	86.1	-	
Specific gravity (20/20°C)	0.898	0.952	0.981	0.998	1.000	0.985	1.100	1.020	
Boiling point	101.3 kPa (°C) (760mmHg) (°F)	116 241	207 405	278 532	340 ^① 644 ^①	- 432	222 295	146 230	230 446
	6.7 kPa (°C) (50mmHg) (°F)	49 120	123 253	183 361	237 459	-	-	-	-
	1.3 kPa (°C) (10mmHg) (°F)	22 72	86 187	144 291	195 383	230 446	-	-	-
	Vapor pressure (20°C)	(Pa)	1.2×10 ³	37.0	<1.3	<1.3	<1.3	<13.3	3.0×10 ⁴ * ^②
	(mmHg)	9.0	0.3	<0.01	<0.01	<0.01	<0.1	227 ^{*②}	-
Melting point	(°C / °F)	8 / 46	-39 / -38	-35 / -31	-30 / -22	-30 / -22	-19 / -2.2	104 / 219	-
Flash point(COC)	(°C / °F)	41.5 / 107 ^③	104 / 219	137 / 279	171 / 340	197 / 387	95 / 203	74 / 165 ^④	178 / 352
Active hydrogen equivalent weight ^⑤	g/eqNH	15.0	20.6	27.2	31.1	34.0	43.1	43.1	-

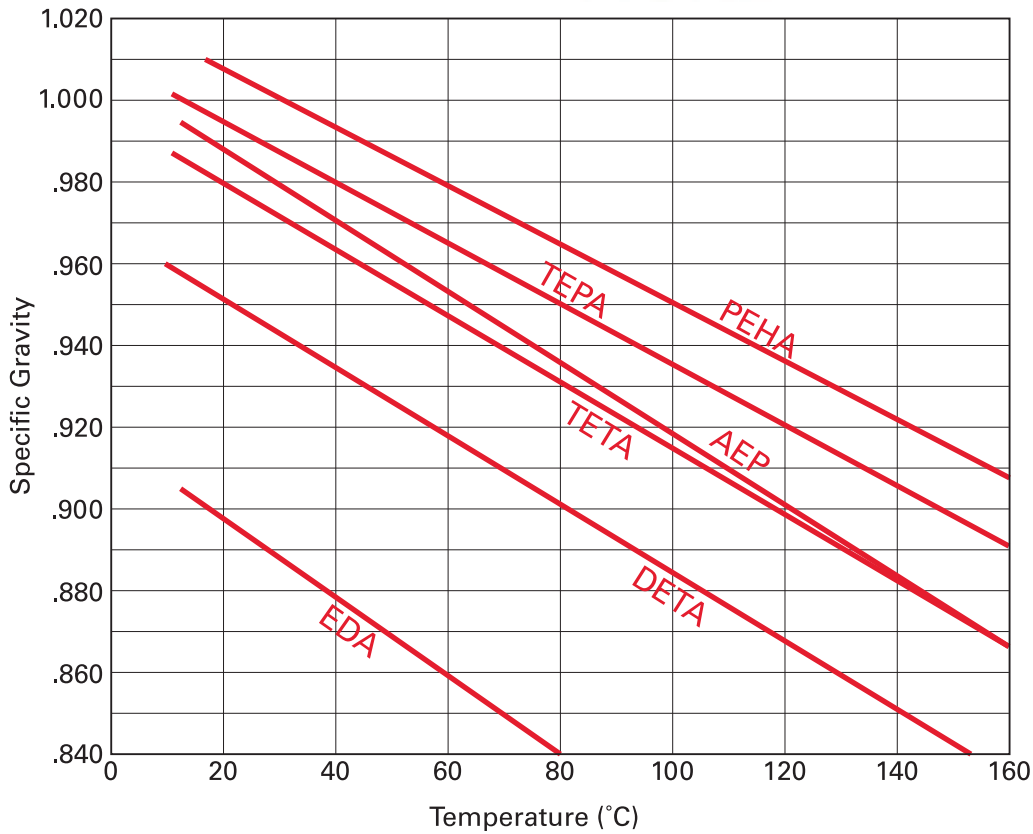
① Decomposition ② 110.8°C ③ Tag closed cup ④ Seta closed cup ⑤ Estimated value



