Thiokol/Ventron Division
Alfa Products

MATERIAL SAFETY DATA SHEET

Li_3PO_4 56

PRODUCT NAME:	Lithium Phosphate
CHEMICAL NATURE:	Metal Salt
% ACTIVITY:	99+%

I. PHYSICAL DATA

BOILING POINT, 760 mm. Hg	No Data	Melting Point	1205 C
SPECIFIC GRAVITY	2.54	VAPOR PRESSURE AT 20°C.	No Data
VAPOR DENSITY	Not Applicable	SOLUBILITY IN H_2O	Soluble
PER CENT VOLATILES BY WEIGHT	Not Applicable	IONIC NATURE	Yes
APPEARANCE AND ODOR	White solid		

II. HAZARDOUS INGREDIENTS

MATERIAL	%	TLV (Units)
Lithium phosphate	99+%	None established

III. FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (test method)	Not flammable	AUTOIGNITION TEMPERATURE	No Data
FLAMMABLE LIMITS IN AIR, % by volume	No Data	LOWER	UPPER

EXTINGUISHING MEDIA	Not flammable - Use water, carbon dioxide, dry chemical extinguishing agents, dry sand, or dry ground dolomite.
SPECIAL FIRE FIGHTING PROCEDURES	No special firefighting procedures needed, use normal procedures which include wearing NIOSH/MSHA approved self-contained breathing apparatus, flame and chemical resistant clothing; hats, boots and gloves. If without risk, remove material from fire area. Cool containers with water from maximum distance.
UNUSUAL FIRE AND EXPLOSION HAZARDS	May emit toxic fumes of PO_x when heated to decomposition.

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Thiokol/Ventron Division
Alfa Products, 152 Andover Street, Danvers, Massachusetts 01923
(617) 777-1970, (415) 836-1777 Telex: 94-0378 ALFA DARS

IV. HEALTH HAZARD DATA

RESHOLD LIMIT VALUE	None established
FECTS OF OVEREXPOSURE	Lithium has a high CNS toxicity. Large doses can cause dizziness and prostration, kidney damage, anorexia, nausea, apathy, coma and death.
ERGENCY AND FIRST D PROCEDURES	Remove from exposure. Eyes: Flush with copious amounts of water for at least 15 minutes. Skin: Remove any contaminated clothing. Flood skin with large volumes of water for 15 minutes. Ingestion/Inhalation: Seek prompt, competent medical attention.

V. REACTIVITY DATA

ABILITY			
UNSTABLE	STABLE	CONDITIONS TO AVOID	Excessive heating
	X		

COMPATIBILITY aterials to avoid)	No data
ZARDOUS COMPOSITION PRODUCTS	PO_x

ZARDOUS POLYMERIZATION			
May Occur	Will not Occur	CONDITIONS TO AVOID	
	X		

VI. SPILL OR LEAK PROCEDURES

EPS TO BE TAKEN MATERIAL IS RELEASED SPILLED	Wearing full protective clothing and respiratory protection (See Sect. VII), eliminate all sources of ignition. Cover spill with dry sand or dry vermiculite, mix well and carefully transfer to a well-marked container. Close container tightly. Submit or retain for disposal.
ASTE DISPOSAL METHOD	Consult state, local, and federal regulaitons for proper disposal of Lithium phosphate.

VII. SPECIAL PROTECTION INFORMATION

ESPIRATORY PROTECTION (specify type)		NIOSH/MSHA approved dust mask for ordinary use, self-contained breathing apparatus for emergencies.		
ENTILATION	LOCAL EXHAUST	Acequate	SPECIAL	
	MECHANICAL		OTHER	
OTECTIVE GLOVES		Rubber	EYE PROTECTION	OSHA approved safety goggles
THER PROTECTIVE QUIPMENT		Lab coat and apron, flame & chemical resistant coveralls, eyewash capable of sustained flushing, safety drench shower and hygienic		

VIII. SPECIAL PRECAUTIONS

RECAUTIONARY LABELING	Warning! CNS toxicity can occur.
THER HANDLING AND TORAGE CONDITIONS	Keep container tightly closed. Store in a cool, dry, well-ventilat area. Wash thoroughly after use.

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Associated Lead Inc.

MATERIAL SAFETY DATA SHEET

SECTION I

MANUFACTURER'S NAME		DATE
ASSOCIATED LEAD, INC.	REGULATORY AFFAIRS DEPARTMENT	2/27/84
STREET ADDRESS	**CITY, STATE, ZIP**	
2545 ARAMINGO AVENUE	PHILADELPHIA, PA. 19125	
PRODUCT CLASS	**MANUFACTURER'S CODE I.D.**	**TRADE NAME**	**EMERGENCY TELEPHONE NO.**
Stabilizer	34535	Lectro 65	215-427-3000

SECTION II - HAZARDOUS INGREDIENTS

INGREDIENT	PERCENT BY WEIGHT	TLV PPM	TLV mg/m³	LEL %	VAPOR PRESSURE mm Hg @ 68°F
Lead-Phthalate Complex	100.0	--	0.05 (1) 0.2 (2)		

(1) OSHA Standard, 29 CFR 1910.1025
A 2½ year implementation schedule in effect as of Jan. 11, 1982 for certain industries including cable coating, pottery, explosives, glass, ammunition and plastics and rubber manufacturing.

(2) OSHA Standard, 29 CFR 1910.1000
Table Z-2 in effect during the 2½ year implementation period.

SECTION III - PHYSICAL DATA

BOILING RANGE N/A

VAPOR DENSITY	EVAPORATION RATE	% VOLATILE BY VOLUME	WEIGHT PER GALLON	SPECIFIC GRAVITY
☐ HEAVIER N/A ☐ LIGHTER THAN AIR	☐ FASTER N/A ☐ SLOWER THAN ETHER	N/A	N/A	5.6

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

DOT CATEGORY	FLASH POINT	LEL
N/A		

EXTINGUISHING MEDIA

XX ☐ WATER-FOG XX ☐ FOAM ☐ OTHER

XX ☐ CARBON DIOXIDE XX ☐ DRY CHEMICAL

UNUSUAL FIRE AND EXPLOSION HAZARDS

Isolate from heat, open flames and all sources of sparks including static electricity.

SPECIAL FIRE FIGHTING PROCEDURES

See "Extinguishing Media".

SECTION V - REACTIVITY DATA

STABILITY	CONDITIONS TO AVOID
☐ UNSTABLE X ☐ STABLE	None.

INCOMPATIBILITY (MATERIALS TO AVOID)

None

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HAZARDOUS DECOMPOSITION PRODUCTS

On ignition, oxides of lead may be volatilized

HAZARDOUS POLYMERIZATION	CONDITIONS TO AVOID
☐ MAY OCCUR XX ☐ WILL NOT OCCUR	None N/A - NOT APPLICABLE

SECTION VI - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE

050mg/m^3 based on lead using engineering and work practice controls effective 2½ yrs. from 1/1

TS OF OVEREXPOSURE

...nding on individual susceptability and degree of overexposure, effects are generally seen ...ly after long-term exposure, although short-term high-level exposure may also be poisonous. ...ptoms may include tiredness, decreased appetite, metallic taste and stomach cramps resem- ...ing colic (intermittent rather than continuous pain). More severe symptoms could include ...e muscle weakness, intense headaches and on rare occasions convulsions and even more rarel ...eath. Kidney damage may occur without symptoms. Lead crosses the placenta. Fetal exposure ...hould be kept within guidelines of the Communicable Disease Center of the U.S. Department ...W-30ug/100g of blood.

EMERGENCY AND FIRST AID PROCEDURES

...ormal Ingestion - Induce vomiting. Use syrup of ipecac-one ounce followed by eight ounces ... water. Call a physician at once.
...rnal - The product may be removed by washing with soap and water.

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

...ear gloves, goggles and respirator. Clean area returning all material possible to container ... not use compressed air for cleaning floors and other surfaces. These surfaces should be ... ned by vacuuming, taking care that the material is not returned to the work area.

WASTE DISPOSAL METHOD

...eep waste rags in a labeled safety container-do not incinerate. Disposal must be in accordance with state, local or federal regulation.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION

...IOSH approved respiratory protection must be used in accordance with existing standards. ...edical Removal Protection (MRP) and biological surveillance are necessary. Respirator must ...e worn if PEL of 0.05mg/m^3 is exceeded. See 29CFR 1910.1025(k); 1910.134.

VENTILATION

...l work areas where lead compounds are used must be ventilated to keep TLV below acceptable ...

PROTECTIVE GLOVES See 29CFR 1910.94.

EYE PROTECTION Yes

OTHER PROTECTIVE EQUIPMENT Yes - goggles

Use respirator. Use clean workclothes. Change workclothes daily.

SECTION IX - SPECIAL PRECAUTIONS

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PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

...ke every precaution to avoid contamination of the atmosphere. *Special care should be give ... removing lead from hair and under fingernails. *Working or contaminated clothes and shoes ... not be worn home. *Before entering eating areas, work clothing should be removed or loo ...ust vacuumed off clothing surface. *Take every precaution to avoid ingestion and inhalation ...se gloves and avoid spilling on hands, face or body. *Do not smoke, eat or apply cosmetics ...n work area. *Wash hands and face thoroughly before entering into eating areas. While the ...nformation and recommendations set forth are believed to be accurate as of the date hereof, ...ssociated Lead Inc. MAKES NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM ...LIANCE OR ACTION BASED THEREON. Because of the nature of the product, user assumes all r...

N/A—NOT APPLICABLE

MATERIAL SAFETY DATA SHEET

NPVLA 6-70

(Approved by U.S. Department of Labor "Essentially Similar" to F rm LSB-006-4)

Section I

MANUFACTURER'S NAME
N L Industries, Inc. Pigments and Chemicals Division

STREET ADDRESS
Post Office Box 420

CITY, STATE, AND ZIP CODE
Hightstown, New Jersey 08520

EMERGENCY TELEPHONE NO
609-448-3200 EXT. 473 - Manager, Quality Control

CHEMICAL NAME AND SYNONYMS	TRADE NAME
Normal Lead Stearate	Leadstar
CHEMICAL FAMILY	**FORMULA**
Lead Stearate	$Pb(C_8H_{17}COO)_2$

Section II — HAZARDOUS INGREDIENTS

PAINTS, PRESERVATIVES, & SOLVENTS

PIGMENTS	%	TLV (Units)	SOLVENTS	%	TLV (Units)
CATALYST			ADDITIVES		
V			OTHERS		

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES	%	TLV (Units)
PbO	29	0.2mg/M

Section III — PHYSICAL DATA

BOILING POINT (°F)	N/A	SPECIFIC GRAVITY ($H_2O=1$)	1.4
VAPOR PRESSURE (mm Hg.)	N/A	PERCENT VOLATILE BY VOLUME (%)	N/A
VAPOR DENSITY (AIR=1)	N/A	EVAPORATION RATE (=1)	N/A
SOLUBILITY IN WATER	Insol.		
APPEARANCE AND ODOR	Fine White Powder		

Section IV — FIRE AND EXPLOSION HAZARD DATA

FLA[illegible]OINT (METHOD USED)	N/A	FLAMMABLE LIMITS	Lel	Uel

EXTINGUISHING MEDIA
Chemical, Foam, CO_2, Water (fog) on fires involving Leadstar

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SPECIAL FIRE FIGHTING PROCEDURES
Decomp ses above 300°C. with out melting

UNUSUAL FIRE AND EXPLOSION HAZARDS Because of the high fatty acid content of Leadstar abnormal concentration of dust coupled with abnormally high temperatures and/or spark sources may cause a dust explosion Care should be taken to prevent such situations.

