

TEA Triethylaluminum

CAS Number	1191-15-7
EINECS/EC	214-729-9
Molecular Formula	(C ₂ H ₅) ₃ Al

APPLICATION

Triethylaluminum (TEA) is used primarily as a catalyst component in Ziegler-Natta type systems for olefin and diene polymerizations. It is also used in ethylene oligomerization to produce olefins and in chain growth of ethylene, to produce longer chain aluminum alkyls, which are then converted to primary alcohols or other products.

SPECIFICATION

Aluminum, wt. %, min	23.0
TEA, wt. %, min	93.0
TNBA, wt. %, max	6.0
TIBA, wt. %, max	0.5
Hydride (calculated as AlH ₃), wt. %, max	0.8

	Average (\bar{x})	Variation (3 σ)
Aluminum, wt. %	23.5	0.3
TEA, wt. %	95.0	1.5
TNBA, wt. %	4.1	1.4
TIBA, wt. %	0.002	0.03
Hydride, wt. %	0.7	0.1

DENSITY & VISCOSITY

Temperature		Density		Viscosity
°C	°F	g/mL	lbs/gal	cp
-40	-40	0.876	7.311	10.8
-30	-22	0.8693	7.255	8.31
-20	-4	0.8626	7.199	6.51
-10	14	0.8559	7.143	5.18
0	32	0.8492	7.087	4.18
10	50	0.8425	7.031	3.42
20	68	0.8358	6.975	2.83
25	77	0.8325	6.947	2.58
30	86	0.8291	6.919	2.36
40	104	0.8224	6.863	2
50	122	0.8156	6.807	1.7
60	140	0.809	6.751	1.46
70	158	0.8023	6.696	1.27
80	176	0.7956	6.64	1.11
90	194	0.7889	6.584	0.972
100	212	0.7822	6.528	0.859
110	230	0.7755	6.472	0.764
120	248	0.7688	6.416	0.683
130	266	0.7621	6.36	0.613
140	284	0.7554	6.304	0.553
150	302	0.7487	6.248	0.501
160	320	0.742	6.192	0.456
260	500	0.6749	5.632	0.21

Equations:

$$\text{Density: } d(\text{g/mL}) = 0.84922 - 0.0006703t, t = ^\circ\text{C}$$

$$\text{Viscosity: } \log_{10}(\text{cp}) = -2.2645 + 923.38/(t + 320), t = ^\circ\text{C}$$

Experimental range: 20 - 90 °C

PHYSICAL PROPERTIES

Property	Value
Formula	(C ₂ H ₅) ₃ Al
Formula weight	114.17
State and color at 25°C	clear, colorless liquid
Stability in contact with air	flames instantly
Stability in contact with water	reacts violently
Melting point, °C(°F)	-50.4 (-58)
Boiling point at 760 mm Hg, °C(°F)	185 (365)
Vapor pressure, mm Hg at 0°C (32°F)	0.00134
10°C (50°F)	0.00466
20°C (68°F)	0.0147
30°C (86°F)	0.0425
40°C (104°F)	0.114
50°C (122°F)	0.283
60°C (140°F)	0.661
80°C (176°F)	3.1
100°C (212°F)	11.7
120°C (248°F)	38.4
140°C (284°F)	109.6
160°C (320°F)	227.0
180°C (356°F)	629.0
200°C (392°F)	1295.0
Specific heat at 25°C, cal/g°C	0.494
77°F, Btu/lb°F	0.494
Heat of vaporization at NBP, cal/g	127
Btu/lb	229
ΔH° of formation at 25°C, kcal/gfw	-45.9
Heat of combustion, net at 25°C, cal/g	10091
77°F, Btu/lb (combustion)	18165
Heat of reaction with water at 25°C, cal/g	1006
77°F, Btu/lb (water reaction)	1811
Coefficient of volume expansion at 25°C, per °C	0.000822
Coefficient of volume expansion per °F	0.000457
Dielectric constant at 5 megacycles at 25°C (77°F)	2.58
Critical temperature, °C (°F)	447 (837)
Critical pressure, atm	33
Surface tension, 28°C (82.4°F), dyne/cm	26.1
Decomposition rate in Bomb at 140°C (284°F), %/hr	0.0028
Decomposition rate at 160°C (320°F)	0.023
Decomposition rate at 180°C (356°F)	0.16
Decomposition rate at 200°C (392°F)	0.90
Decomposition rate at 220°C (428°F)	0.075
Decomposition rate at 240°C (464°F)	0.33
Decomposition rate at 260°C (500°F)	1.3
Experimental range	80–190°C
Experimental range (second)	160–250°C
Equation: log ₁₀ (%/hr)	17.249 - 8185/t; t = °C + 273