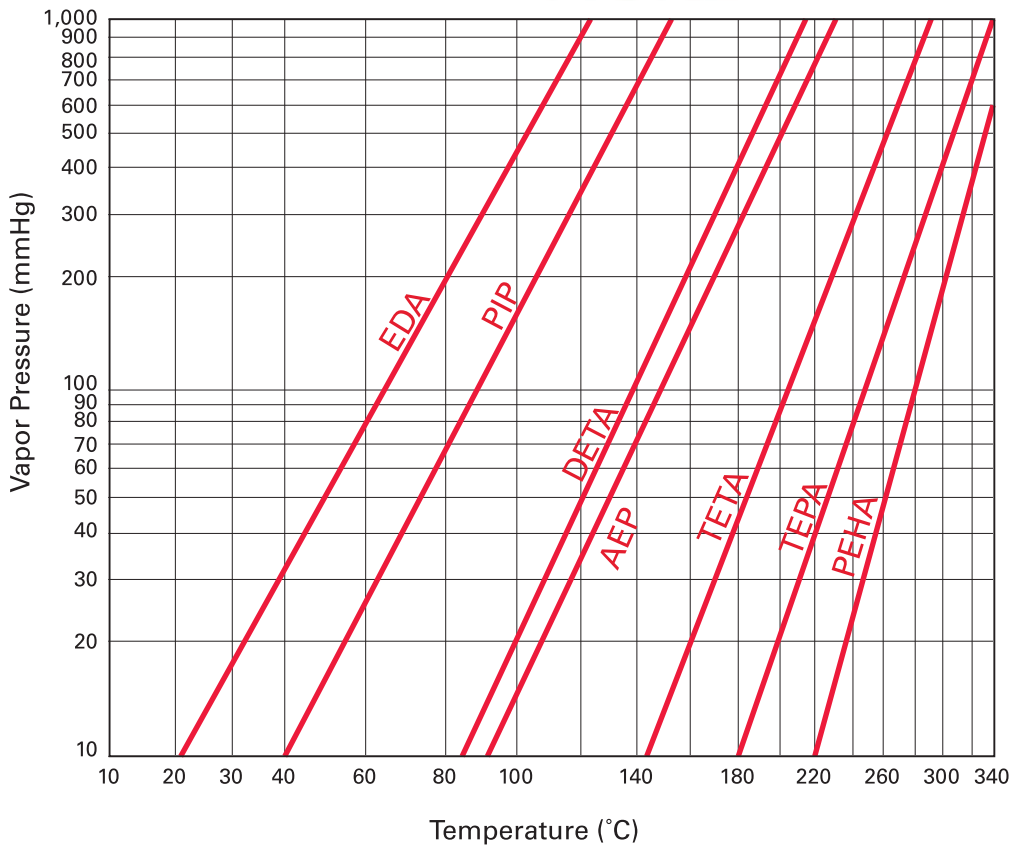
Nanyo Complex

Aerial view of Tosoh's Nanyo Complex located in Shunan City, Yamaguchi, Japan

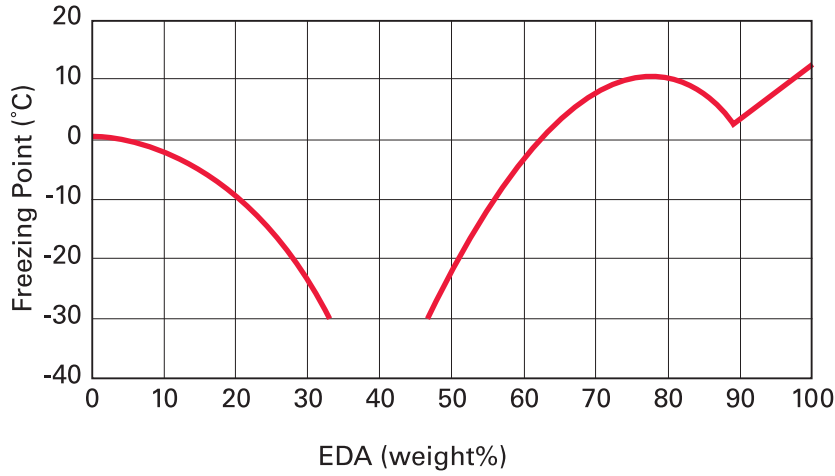
Specific Gravity



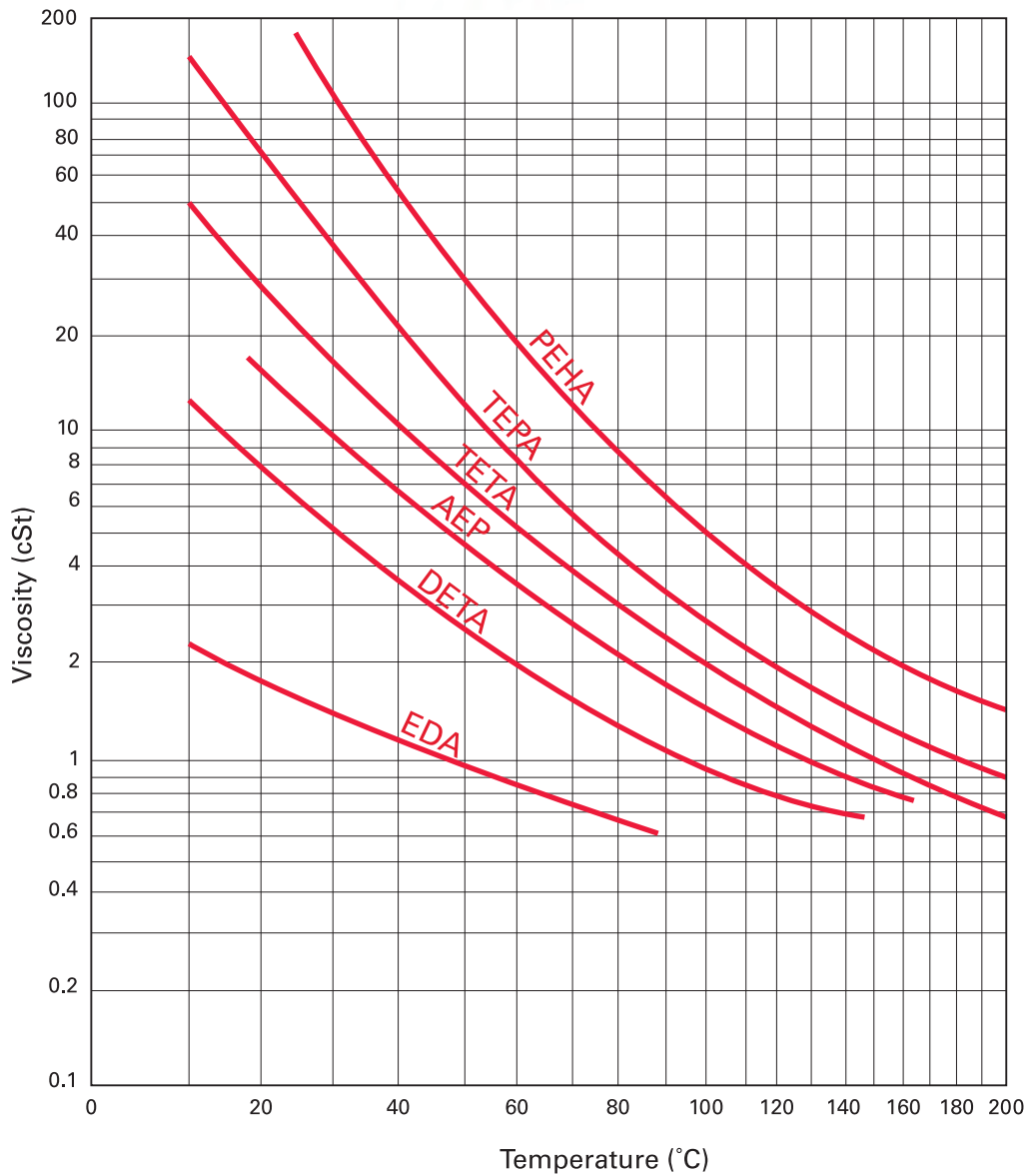
Vapor Pressure



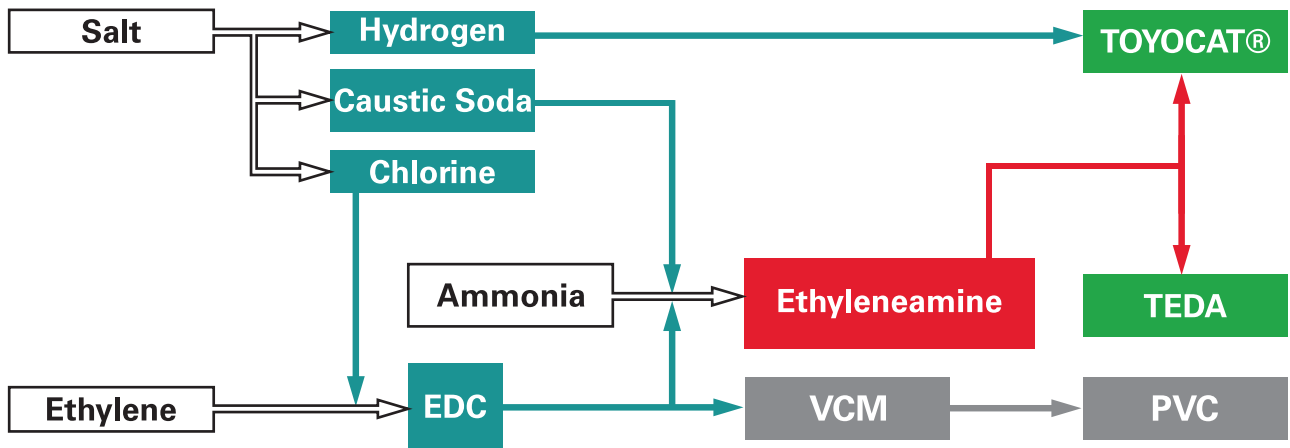
Freezing Point of EDA Aqueous Solution



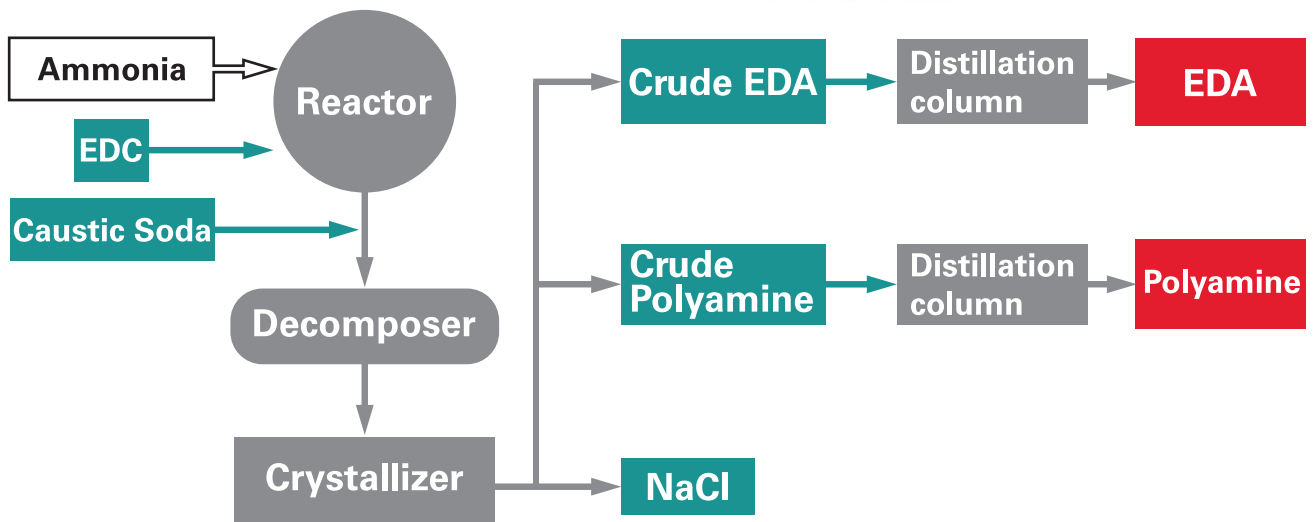
Viscosity



Utility Flow



Manufacturing Process



Shipping Information



Name		Ethylene-diamine	Diethylene-triamine	Triethylene-tetramine	Tetraethylene-pentamine	Pentaethylene-hexamine	N-Aminoethyl-piperazine	Piperazine	Poly-8
Abbreviated word		EDA	DETA	TETA	TEPA	PEHA	AEP	PIP	P8
Net	(kg)	180	190	200	200	200	200	80	200
	(lbs)	397	418	440	440	440	440	176	440
Package		In specially treated carbon steel drum or in bulk.							
IMCO	NO.	8	8	8	8	8	8	8	8
UN	NO.	1604	2079	2259	2320	2735	2815	2579	2735
CAS	NO.	107-15-3	111-40-0	90640-67-8	90640-66-7	4067-16-7	140-31-8	110-85-0	-