Reference Section II

Section V — HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE: Prolonged excessive absorption of inorganic lead by ingestion or inhalation of

EFFECTS OF OVEREXPOSURE: dust and fume is characterized by adominal pain (lead colic), metallic taste mouth, loss of weight, pains in muscles and muscular weakness. The similarity of these symptoms with those of other illnesses require that excessive absorption of lead be verified by medical examination and analysis of biological specimens.

EMERGENCY AND FIRST AID PROCEDURES: Consult a physician if you have symptoms of illness. Abnormal Ingestic Call a physician at once. As first aid, induce vomiting, give milk and magnesium sulfate (Epsom Salt). External: Normal work day accumulations can be effectively cleansed with soap and water. Eyes: Use first aid procedure for dust.

Section VI — REACTIVITY DATA

STABILITY	UNSTABLE		CONDITIONS TO AVOID
	STABLE	X	

INCOMPATABILITY *(Materials to avoid)*: Can react vigorously with mineral acids

HAZARDOUS DECOMPOSITION PRODUCTS: Pb, PbO At high temperatures toxic fumes are emitted

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: Sweep carefully, wear gloves, goggles and respirato

WASTE DISPOSAL METHOD: Landfill or smelter. Disposal must be done in accordance with local, state, and federal regulations.

Section VIII — SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)*: Dust and/or fume respirator (Bureau of Mines Approved)

VENTILATION
- LOCAL EXHAUST: Ventilation provided as required by job condition to keep TLV liste in Section II below acceptable limits.
- MECHANICAL *(General)*:
- OTHER:

PROTECTIVE GLOVES: yes

EYE PROTECTION: goggles

OTHER PROTECTIVE EQUIPMENT: Change in work clothes

Section IX — SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING:

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OTHER PRECAUTIONS: Avoid dusting. P rsonnel must wear prescribed protective equipment.
Ground storage hoppers

June 11, 1973

Pr duct No.: LZ 0038

MATERIAL SAFETY DATA SHEET

SECTION I

Manufacturer's Name Kenrich Petrochemicals, Inc.	Emergency Telephone No. (201) 823-9000
Address 140 E. 22nd Street, Bayonne, NJ 07002-0032	Date of Preparation January 22, 1986
Chemical Name Zirconium IV neoalkanolato, tris(dioctyl) pyrophosphato-O	Trade Name Ken-React® LZ 38
Chemical Family Organo-Zirconate	Formula $ROZr[OP(O)(OH)OP(O)(OC_8H_{17}(_2]_3$

SECTION II - HAZARDOUS INGREDIENTS

Ingredient	CAS Registry No.	Nominal Percent	Threshold Limit Value (TLV-TWA)	Permissible Exposure Limit (PEL)
A) Ken-React LZ 38	Developmental	95	NE	NE
B) Isooctyl Alcohol	26952-21-6	LT 5	270 mg/M^3	NE
C) N-propylalcohol	71-23-8	LT 5	500 mg/M^3	NE

Hazard Classification - OSHA Health Hazard: Irritant
OSHA Physical Hazard: Combustible liquid

SECTION III - PHYSICAL DATA

	A	B	C
Boiling Point (°F):	345	361	207
Vapor Pressure (mm Hg.):	NE	5 @ 68°F	10 @ 57°F
Vapor Density (air = 1):	GT 1	4.5	2.07
Solubility in Water:	Negligible	Negligible	Miscible
Specific Gravity (H_2O = 1):	1.1	0.83	0.80
Percent Volatile by Weight @ 77°F:	5	50	100
Evaporation Rate (H_2O = 1):	LT 1	LT 1	GT 1

Appearance and Odor: Reddish liquid, fatty odor

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used):	Flammable Limits LEL	UEL
(TCC) 170°F	NE	NE

Extinguishing Media: Foam (X), Dry Chem. ( ), CO_2 (X), Water Spray ( )
Special Fire Fighting Procedures: Wear self contained breathing apparatus with a full facepiece operated in a pressure demand mode. Also, wear full protective clothing.
Unusual Fire and Explosion Hazards: None known

SECTION V - HEALTH HAZARD DATA

Threshold Limit Value: NE
Effects of Overexposure: Irritant to skin, eyes and respiratory tract. Harmful if swallowed. Avoid all direct contact with this material.

NA = Not Applicable/NE = Not Established/UNK = Unknown/LT = Less Than/GT = Greater Than
APX = Approximate
(Essentially similar to OSHA-20 Form)

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SECTION V - HEALTH HAZARD DATA (continu d)

Emergency and First Aid Procedures:
External Contact: Wash thoroughly with soap and water. Consult a physician.
Eye Contact: Flush with water for 15 minutes - consult a physician.
Ingestion: Immediately consult a physician, before taking any action.
Inhalation: Remove to uncontaminated area - consult a physician.

SECTION VI - REACTIVITY DATA

Stability: Unstable ( ) Stable (X)
Conditions to Avoid: Contact with alkaline materials, amines.

Incompatibility (materials to avoid): Alkaline materials, amines

Hazardous Decomposition Products: Oxides of carbon, phosphorous, possibly phosphoric acid if decomposed in the presence of water.

Hazardous Polymerization: May Occur ( ) Will Not Occur (X)
Conditions to Avoid: NA

SECTION VII - SPILL OR LEAK PROCEDURES

Steps to be taken in Case Material is Released or Spilled: Collect and place in an appropriate disposal container. Use proper safety equipment when handling this material. Prevent entry to surface and ground waters. Promptly remove any contaminated soils.

Waste Disposal Method: Dispose of in accordance with applicable Federal, State and local regulations.

SECTION VIII - SAFE HANDLING AND USE INFORMATION

Respiratory Protection: NIOSH/MSHA approved vapor respirator.

Ventilation: Local Exhaust (required) Mechanical (required)
Protective Gloves: Polyolefin
Eye Protection: Safety Goggles
Hygenic Practices: Wash thoroughly before eating, smoking, applying cosmetics, etc. Thoroughly launder work clothing before reuse.
Other Protective Equipment: Eye bath, safety shower

SECTION IX - SPECIAL PRECAUTIONS

Precautions to be taken in Handling and Storing:
Store containers closed in a cool dry place.

Other Precautions: pH of 5% solution of Ken-React LZ 38 in H_2O APX 3.

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January 29, 1986

KENRICH PETROCHEMICALS, INC.

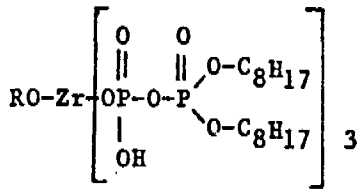
KEN-REACT ZIRCONATE COUPLING AGENT

LZ 38

PRODUCT DATA SHEET

Chemical Description: Zirconium IV neoalkanolato, tris(dioctyl) pyrophosphato-O

Chemical Structure:



Zirconate Type: Neoalkoxy modified monoalkoxy

Typical Properties:

Physical Form	Liquid
Solids, %	95
Color, descriptive Gardner	Transparent, Reddish 4
Viscosity, cps @ 77°F (25°C)	360
Specific Gravity @ 77°F (16°C)	1.10
Flash Point, °F (TCC)	170
Initial Boiling Pt., °F, ASTM	345
Ph (saturated solution)	6
Solubility	Isopropanol - Soluble Xylene - Soluble Toluene - Soluble DOP - Soluble Mineral Oil - Insoluble (<1%) Water - Insoluble (<1%)

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Emulsification Technique(s): (E_1) Add 2% nonyl phenol ethoxylate
(Q_1) Solubilized by reaction with excess DMAMP-80

140 EAST 22nd STREET . P.O. BOX 32 . BAYONNE, N.J. 07002-0032 Telephone: (201) 823-9000 TELEX 12-5023

NEOALKOXY ZIRCONATES

Tetrafunctional organometallic compounds based on titanium (Ti), silicone (Si) and Zirconium (Zr) make useful coupling agents because the central metal's tetravalency is conducive to electron sharing. Titanium ester derived coupling agents have an advantage in their relative ease of manufacture and molecule building as compared to organosilanes, thus providing specific function for a wide scope of composite applications.

However, titanium acts as a reducing agent in the presence of peroxide. Peroxide free radicals are thereby eliminated and cure efficiency is diminished as Ti^{+4} is reduced to Ti^{+3}. On the other hand, Zn^{+4} is an activator for peroxide resulting in a frequently desirable acceleration of peroxide and air-based cures - the basis for many thermoset and coatings systems.

Since zirconates are not as active Lewis acids as titanates, they have less of a catalytic effect in urethane systems and, therefore, may prove useful as cure rate independent rheology modifiers.

Another area of concern in using titanates is the possibility of undesirable color formation experienced when they come in contact with additives containing phenolic functionality. Phenolic functionality is encountered in the form of: heat and light stabilizers (antioxidants) used in thermoplastic vinyl and polyolefin systems, alkyds and urethanes. Phenolics are also used as chain stops in polyester systems, urethanes, alkyds and acrylics. Zirconates in general are not color body producers in contact with phenols other than nitrophenols.

Both organotitanate and organozirconate coupling agents as produced by Kenrich do not interact with hindered amines (light stabilizers and/or antioxidants - HALS) under common operating conditions.

Zirconium chemistry provides a functional equivalent alternative to silanes and titanates in these instances. Heretofore, organozirconates have been restricted in availability because of their high cost. Kenrich has now overcome the cost hurdle through proprietary (patents applied for) manufacturing techniques and is able to supply these materials at commercially realistic prices.

The neoalkoxy zirconates LZ 01, LZ 09, LZ 12, LZ 38 and LZ 44 are parallel organofunctional materials to neoalkoxy titanates LICA 01, LICA 09, LICA 12, LICA 38 and LICA 44. Also, since the aliphatic amine functional KR 44 and LICA 44 titanates have been so successful in adhesive applications, LZ 97, an aromatic amine functional zirconate as well as LZ 44 was developed.