HANDLING & STORAGE

The pyrophoric nature of TEA presents potential hazards not common to most liquid chemicals used by industry in tank truck quantities. TEA, being pyrophoric, breaks into flame spontaneously and gives off dense smoke when exposed to air. It reacts violently with water. TEA is a clear, non-corrosive mobile liquid with a low vapor pressure. Hydrocarbon solutions of TEA, depending on the concentration and temperature, may not be pyrophoric. However, these solutions must still be blanketed with an inert gas such as dry nitrogen because TEA will react with air and moisture at the surface of the solution, giving off dense smoke, heat and flammable gas. For specific information on the safe handling and toxicity of this product, please refer to the Material Safety Data Sheet, which is available upon request.

TRANSPORT & PACKAGING

Container Description	Nominal Value		Approximate Loadings	
	Gallons	Liters	Pounds	Kilograms
Tank Car (DOT-105A300W)	23,000-25,100	87,100-95,000	135,000-230,000	61,400- 104,000
Tank Trailer (DOT-MC330 or 331)	6,200-7,200	23,500-27,200	30,00-48,000	13,600- 21,800
Portable Tanks (DOT-51)/UN T21	430	1,635	2,250-3,800	1,021-1,725
	1,980	7,500	10,257-17,000	4,880-7,711
Isotank	5,635-5,970	21,330-22,600	30,000-34,000	13,600- 15,500
Cylinders: dual valve (DOT-4BA240)				
5 gallon size	5.7	22	25-53	11-24
26 gallon size	28.0	106	150-268	68-120
Laboratory cylinders (DOT-3AA2015)				
0.4 gallon size	0.40	1.47	1.2-2.2	0.58-0.97
1.0 gallon size	0.94	3.60	2.9-6.3	1.4-2.8

*Actual weight depends on highway load limits, product density and lifting considerations.

Shipments are made in accordance with DOT regulations — Section 173.134. All containers are shipped blanketed with dry nitrogen under slight positive pressure. Hydrocarbon solutions are also available blended to customer specifications. Tank rail cars and tank trucks are available in North America only.

Transportation Classification

Proper shipping name..... Organometallic Substance, Liquid, Pyrophoric, Water Reactive (Triethylaluminum)
 Hazard class.....4.2 (spontaneously combustible) + 4.3(dangerous when wet)
 ID number..... UN3394
 Placard(s)..... spontaneously combustible w/ number 4+dangerous when wet 4
 Label(s)..... spontaneously combustible+dangerous when wet
 MARPOL Classificationn/a
 Harmonized tariff number2931.00.4000-2
 Schedule B number 2931.00.6000-7)

OTHER INFORMATION

Further Related Documents

Safety Data Sheet

The information presented herein is believed to be accurate and reliable, but is presented without guarantee or responsibility on the part of Albemarle Corporation and its subsidiaries and affiliates. It is the responsibility of the user to comply with all applicable laws and regulations and to provide for a safe workplace. The user should consider any health or safety hazards or information contained herein only as a guide, and should take those precautions which are necessary or prudent to instruct employees and to develop work practice procedures in order to promote a safe work environment. Further, nothing contained herein shall be taken as an inducement or recommendation to manufacture or use any of the herein materials or processes in violation of existing or future patent.

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