Handling and Storage



1. Ethyleneamines have a tendency to color when exposed to air and light for prolonged periods. If color is important, storage in vessels that block light and equipped with nitrogen blanketing is recommended.
2. Stainless steel, aluminum, specially treated carbon steel, teflon and polyethylene are suitable materials for handling and storing ethyleneamines. If color is important, specially treated carbon steel is not suitable for prolonged storage. Ethyleneamines actively attack copper, nickel and cobalt and therefore should never be allowed contact with these materials.
3. Ethylenediamine has a high freezing point (10.8°C), so outdoor tanks and piping require heating and insulation to prevent freezing in winter.
4. Generally, ethyleneamines have a high flash point, so risk of fire at normal temperature is relatively low. If necessary, water or powder extinguishers should be kept on hand.
5. Ethyleneamines show strong basicity, therefore in cases where ethyleneamines come into contact with eyes, flush immediately with plenty of water and consult a physician.
6. Although there are some differences in their acute toxicity, ethyleneamines in general can cause eye and skin burns. Direct contact with ethyleneamines in liquid or vapor form should be prevented. Handling of ethyleneamines should be done wearing suitable protective clothing, rubber gloves, and safety goggles.
7. Repeated exposure to ethyleneamine vapor presents a definite health hazard so areas of ethyleneamine exposure to the air should be well ventilated.
8. For more specific information, please contact your nearest Tosoh office.



Tosoh Corporation is ISO9001 certified for its Quality Management System.



Tosoh Corporation Nanyo Complex is ISO14001 certified for its Environment Management System.



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