Reactive Substrates: Minerals, silicas, silicates, metals-oxides, peroxides, hydrates, acetates, borates, sulfates, carbonates, nitrates, carbon black, graphite, aramid, pigments, cellulosics, sulfur, azodicarbonamide, polymers, etc.

Amounts to Use: Zirconate use level can vary from ppm when used as a catalyst to 10% of formulation when used as a comonomer. A general rule of thumb is to use 0.2% by weight of polymer or 0.2% to 0.5% by weight of filler, whichever is the greater. Typically, a 2.7 Sp. Gr., 2.5 micron mineral filler such as $CaCO_3$ will require 0.2% to 0.4% zirconate by weight of $CaCO_3$. 0.1% to 0.5% is a good range for ladder studies.

Suggested Applications: See Neoalkoxy Zirconate (LZ) Selection Tables for Coatings, Thermoset Polymers and Elastomers as listed in the Ken-React Reference Manual, Bulletin KR-1084L.

Product No.: LZ 0044

MATERIAL SAFETY DATA SHEET

SECTION I

Manufacturer's Name	Emergency Telephone No.
Kenrich Petrochemicals, Inc.	(201) 823-9000
Address	**Date of Preparation**
140 E. 22nd Street, Bayonne, NJ 07002-0032	January 24, 1986
Chemical Name	**Trade Name**
Zirconium IV neoalkanolato, tris(2-ethylene-diamino-ethanolato)	Ken-React® LZ 44
Chemical Family	**Formula**
Organo-Zirconate	$ROZr(OC_2H_4NHC_2H_4NH_2)_3$

SECTION II - HAZARDOUS INGREDIENTS

Ingredient	CAS Registry No.	Nominal Percent	Threshold Limit Value (TLV-TWA)	Permissible Exposure Limit (PEL)
A) Ken-React LZ 44	P86-358	95	NE	NE
B) N-propylalcohol	71-23-8	LT 5	500 mg/M^3	NE
C) 2-ethylenediaminoethenol	111-41-1	LT 5	NE	NE

Hazard Classification - OSHA Health Hazard: Irritant
OSHA Physical Hazard: NA

SECTION III - PHYSICAL DATA

	A	B	C
Boiling Point (°F):	300	207	470
Vapor Pressure (mm Hg.):	NE	10 @ 57°F	LT 0.01
Vapor Density (air = 1):	GT 1	2.07	3.6
Solubility in Water:	Negligible	Miscible	100%
Specific Gravity (H_2O = 1):	1.17	0.8	1.03
Percent Volatile by Weight @ 77°F:	5	100	0
Evaporation Rate (H_2O = 1):	LT 1	GT 1	LT 1

Appearance and Odor: Yellow liquid, amine odor.

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used):	Flammable Limits LEL	UEL
(TCC) GT 200°F	NE	NE

Extinguishing Media: Foam (X), Dry Chem. (X), CO_2 (X), Water Spray (X)
Special Fire Fighting Procedures: Wear self contained breathing apparatus with a full facepiece operated in a pressure demand mode. Also, wear full protective clothing.
Unusual Fire and Explosion Hazards: Direct water stream may cause frothing.

SECTION V - HEALTH HAZARD DATA

Threshold Limit Value: NE
Effects of Overexposure: Irritating to skin, eyes and respiratory tract. Harmful if swallowed. Avoid all contact with this material.

NA = Not Applicable/NE = Not Established/UNK = Unknown/LT = Less Than/GT = Greater Than
≈ = Approximate
(Essentially similar to OSHA-20 Form)

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SECTION V - HEALTH HAZARD DATA (continued)

Emergency and First Aid Procedures:
External Contact: Wash thoroughly with soap and water. Consult a physician.
Eye Contact: Flush with water for 15 minutes - consult a physician.
Ingestion: Immediately consult a physician, before taking any action.
Inhalation: Remove to uncontaminated area - consult a physician.

SECTION VI - REACTIVITY DATA

Stability: Unstable ( ) Stable (X)
Conditions to Avoid: Contact with acids.

Incompatibility (materials to avoid): Acids

Hazardous Decomposition Products: Oxides of carbon and nitrogen, ammonia, oxides of zirconium

Hazardous Polymerization: May Occur ( ) Will Not Occur (X)
Conditions to Avoid: NA

SECTION VII - SPILL OR LEAK PROCEDURES

Steps to be taken in Case Material is Released or Spilled: Collect and place in an appropriate disposal container. Use proper safety equipment when handling this material. Prevent entry to surface and ground waters. Promptly remove any contaminated soils.

Waste Disposal Method: Dispose of in accordance with applicable Federal, State and local regulations.

SECTION VIII - SAFE HANDLING AND USE INFORMATION

Respiratory Protection: NIOSH/MSHA approved organic vapor respirator.

Ventilation: Local Exhaust (required) Mechanical (required)
Protective Gloves: Polyolefin
Eye Protection: Safety Goggles
Hygenic Practices: Wash thoroughly before eating, smoking, applying cosmetics, etc. Thoroughly launder work clothing before reuse.
Other Protective Equipment: Eye bath, safety shower

SECTION IX - SPECIAL PRECAUTIONS

Precautions to be taken in Handling and Storing:
Store containers closed in a cool dry place.

Other Precautions: pH of 5% solution of LZ 44 in H_2O APX 11. Avoid all direct contact with this product.

WHILE THE INFORMATION ACCUMULATED AND SET FORTH HEREIN IS BELIEVED TO BE ACCURATE AS OF THE DATE HEREOF, KENRICH PETROCHEMICALS, INC. MAKES NO WARRANTY WITH RESPECT THERETO AND DISCLAIMS ALL LIABILITY FROM RELIANCE THEREON. THE INFORMATION CONTAINED HEREIN WAS COMPILED IN ACCORDANCE WITH APPLICABLE FEDERAL REGULATIONS AND MAY BE BASED UPON INFORMATION PROVIDED BY OUR SUPPLIERS.

January 29, 1986

KENRICH PETROCHEMICALS, INC.

KEN-REACT ZIRCONATE COUPLING AGENT

LZ 44

PRODUCT DATA SHEET

Chemical Description:	Zirconium IV neoalkanolato, tris(2-ethylene-diamino-O) ethanolato-O
Chemical Structure:	$RO\text{-}Zr[OC_2H_4\text{-}NH\text{-}C_2H_4\text{-}NH_2]_3$
Zirconate Type:	Neoalkoxy modified monoalkoxy
Typical Properties:	
Physical Form	Liquid
Solids, %	95
Color, descriptive Gardner	Transparent (tentative) 13
Viscosity, cps @ 77°F (25°C)	≤1000
Specific Gravity @ 77°F (16°C)	1.17
Flash Point, °F (TCC)	≥200
Initial Boiling Pt., °F, ASTM	300
Ph (saturated solution)	11
Solubility	Isopropanol - Soluble Xylene - Limited (<5%) Toluene - Limited (<5%) DOP - Reacts Mineral Oil - Insoluble (<1%) Water - Insoluble (<1%)
Emulsification Technique(s):	(E_1) Add 2% nonyl phenol ethoxylate

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NEOALKOXY ZIRCONATES

Tetrafunctional organometallic compounds based on titanium (Ti), silicone (Si) and Zirconium (Zr) make useful coupling agents because the central metal's tetravalency is conducive to electron sharing. Titanium ester derived coupling agents have an advantage in their relative ease of manufacture and molecule building as compared to organosilanes, thus providing specific function for a wide scope of composite applications.

However, titanium acts as a reducing agent in the presence of peroxide. Peroxide free radicals are thereby eliminated and cure efficiency is diminished as Ti^{+4} is reduced to Ti^{+3}. On the other hand, Zn^{+4} is an activator for peroxide resulting in a frequently desirable acceleration of peroxide and air-based cures - the basis for many thermoset and coatings systems.

Since zirconates are not as active Lewis acids as titanates, they have less of a catalytic effect in urethane systems and, therefore, may prove useful as cure rate independent rheology modifiers.

Another area of concern in using titanates is the possibility of undesirable color formation experienced when they come in contact with additives containing phenolic functionality. Phenolic functionality is encountered in the form of: heat and light stabilizers (antioxidants) used in thermoplastic vinyl and polyolefin systems, alkyds and urethanes. Phenolics are also used as chain stops in polyester systems, urethanes, alkyds and acrylics. Zirconates in general are not color body producers in contact with phenols other than nitrophenols.

Both organotitanate and organozirconate coupling agents as produced by Kenrich do not interact with hindered amines (light stabilizers and/or antioxidants - HALS) under common operating conditions.

Zirconium chemistry provides a functional equivalent alternative to silanes and titanates in these instances. Heretofore, organozirconates have been restricted in availability because of their high cost. Kenrich has now overcome the cost hurdle through proprietary (patents applied for) manufacturing techniques and is able to supply these materials at commercially realistic prices.

The neoalkoxy zirconates LZ 01, LZ 09, LZ 12, LZ 38 and LZ 44 are parallel organofunctional materials to neoalkoxy titanates LICA 01, LICA 09, LICA 12, LICA 38 and LICA 44. Also, since the aliphatic amine functional KR 44 and LICA 44 titanates have been so successful in adhesive applications, LZ 97, an aromatic amine functional zirconate as well as LZ 44 was developed.

Reactive Substrates:	Minerals, silicas, silicates, metals-oxides, peroxides, hydrates, acetates, borates, sulfates, carbonates, nitrates, carbon black, graphite, aramid, pigments, cellulosics, sulfur, azodicarbonamide, polymers, etc.
Amounts to Use:	Zirconate use level can vary from ppm when used as a catalyst to 10% of formulation when used as a comonomer. A general rule of thumb is to use 0.2% by weight of polymer or 0.2% to 0.5% by weight of filler, whichever is the greater. Typically, a 2.7 Sp. Gr., 2.5 micron mineral filler such as $CaCO_3$ will require 0.2% to 0.4% zirconate by weight of $CaCO_3$. 0.1% to 0.5% is a good range for ladder studies.
Suggested Applications:	See Neoalkoxy Zirconate (LZ) Selection Tables for Coatings, Thermoset Polymers and Elastomers as listed in the Ken-React Reference Manual, Bulletin KR-1084L.

Product No.: LZ 0097

MATERIAL SAFETY DATA SHEET

SECTION I

Manufacturer's Name
Kenrich Petrochemicals, Inc.

Emergency Telephone No.
(201) 823-9000

Address
140 E. 22nd Street, Bayonne, NJ 07002-0032

Date of Preparation
April 16, 1986

Chemical Name
Zirconium IV neoalkanolato, tris(3-amino) phenolato-O

Trade Name
Ken-React® LZ 97

Chemical Family
Organo-Zirconate

Formula
$ROZr(OC_6H_4NH_2\text{-}m)_3$

SECTION II - HAZARDOUS INGREDIENTS

Ingredient	CAS Registry No.	Nominal Percent	Threshold Limit Value (TLV-TWA)	Permissible Exposure Limit (PEL)
A) Ken-React LZ 97	Developmental	67	NE	NE
B) N-propyl alcohol	71-23-8	LT 5	500 mg/M^3	NE
C) 3-amino phenol	59127-5	LT 5	NE	NE

Hazard Classification - OSHA Health Hazard: Not a skin irritant. However, in the absence o eye irritation testing, this product must b considered a potential eye irritant.

OSHA Physical Hazard: NA

SECTION III - PHYSICAL DATA

	A	B	C
Boiling Point (°F):	300	207	327 @ 11mmH_g
Vapor Pressure (mm Hg.):	NE	10 @ 27°F	UNK
Vapor Density (air = 1):	GT 1	2.07	UNK
Solubility in Water:	5%	Miscible	Soluble
Specific Gravity (H_2O = 1):	1.25	0.8	UNK
Percent Volatile by Weight @ 77°F:	5	100	NA
Evaporation Rate (H_2O = 1):	LT 1	GT 1	LT 1

Appearance and Odor: Brown liquid, phenolic odor

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

Flash Point (Method Used):	Flammable Limits LEL	UEL
(TCC) 210°F	NE	NE

Extinguishing Media: Foam (X), Dry Chem. ( ), CO_2 (X), Water Spray ( )

Special Fire Fighting Procedures: Wear self contained breathing apparatus with a full facepiece operated in a pressure demand mode. Also, wear full protective clothing.

Unusual Fire and Explosion Hazards: None known

SECTION V - HEALTH HAZARD DATA

Threshold Limit Value: NE

Effects of Overexposure: Not a skin irritant according to OSHA Standard 29 CFR 1910.120 However, may irritate eyes and respiratory tract. May be harmful if swallowed.

NA = Not Applicable/NE = Not Established/UNK = Unknown/LT = Less Than/GT = Greater Than
APX = Approximate
(Essentially similar to OSHA-20 Form)

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SECTION V - HEALTH HAZARD DATA (continued)

Emergency and First Aid Procedures:
External Contact: Wash thoroughly with soap and water. Consult a physician.
Eye Contact: Flush with water for 15 minutes - consult a physician.
Ingestion: Immediately consult a physician, before taking any action.
Inhalation: Remove to uncontaminated area - consult a physician.

SECTION VI - REACTIVITY DATA

Stability: Unstable ( ) Stable (X)
Conditions to Avoid: Strong acids.

Incompatibility (materials to avoid): Strong acids.

Hazardous Decomposition Products: Oxides of carbon, nitrogen, ammonia

Hazardous Polymerization: May Occur ( ) Will Not Occur (X)
Conditions to Avoid: NA

SECTION VII - SPILL OR LEAK PROCEDURES

Steps to be taken in Case Material is Released or Spilled: Collect and place in an appropriate disposal container. Use proper safety equipment when handling this material. Prevent entry to surface and ground waters. Promptly remove any contaminated soils.

Waste Disposal Method: Dispose of in accordance with applicable Federal, State and local regulations.

SECTION VIII - SAFE HANDLING AND USE INFORMATION

Respiratory Protection: NIOSH/MSHA approved organic respirator. If large amounts of vapor are present, a full face piece with supplied air is necessary.

Ventilation: Local Exhaust (required) Mechanical (required)
Protective Gloves: Polyolefin
Eye Protection: Safety Goggles for small quantities. If large quantities of vapor are generated, a full facepiece with supplied aire is necessary.
Hygenic Practices: Wash thoroughly before eating, smoking, applying cosmetics, etc. Thoroughly launder work clothing before reuse.
Other Protective Equipment: Eye bath, safety shower

SECTION IX - SPECIAL PRECAUTIONS

Precautions to be taken in Handling and Storing:
Store containers closed in a cool dry place.

Other Precautions: pH of 5% solution of LZ 97 in H_2O APX 8.

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KRONITEX(R) 100
TRIISOPROPYLATED PHENYL PHOSPHATE

NFPA Designation 704

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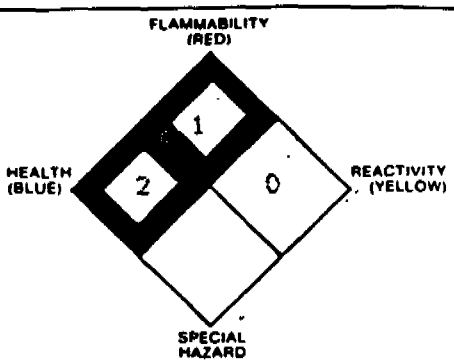

EMERGENCY TELEPHONE NUMBERS
CHEMTREC (800) 424-9300
MEDICAL (303) 595-9048 CALL COLLECT
OTHER (304) 755-6300 CALL COLLECT

REVISION: 08	EFFECTIVE: 03/13/90 PRINTED: 08/20/90
PREPARED FOR USE BY.....	C.P. HALL COMPANY 7300 S. CENTRAL CHICAGO IL 60638
==========	**IDENTIFICATION** ==========
INFORMATION PROVIDED BY..:	FMC CORPORATION 2000 MARKET STREET PHILADELPHIA, PA 19103
==========	**PRODUCT INFORMATION** ==========
SYNONYMS.....:	MIXED ISOPROPYLPHENYL PHENYL PHOSPHATE
SHIPPING NAME - DOT.....:	KRONITEX(R) TRIARYL PHOSPHATE
IATA.....:	KRONITEX(R) TRIARYL PHOSPHATE
IMCO.....:	KRONITEX(R) TRIARYL PHOSPHATE
FORMULA.....:	(RO)3PO
CHEMICAL FAMILY.....:	ORGANOPHOSPHATE
PRODUCT USES.....:	FLAME RETARDANT PLASTICIZER; CATALYST CARRIER AND PIGMENT VEHICLE FOR POLYURETHANES; PROCESSING AID, PLASTICIZER AND FLAME RETARDANT IN RUBBIR BELTING.
==========	**PRECAUTIONARY INFORMATION** ==========
PRECAUTIONARY STATEMENT..: (PLEASE USE THIS STATEMENT TO SATISFY THE IN-PLANT LABELING REQUIREMENTS OF THE OSHA HAZARD COMMUNICATIONS STANDARD 29CFR 1910.1200)	HEALTH: MIST GENERATED BY HEAT,VIOLENT AGITATION OR SPRAYING WILL IRRITATE EYES,NOSE,& THROAT. CONTINUOUS CONTACT WITH LIQUID WILL IRRITATE SKIN. LONG AND CONTINUOUS CONTACT WITH THE LIQUID OR MIST MAY EFFECT THE NERVOUS SYSTEM. PRODUCT PRESENTAS A NEGLIGIBLE HAZARD TO HEALTH DURING NORMAL HANDLING EXCEPT AT ELEVATED TEMPATURES & CONTINUOUS/PROLONGED CONTACT WITH SKIN. PHYSICAL: NO SIGNIFICANT HAZARD EXCEPT IN FIRE CONDITIONS WHERE PHOSPHORUS OXIDE GASES ARE EMITTED.

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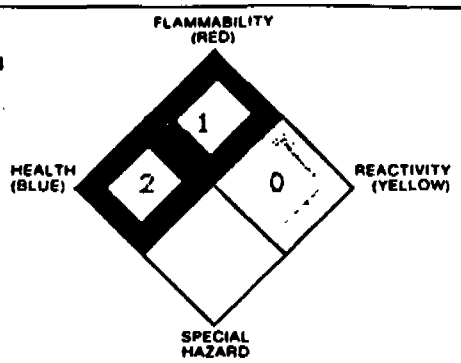

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==========	INGREDIENTS ==========
CAS# AND COMPONENT.....:	MATERIAL/COMPONENT: CAS NO. PHENOL, ISOPROPYLATED, PHOSPHATE (3-1) 68937-41-7 TRIPHENYL PHOSPHATE 115-86-6
CANADIAN PRODUCT IDENTIFICATION NUMBER....:	3018 FOR ORGANIC PHOSPHATES, LIQUID.
==========	PHYSICAL DATA ==========
MELTING/FREEZING POINT...:	< -40*C
BOILING POINT.....:	@ 4MM HG 220-270*C (428-518*F)
VAPOR PRESSURE.....:	0.26MM HG @ 150*C (320*F)
VAPOR DENSITY (AIR = 1)..:	ABOVE 1.0
ROOM TEMPERATURE APPEARANCE AND STATE:	CLEAR LIQUID
ODOR.....:	ODORLESS
SPECIFIC GRAVITY (H2O =1):	20*/20*1.150-1.165
SOLUBILITY IN H2O % BY WT:	INSOLUBLE
% VOLATILES BY VOLUME....:	NIL
EVAPORATION RATE (BUTYL ACETATE = 1).:	NOT APPLICABLE
PH (AS IS).....:	NOT APPLICABLE
PH (1% SOLUTION).....:	NOT APPLICABLE
ODOR THRESHOLD.....:	NOT APPLICABLE
DENSITY (GMS/ML).....:	1.15-1.17
COEFF. WATER/OIL DIST....:	NOT AVAILABLE

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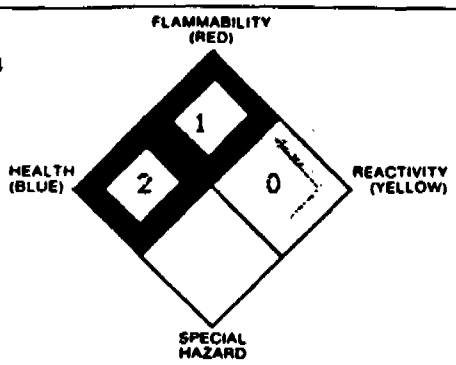

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==========	FIRE, EXPLOSION AND REACTIVITY DATA ==========
FLASH POINT.....:	PMCC 198*C(388*F)SETAFLASH 242*C(468*F)
AUTOIGNITION TEMPERATURE.:	551*C (1024*F)
FLAMMABLE LIMITS UPPER..:	NOT AVAILABLE
(AIR) LOWER..:	NOT AVAILABLE
EXTINGUISHING MEDIA.....:	WATER FOG, CO2, DRY CHEMICAL, MULTIPURPOSE FOAM
SPECIAL FIREFIGHTING.....: PROCEDURES	FOR FIRES INVOLVING THIS MATERIAL, WEAR FULL PROTECTIVE CLOTHING, INCLUDING NIOSH APPROVED SELF-CONTAINED BREATHING APPARATUS. DO NOT ENTER ANY ENLCOSED OR CONFINED FIRE SPACE WITHOUT NIOSH APPROVED SELF-CONTAINED BREATHING APPARATUS. SEE SECTION ON HAZARDOUS DECOMPOSTION PRODUCTS FOR DECOMPOSITON PRODUCTS.
DEGREE OF FIRE AND .....: EXPLOSION HAZARD	SLIGHTLY COMBUSTIBLE. NO EXPLOSION HAZARD.
STABILITY.....:	STABLE
HAZARDOUS POLYMERIZATION.:	WILL NOT OCCUR.
CONDITIONS TO AVOID.....:	PROTECT AGAINST PHYSICAL DAMAGE. STORE IN COOL, WELL VENTILATED AREA.
MAJOR CONTAMINANTS THAT..: CONTRIBUTE TO INSTABILITY	NONE
INCOMPATIBILITY.....:	NONE
HAZARDOUS DECOMPOSITION..: PRODUCTS	UNDER FIRE CONDITONS TOXIC ACIDIC VAPORS MAY BE FORMED FROM PHOSPHORUS OXIDE.
SENSITIVITY TO MECH.....: IMPACT	NONE
SENSITIVITY TO STATIC....: DISCHARGE	NONE
==========	ROUTES OF EXPOSURE ==========
EYE CONTACT.....:	SOURCE DATE
	NON IRRITATING (RABBIT) FMC 1976
	REF:ICD/T-086/024
SKIN CONTACT.....:	NON-IRRITATING (RABBIT) FMC 1976
	REF:ICD/T-076/024
SKIN ABSORPTION.....:	NO SIGNIFICANT HAZARD FMC 1976
	DERMAL LD50 ABOVE 10G/KG RABBIT
	REF:ICD/T-076/024

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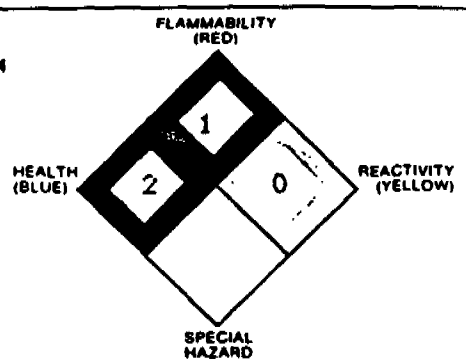

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==========	**ROUTES OF EXPOSURE** ==========	
INHALATION.....:	INH(RAT)LC50 ABOVE 200MG/L NO SIGNIFICANT HAZARD REF:ICD/T-076/024	FMC 1976
INGESTION.....:	NO SIGNIFICANT HAZARD ORAL LD50 ABOVE 20G/KG (RATS) REF: ICD/T-076/024	FMC 1976
==========	**EXPOSURE LIMITS** ==========	
	THE TWA AIR LIMIT FOR TRIPHENYL PHOSPHATE IS 3 MG/CU M.; KRONITEX-100 CONTAINS ABOUT 15% TRIPHENYL PHOSPHATE BY GC ANALYSIS.	
==========	**EFFECTS OF OVEREXPOSURE** ==========	
ACUTE EXPOSURE.....:	BREATHING OR SWALLOWING LARGE QUANTITIES MAY CAUSE NEUROLOGICAL DISTURBANCES WHICH MAY PROGRESS TO DELAYED NEUROTOXICITY CHARACTERIZED BY ATAXIA. MAY ALSO BE IRRITATING TO SKIN, RESPIRATORY SYSTEM, MUCOUS MEMBRANES AND EYES. SEE EMERGENCY AND FIRST AID PROCEDURES AND NOTES TO PHYSICIAN.	
CHRONIC EXPOSURE.....: (EFFECTS CONSIDERED INCLUDE: SENSITIVITIES, CARCINOGENICITY, TERATOGENICITY, MUTAGENICITY, SYNERGISTIC PRODUCTS, AND ANY MEDICAL CONDITIONS GENERALLY RECOGNIZED AS BEING AGGRAVATED BY EXPOSURE.)	MAY CAUSE IRRITATION TO SKIN, MUCOUS MEMBRANES, RESPIRATORY SYSTEM AND EYES. REPEATED EXPOSURE OVER PROLONGED PERIOD OF TIME MAY CAUSE NEUROLOGICAL DISTURBANCES WHICH MAY PROGRESS TO DELAYED NEUROTOXICITY CHARACTERIZED BY ATAXIA. SEE EMERGENCY AND FIRST AID PROCEDURES AND NOTE TO PHYSICIAN. FOLLOW GOOD INDUSTRIAL HYGIENE PRACTICES AND OBSERVE THE SPECIAL PROTECTION INFORMATION TO AVOID EXPOSURES. NOTE: EPIDEMEOLOGY STUDIES COMPLETED IN 1977 AND 1985 OF CURRENT AND FORMER WORKERS AT THE FMC PLANT WHERE KRONITEX, DURAD, NATURAL AND SYNTHETIC TRIARYL PHOSPHATE ESTERS ARE MANUFACTURED HAVE NOT DEMONSTRATED ANY UNUSUAL PATTERN OF MORTALITY OR DISEASE.	

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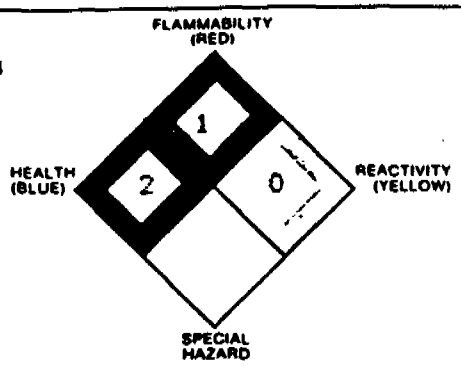

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==========	**EMERGENCY AND FIRST AID PROCEDURES** ==========
EYES.....:	IF EYE EXPOSURE OCCURS, IMMEDIATELY FLOOD WITH LARGE AMOUNTS OF TAP WATER, PREFERABLY TEPID, FOR AT LEAST 15 MINUTES. SEE A PHYSICIAN.
SKIN.....:	REMOVE CONTAMINATED CLOTHING IMMEDIATELY AND WASH SKIN THOROUGHLY WITH SOAP AND WATER. AVOID FURTHER CONTACT. IF COMPLICATIONS DEVELOP, CALL A PHYSICIAN.
INHALATION.....:	REMOVE TO FRESH AIR.IF SUBJECT HAS DIFFICULTY BREATHING, ADMINISTER OXYGEN.IF COMPLICATIONS DEVELOP, TREAT SYMPTOMATICALLY AND CALL A PHYSICIAN.
INGESTION.....:	IF SWALLOWED, IMMEDIATELY DILUTE CONTAMINANT BY DRINKING A PINT OF TEPID TAP WATER. THEN INDUCE VOMITING BY EITHER TICKLING THE BACK OF THE THROAT WITH THE FINGERS OR BY TAKING AN EMETIC,IE. SOAPY TEPID TAP WATER, POWDERED MUSTARD IN WATER, OR SYRUP OF IPECAC. NOTE: DO NOT INDUCE VOMITING OR GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.
DECONTAMINATION PROCEDURE:	REMOVE CONTAMINATED CLOTHING IMMEDIATELY. WASH SKIN THOROUGHLY WITH SOAP AND WATER.
NOTES TO PHYSICIAN.....:	MAY BE IRRITATING TO SKIN, MUCOUS MEMBRANES, RESPIRATORY SYSTEM AND EYES. CONTAMINATED EYES SHOULD BE IMMEDIATELY FLOODED WITH TAP WATER, PREFERABLY TEPID. SKIN SHOULD BE WASHED THOROUGHLY WITH SOAP AND WATER. EYE CONTACT SHOULD RECEIVE OPHTHALMOLOGIC EVALUATION IF COMPLICATIONS DEVELOP. TREATMENT OF ANY TOXICITY SHOULD BE SYMPTOMATIC AND SUPPORTIVE AFTER TERMINATING EXPOSURE THROUGH ABOVE MEANS, OR IN CASE OF INGESTION, GASTRIC EVACUATION VIA EMESIS INDUCTION OR GASTRIC LAVAGE.

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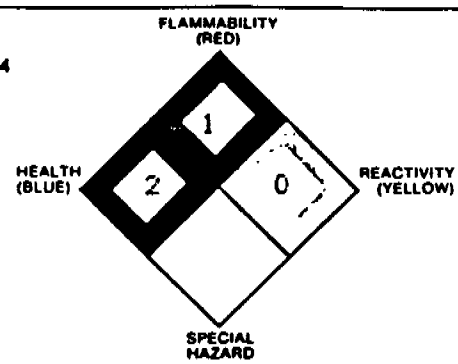

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EMERGENCY AND FIRST AID PROCEDURES

HUMAN SYSTEMIC TOXICITY INFORMATION IS UNAVAILABLE, BUT EXPECTED TO BE LOW. IMPORTANTLY STRUCTURE-ACTIVITY RELATIONSHIPS SUGGEST THE ABSENCE OF APPRECIABLE ANTICHOLINESTERASE ACTIVITY SUCH AS POSSESSED BY STRUCTURALLY DISSIMILAR ORGANIC PHOSPHATES. NEUROLOGICAL EVALUATION OF WORKERS, WHERE NO SIGNIFICANT DIFFERENCES WERE DEMONSTRATED BETWEEN TRIARYL PHOSPHATE ESTERS EXPOSED AND CONTROL POPULATIONS, SUPPORTS THIS CONCLUSION.(1) EXPOSURE TO HUMANS HAS BEEN SHOWN TO RESULT IN A SLIGHT INHIBITATION OF MONOCYTE NON-SPECIFIC ESTERASE. THE CLINICAL SIGNIFICANCE OF THIS FINDING HAS NOT BEEN DETERMINED.(2)
SYNTHETIC TRIARYL PHOSPHATE ESTERS, AS TYPIFIED BY KRONITEX(R) 100, ARE MADE FROM CAREFULLY CONTROLLED MIXTURES OF ISOPROPYLPHENOLS AND PHENOLS.INTRODUCED IN EUROPE IN THE MID 60'S AND IN THE UNITED STATES IN 1969, KRONITEX(R) SYNTHETIC TRIARYL PHOSPHATE ESTERS ARE WIDELY USED IN A VARIETY OF INDUSTRIAL APPLICATIONS. THEY HAVE A HISTORY OF EVENT FREE MANUFACTURE, AND THERE ARE NO REPORTED INSTANCES OF TOXIC PROBLEMS.
STANDARD TEST PROTOCOLS USING RODENTS FOR ACUTE ORAL, INHALATION, AND SKIN TOXICITY REVEAL KRONITEX(R) SYNTHETIC TRIARYL PHOSPHATE ESTERS TO BE OF NO SIGNIFICANT HAZARD (NIOSH RECOMMEND-

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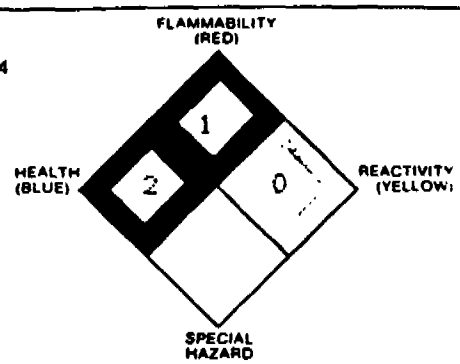

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	ED RATING SYSTEM). THESE PRODUCTS ARE NOT CORROSIVE OR SUFFICIENTLY IRRITATING TO BE CLASSIFIED IRRITANT UNDER FHSLA. PROLONGED OR REPEATED EYE OR SKIN EXPOSURE CAN CAUSE MILD IRRITATION AND SHOULD BE AVOIDED. HUMAN PANEL TESTS HAVE SHOWN SUCH PRODUCTS TO BE NON-IRRITATING AND NON-SENSITIZING. BASED ON AMES TEST, SYNTHETIC TRIARYL PHOSPHATE ESTERS ARE NON-MUTAGENIC. NEUROTOXICITY OF A TYPE DIFFERENT THAN CHOLINESTERASE INHIBITION (SEE CHRONIC EXPOSURE DATA) HAS BEEN IDENTIFIED AND ASSOCIATED WITH CERTAIN TRIARYL PHOSPHATES FOR MANY YEARS. EXTENSIVE STUDIES CONDUCTED IN EUROPE AND IN THIS COUNTRY HAVE PINPOINTED THE EFFECTIVE NEUROTOXIC DOSE (ED50) OF THESE PRODUCTS. THE ED50 IS NOT A LETHAL DOSE, BUT RATHER A DOSE AT WHICH CLINICAL SIGNS OF ATAXIA ARE APPARENT IN 50% OF THE TEST ANIMALS(HENS). THE MINIMAL NEUROTOXIC POTENTIAL OF KRONITEX(R) SYNTHETIC TRIARLY PHOSPHATE ESTERS IS SEEN IN THE HIGH ACUTE ED50 OF 4,000-8,000 MG/KG. (1)FMC-MJ REAPE THESIS MARCH 19822 (2)FMC-NITRO INTERNAL STUDY 1984	
==========	**SPECIAL PROTECTION** ==========	
VENTILATION REQUIREMENTS.:	USE IN VENTILATED AREAS.	
RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT RESPIRATORY.....:	SEE BELOW IN HIGH TEMPERATURE APPLICATIONS OR EXPOSURE TO MISTING, USE NIOSH CERTIFIED ORGANIC VAPOR CARTRIDGE. USE NIOSH RESPIRATOR AND SELF-CONTAINED BREATHING APPARATUS IN EMERGENCY SITUATIONS.	

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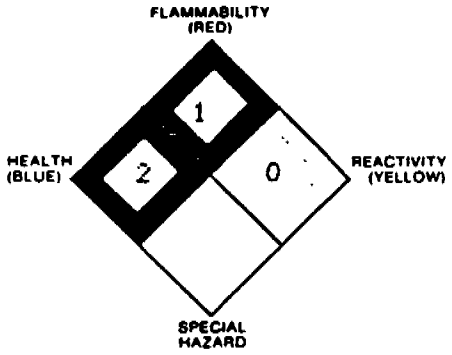

EMERGENCY TELEPHONE NUMBERS
CHEMTREC (800) 424-9300
MEDICAL (303) 595-9048 CALL COLLECT
OTHER (304) 755-6300 CALL COLLECT

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==========	**SPECIAL PROTECTION** ==========
EYES.....:	CHEMICAL SAFETY GOGGLES.
GLOVES.....:	RUBBER NON-PERMEABLE GLOVES.
SPECIAL CLOTHING..: AND EQUIPMENT	WHEN DIRECT CONTACT ON SKIN IS EXPECTED, RUBBER OR OTHER IMPERVIOUS COVERALLS OR SUITS AND BOOTS SHOULD BE WORN.
FOOTWEAR.....:	NO SPECIAL REQUIREMENT
==========	**STORAGE AND HANDLING** ==========
(PLEASE USE THIS STATEMENT TO SATISTY THE IN-PLANT LABELING REQUIREMENTS OF THE OSHA HAZARD COMMUNICATIONS STANDARD 29CFR 1910.1200)	KEEP CONTAINERS CLOSED WHEN NOT IN USE AND AWAY FROM HEAT AND OPEN FLAMES. PROTECT AGAINST PHYSICAL DAMAGE. STORE AND HANDLE AWAY FROM ANY PRODUCT INVOLVED IN FOOD PROCESSING. USE RESPIRATORY PROTECTION FOR MIST GENERATION (SEE HEALTH HAZARD WARNING). WEAR PROTECTIVE CLOTHING AND GLOVES WHEN HANDLING. IF SPLASHED ON CLOTHING, IMMEDIATELY REMOVE CONTAMINATED CLOTHING AND WASH WITH SOAP AND WATER. ALWAYS USE CLEAN CLOTHING. DISCARD ANY CONTAMINATED LEATHER SHOES. PROPERLY LABEL STORAGE TANKS, BINS, VESSELS, CONTAINRES, PALLET LOADS OR STORAGE AREAS WITH NFPA DESIGNATION NO. 704 AS SHOWN ON PAGE ONE OF THIS MATERIAL SAFETY DATA SHEET. THIS DESIGNATION WILL ASSIST FIRE FIGHTING AND EMERGENCY PERSONNEL, AND ASSIST IN TRAINING/ COMMUNICATIONS OF MATERIAL HAZARDS.
==========	**DISPOSAL, SPILL OR LEAK PROCEDURES** ==========
PROCEDURE FOR RELEASE....: OR SPILL	KEEP MATERIAL OUT OF STREAMS AND SEWERS. ABSORB SPILLED MATERIAL ON COMMERCIAL OIL ABSORBANT SAND OR DIRT (SOIL). PUT THE CONTAMINATED ABSORBANT INTO A DOT APPROVED CONTAINER AND DISPOSE OF ACCORDING TO THE METHODS OUTLINED BELOW FOR WASTE DISPOSAL.

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MATERIAL SAFETY DATA 68937 41 7 2

KRONITEX(R) 100
TRIISOPROPYLATED PHENYL PHOSPHATE

NFPA Designation 704

DEGREE OF HAZARD
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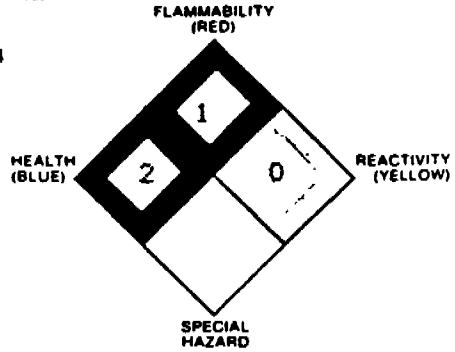

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==========	**DISPOSAL, SPILL OR LEAK PROCEDURES** ==========
WASTE DISPOSAL METHOD....:	AN ACCEPTABLE METHOD OF DISPOSAL IS TO BURN IN AN INCINERATOR IN ACCORDANCE WITH ALL LOCAL, STATE AND FEDERAL ENVIRONMENTAL LAWS, RULES, REGULATIONS, STANDARDS AND OTHER REQUIREMENTS. BECAUSE ACCEPTABLE METHODS OF DISPOSAL MAY VARY BY LOCATION, AND BECAUSE REGULATORY REQUIREMENTS MAY CHANGE, THE APPROPRIATE REGULATORY AGENCIES SHOULD BE CONTACTED PRIOR TO DISPOSAL.
==========	**TRANSPORTATION DATA** ==========
DOT PROPER SHIPPING NAME.:	KRONITEX(R) 100 TRIARLY PHOSPHATE
DOT CLASSIFICATION.....:	NOT REGULATED
DOT LABELS.....:	NONE
DOT MARKING.....:	NONE
DOT PLACARD.....:	NONE
UN NUMBER.....:	NONE
HAZARDOUS SUBSTANCE/RQ...:	NOT LISTEDD
49 STCC NUMBER.....:	NONE
EMERGENCY ACCIDENT PRECAUTIONS AND PROCEDURE:	KEEP UNNECESSARY PEOPLE AWAY. HANDLE AS A HIGH BOILING ORGANIC LIQUID.
PRECAUTIONS TO BE TAKEN..: IN TRANSPORTATION	PROTECT AGAINST PHYSICAL DAMAGE.
TYPE PACKAGES.....:	DRUMS, TANK CARS, TANK TRUCKS.
OTHER SHIPPING IDS.....:	NONE
==========	**ADDITIONAL REGULATORY INFORMATION** ==========
MATERIAL IS REPORTED IN EPA TSCA INVENTORY LIST?	YES
MATERIAL IS LISTED AS A CARCINOGEN/POTENTIAL CARCINOGEN IN FOLLOWING	
NTP ANNUAL REPORT... ?	NO
IARC GROUP I OR II...?	NO
OSHA 29CFR PART 1910 SUBPART Z ?	NO
ACGIH APPENDIX A.....?	NO

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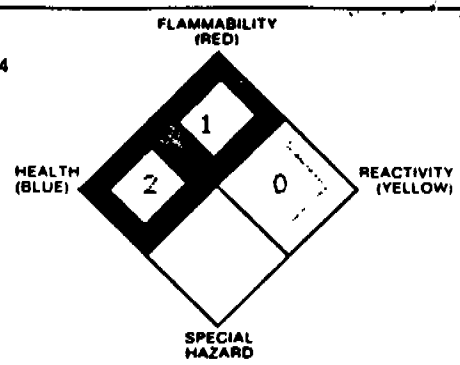

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==========	ADDITIONAL REGULATORY INFORMATION ==========
	CONTAINS UP TO 1 PPM ARSENIC FROM CALIFORNIA'S "PROPOSITION 65" LISTS OF CARCINOGENS.
DOES PRODUCT CONTAIN A TOXIC CHEMICAL(S) SUBJECT TO SARA TITLE III SECTION 313 REPORTING..... CHEMICAL(S).....:	NO
SARA TITLE III SECTION 311/312 CLASSIFICATION...:	MSDS REQUIRED; INVENTORY REPORTING REQUIRED.
==========	ADDITIONAL INFORMATION ==========

AQUATIC TOXICITY CLASSIFICATION - NIOSH RTECS NO. 79-100	SOURCE	DATE
96 HR LC50-RAINBOW TROUT 2.4 (1.7-3.4)MG/L ICG/T-79-049	FMC	1979
96 HR LC50-FATHEAD MINNOW 14.9 (12.8-17.4)MG/L ICG/T-79-049	FMC	1979
48 HR LC50-DAPHNIA MAGNA 0.83 (0.68-1.00) MG/L ICG/T-79-049	FMC	1979

Distributors
The C.P. HALL Company

PCD

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KRONITE-(R) TCP
TRIARYL PHOSPHATE

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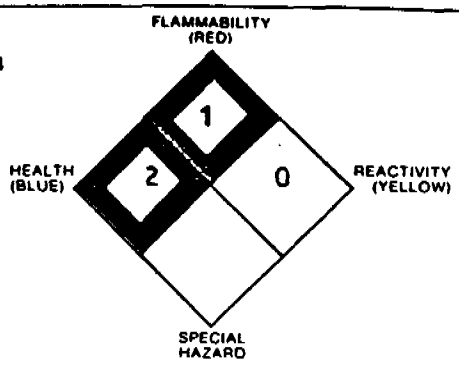

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PREPARED FOR USE BY.....	C P HALL CO OF ILL 2500 CHANNEL AVE PRESIDENTS ISLAND
==========	**IDENTIFICATION** ==========
INFORMATION PROVIDED BY..:	FMC CORPORATION 2000 MARKET STREET PHILADELPHIA, PA 19103
==========	**PRODUCT INFORMATION** ==========
SYNONYMS.....:	TRICRESYL PHOSPHATE, TRITOLYL PHOSPHATE
SHIPPING NAME - DOT.....:	KRONITEX(R) TCP TRIARYL PHOSPHATE
IATA.....:	KRONITEX(R) TCP TRIARYL PHOSPHATE
IMCO.....:	KRONITEX(R) TCP TRIARYL PHOSPHATE
FORMULA.....:	C21H2104P
CHEMICAL FAMILY.....:	ORGANOPHOSPHATE
==========	**PRECAUTIONARY INFORMATION** ==========
PRECAUTIONARY STATEMENT..: (PLEASE USE THIS STATEMENT TO SATISFY THE IN-PLANT LABELING REQUIREMENTS OF THE OSHA HAZARD COMMUNICATIONS STANDARD 29CFR 1910.1200)	HEALTH: MIST GENERATED BY HEAT, VIOLENT AGITATION OR SPRAYING WILL IRRITATE EYES, NOSE, & THROAT.CONTINUOUS CONTACT WITH LIQUID WILL IRRITATE SKIN. LONG & CONTINUOUS CONTACT WITH THE LIQUID OR VAPOR MAY EFFECT THE NERVOUS SYSTEM. PRODUCT PRESENTS A NEGLIBLE HAZARD TO HEALTH DURING NORMAL HANDLING EXCEPT AT ELEVATED TEMPERATURES & PROLONGED & CONTINUOUS/PROLONGED CONTACT WITH SKIN. PHYSICAL: NO SIGNIFICANT HAZARD EXCEPT IN FIRE CONDITIONS WHERE PHOSPHORUS OXIDE GASES ARE EMITTED.
==========	**INGREDIENTS** ==========
CAS# AND COMPONENT.....:	MATERIAL/COMPONENT: TAR ACIDS, CRESYLIC, PHENYL, PHOSPHATE PERCENT.....: 100% CAS #.....: ~~68952-35-2~~ 1330-78-5 HAZARD CLASS.....: NONE

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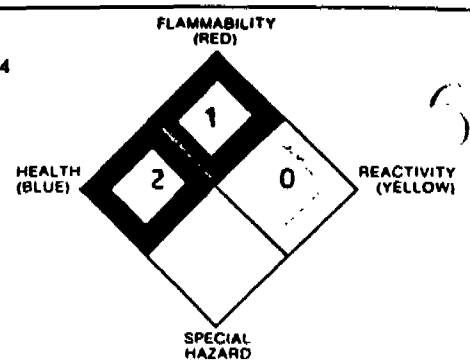

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==========	**PHYSICAL DATA** ==========
MELTING POINT.....:	.NA
BOILING POINT.....:	241*-255*C (466*-491*F)
VAPOR PRESSURE.....:	.033MM HG @ 150*C
VAPOR DENSITY (AIR - 1)..:	NO DATA
ROOM TEMPERATURE APPEARANCE AND STATE:	CLEAR LIQUID
ODOR.....:	ODORLESS
SPECIFIC GRAVITY (H2O =1):	20*C 1.160-1.75
SOLUBILITY IN H2O % BY WT:	INSOLUBLE
% VOLATILES BY VOLUME....:	NIL AT ROOM TEMPERATURE
EVAPORATION RATE (BUTYL ACETATE = 1)..:	NO DATA
PH (AS IS).....:	NA
PH (1% SOLUTION).....:	NA
==========	**FIRE, EXPLOSION AND REACTIVITY DATA** ==========
FLASH POINT.....:	PMCC 199*C (390*F), CC 210*C (410*F)
AUTOIGNITION TEMPERATURE..:	410*C (770*F)
FLAMABLE LIMITS (AIR) UPPER...:	NO DATA
LOWER...:	NO DATA
EXTINGUISHING MEDIA.....:	WATER FOG, CO2, DRY CHEMICAL, MULTIPURPOSE FOAM
SPECIAL FIREFIGHTING PROCEDURES.....:	FOR FIRES INVOLVING THIS MATERIAL, WEAR FULL PROTECTIVE CLOTHING, INCLUDING NIOSH APPROVED SELF-CONTAINED BREATHING APPARATUS. DO NOT ENTER ANY ENCLOSED OR CONFINED FIRE SPACE WITHOUT NIOSH APPROVED SELF-CONTAINED BREATHING APPARATUS. SEE SECTION ON HAZARDOUS DECOMPOSITION PRODUCTS FOR DECOMPOSITION PRODUCTS.
DEGREE OF FIRE AND EXPLOSION HAZARD.....:	SLIGHTLY COMBUSTIBLE - NO EXPLOSION HAZARD.
STABILITY.....:	STABLE
HAZARDOUS POLYMERIZATION..:	WILL NOT OCCUR
CONDITIONS TO AVOID.....:	PROTECT AGAINST PHYSICAL DAMAGE. STORE IN COOL, WELL VENTILATED AREA.

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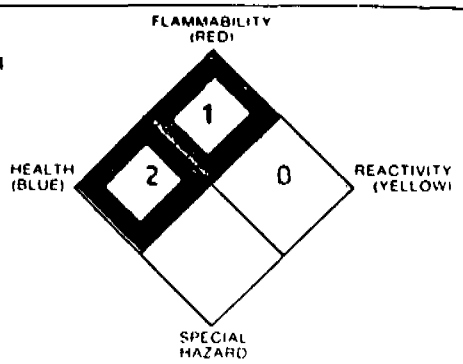

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FIRE, EXPLOSION AND REACTIVITY DATA

MAJOR CONTAMINANTS THAT CONTRIBUTE TO INSTABILITY: NONE KNOWN

INCOMPATIBILITY: NONE

HAZARDOUS DECOMPOSITION PRODUCTS: UNDER FIRE CONDITIONS TOXIC ACIDIC VAPORS MAY BE FORMED FROM PHOSPHORUS OXIDES.

ROUTES OF EXPOSURE

		SOURCE	DATE
EYE CONTACT:	SLIGHTLY IRRITATING (RABBIT) REF ICO/T-76.030	FMC	1976
SKIN CONTACT:	SLIGHTLY IRRITATING (RABBIT) REF ICO/T-76.030	FMC	1976
SKIN ABSORPTION:	NO SIGNIFICANT HAZARD LD50 ABOVE 10G/KG (RABBIT) REF ICO/T-76.030	FMC	1976
INHALATION:	SLIGHT IRRITANT (RAT) LC50 ABOVE 200 MG/L REF ICO/T-76.030	FMC	1976
INGESTION:	NO SIGNIFICANT HAZARD ORAL LD50 ABOVE 20 G/KG (RAT) REF ICO/T-76.030	FMC	1976

EXPOSURE LIMITS

EFFECTS OF OVEREXPOSURE

ACUTE EXPOSURE: BREATHING OR SWALLOWING LARGE QUANTITIES MAY CAUSE NEUROLOGICAL DISTURBANCES WHICH MAY PROGRESS TO DELAYED NEUROTOXICITY CHARACTERIZED BY ATAXIA. MAY ALSO BE IRRITATING TO SKIN, RESPIRATORY SYSTEM, MUCOUS MEMBRANES AND EYES. SEE EMERGENCY AND FIRST AID PROCEDURES AND NOTES TO PHYSICIAN.

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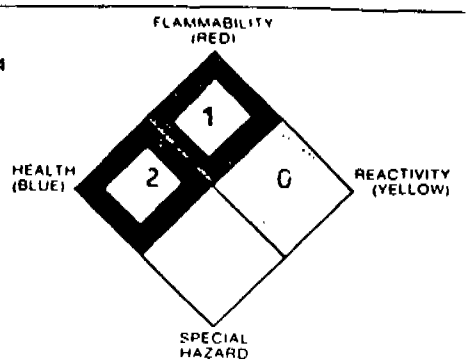

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EFFECTS OF OVEREXPOSURE

CHRONIC EXPOSURE.....:

MAY CAUSE IRRITATION TO SKIN, MUCOUS MEMBRANES, RESPIRATORY SYSTEM AND EYES. REPEATED EXPOSURE OVER PROLONGED PERIOD OF TIME MAY CAUSE NEUROLOGICAL DISTURBANCES WHICH MAY PROGRESS TO DELAYED NEUROTOXICITY CHARACTERIZED BY ATAXIA. SEE EMERGENCY AND FIRST AID PROCEDURES AND NOTES TO PHYSICIAN. FOLLOW GOOD INDUSTRIAL HYGIENE PRACTICES AND OBSERVE THE SPECIAL PROTECTION INFORMATION SECTION TO AVOID EXPOSURES.
A COMMERCIALLY AVAILABLE TRICRESYL PHOSPHATE CONTAINING LESS THAN 1% OF THE TRIORTHOCRESYL PHOSPHATE ISOMER WAS ADMINISTERED TO MICE AND RATS BY STOMACH TUBE 5 DAYS PER WEEK FOR 13 WEEKS AT DOSE LEVELS OF 800, 400, 200, 100, 50, 0 MG (VEHICLE CONTROL) PER KG BODY WEIGHT. EXPOSED MICE EXHIBITED EVIDENCE OF NEUROTOXICITY; DECREASED BODY, LUNG, THYMUS AND TESTICLE WEIGHTS ; INCREASED LIVER WEIGHTS; INHIBITION OF SERUM CHOLINESTERASE; AND DECREASED SPERM COUNT AND MOTILITY. EXPOSED RATS EXHIBITED EVIDENCE OF NEUROTOXICITY; DECREASED BODY, LUNG, THYMUS AND TESTICLE WEIGHTS; INCREASED LIVER WEIGHTS; INHIBITION OF SERUM CHOLINESTERASE, MICROSCOPIC LESIONS IN THE SPINAL CORD, ADRENAL CORTEX, TESTES, AND OVARIES; AND SIGNIFICANT EFFECTS ON SPERM MORPHOLOGY (UNPUBLISHED RESULTS OF THE NATIONAL TOXICOLOGY PROGRAM).
NOTE: EPIDEMEOLOGY STUDIES COMPLETED IN 1977 AND 1985 OF CURRENT AND FORMER WORKERS AT THE FMC PLANT WHERE KRONITEX, DURAD, NATURAL AND SYNTHETIC TRIARYL PHOSPHATE ESTERS ARE MANUFACTURED HAVE NOT DEMONSTRATED ANY UNUSUAL PATTERN OF MORTALITY OR DISEASE.

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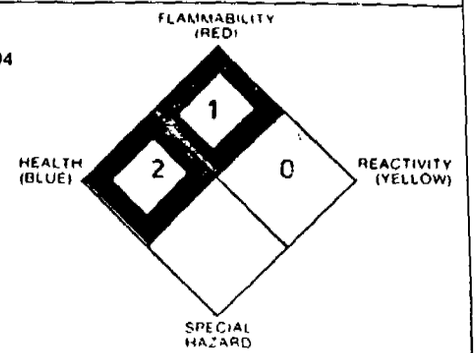

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EMERGENCY AND FIRST AID PROCEDURES

EYES:	IF EYE EXPOSURE OCCURS, IMMEDIATELY FLOOD WITH LARGE AMOUNTS OF TAP WATER, PREFERABLY TEPID, FOR AT LEAST 15 MINUTES. IF COMPLICATIONS DEVELOP, SEE AN OPTHALMOLOGIST.
SKIN:	REMOVE CONTAMINATED CLOTHING IMMEDIATELY AND WASH SKIN THOROUGHLY WITH SOAP AND WATER. AVOID FURTHER CONTACT. IF COMPLICATIONS DEVELOP, CALL A PHYSICIAN.
INHALATION:	REMOVE TO FRESH AIR. IF SUBJECT HAS DIFFICULTY BREATHING, ADMINISTER OXYGEN. IF COMPLICATIONS DEVELOP, TREAT SYMPTOMATICALLY AND CALL A PHYSICIAN.
INGESTION:	IF SWALLOWED, IMMEDIATELY DILUTE CONTAMINANT BY DRINKING A PINT OF TEPID TAP WATER.THEN INDUCE VOMITING BY EITHER TICKLING THE BACK OF THE THROAT WITH THE FINGERS OR BY TAKING AN EMETIC, IE, SOAPY TEPID TAP WATER,POWDERED MUSTARD IN WATER, OR SYRUP OF IPECAC. NOTE: DO NOT INDUCE VOMITING OR GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON.
DECONTAMINATION PROCEDURE:	REMOVE CONTAMINATED CLOTHING IMMEDIATELY. WASH SKIN THOROUGHLY WITH SOAP AND WATER.
NOTES TO PHYSICIAN:	MAY BE IRRITATING TO SKIN, MUCOUS MEMBRANES, RESPIRATORY SYSTEM AND EYES. CONTAMINATED EYES SHOULD BE IMMEDIATELY FLOODED FOR 15 MINUTES WITH TAP WATER PREFERABLY TEPID. SKIN SHOULD BE WASHED THOROUGHLY WITH SOAP AND WATER. EYE CONTACT SHOULD RECEIVE OPHTHALMOLOGIC EVALUATION IF COMPLICATIONS DEVELOP. TREATMENT OF ANY TOXICITY SHOULD BE SYMPTOMATIC AND SUPPORTIVE AFTER TERMINATING EXPOSURE THROUGH ABOVE MEANS, OR IN CASE OF INGESTION, GASTRIC EVACUATION VIA EMESIS INDUCTION OR GASTRIC LAVAGE.

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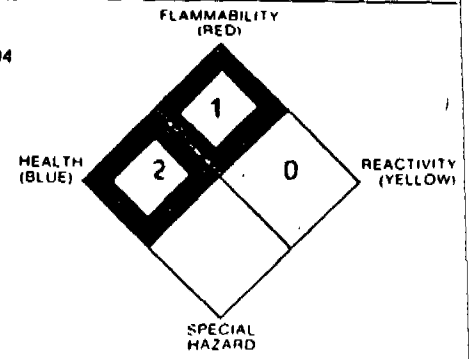

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EMERGENCY AND FIRST AID PROCEDURES

HUMAN SYSTEMIC TOXICITY INFORMATION IS UNAVAILABLE, BUT EXPECTED TO BE LOW. IMPORTANTLY, STRUCTURE-ACTIVITY RELATIONSHIPS SUGGEST THE ABSENCE OF APPRECIABLE ANTICHOLINESTERASE ACTIVITY SUCH AS POSSESSED BY STRUCTURALLY DISSIMILAR ORGANOPHOSPHATES. NEUROLOGICAL EVALUATION OF WORKERS, WHERE NO DIFFERENCES WERE DEMONSTRATED BETWEEN TRIARYL PHOSPHATE ESTERS EXPOSED AND CONTROL POPULATIONS, SUPPORTS THIS CONCLUSION.(1)
THE KRONITEX(R) NATURAL TRIARYL PHOSPHATE ESTERS ARE COMPLEX MIXUURES OF ALKYLPHENYL PHOSPHATES DERIVED FROM NATURAL CRESYLIC ACIDS. THE CRESYLIC ACIDS ARE SELECTED TO YIELD VERY LOW CONCENTRATIONS OF THE ORTHO ESTER (LESS THAN 1% ORTHO CRESOL).
USING NIOSH RECOMMENDED RATING SYSTEM, THESE PRODUCTS WERE EVALUATED TO HAVE NO SIGNIFICANT HAZARD WITH ACUTE ORAL AND DERMAL TOXICITY. KRONITEX(R) TCP WAS EVALUATED FOR ACUTE INHALATION AND, AGAIN, IT WAS FOUND TO BE OF NO SIGNIFICANT HAZARD.
THESE PRODUCTS ARE NOT CLASSIFIED AS IRRITANTS UNDER FHSLA. PROLONGED OR REPEATED EXPOSURE CAN CAUSE MILD SKIN OR EYE IRRITATION AND SHOULD BE AVOIDED.
NEUROTOXICITY OF A TYPE DIFFERENT THAN CHOLINESTERASE INHIBITION (SEE CHRONIC EXPOSURE DATA) HAS BEEN IDENTIFIED AND ASSOCIATED WITH CERTAIN TRIARLY PHOSPHATES FOR MANY YEARS.

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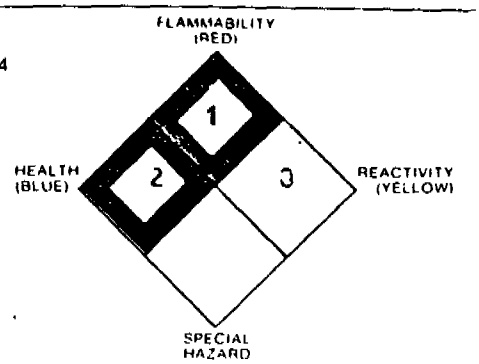

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EMERGENCY AND FIRST AID PROCEDURES

EXTENSIVE STUDIES CONDUCTED IN EUROPE AND IN THIS COUNTRY HAVE ESTABLISHED THAT ACUTE DOSES OF 500 MG/KG WILL PRODUCE CLINICAL SIGNS OF ATAXIA IN TEST ANIMALS (HENS).
ALTHOUGH MORE NEUROTOXIC THAN KRONITEX(R) SYNTHETIC TRIARYL PHOSPHATE ESTERS, THE KRONITEX(R) NATURAL TRIARYL PHOSPHATE ESTERS CAN BE SAFELY USED WITHOUT UNDUE RISK BY OBSERVING PROPER INDUSTRIAL HYGIENE AS DESCRIBED HEREIN. ORAL INGESTION, SKIN CONTACT, AND INHALATION OF MISTS OR HIGH TEMPERATURE VAPORS SHOULD BE AVOIDED.
KRONITEX(R) TCP AND TXP GIVE NEGATIVE AMES TEST FOR MUTAGENICITY.
(1) FMC-MJ REAPE THESIS MARCH 1982.

SPECIAL PROTECTION

VENTILATION REQUIREMENTS.:	USE IN VENTILATED AREAS.
RECOMMENDED PERSONAL.....: PROTECTIVE EQUIPMENT	
RESPIRATORY.....:	IN HIGH TEMPERATURE APPLICATIONS OR EXPOSURE TO MISTING, USE NIOSH CERTIFIED ORGANIC VAPOR CARTRIDGE. USE NIOSH RESPIRATOR AND SELF-CONTAINED BREATHING APPARATUS IN EMERGENCY SITUATIONS.
EYES.....:	CHEMICAL SAFETY GOGGLES ARE RECOMMENDED.
GLOVES.....:	RUBBER NON-PERMEABLE GLOVES ARE RECOMMENDED.
SPECIAL CLOTHING..: AND EQUIPMENT	WHEN DIRECT CONTACT ON SKIN IS EXPECTED, RUBBER OR OTHER IMPERVIOUS COVERALLS OR SUITS AND BOOTS SHOULD BE WORN.

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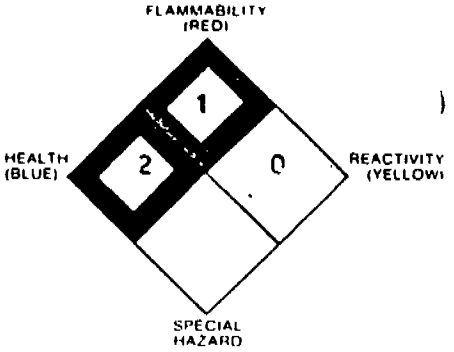

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CHEMTREC (800) 424-9300
OTHER (304) 755-3351 CALL COLLECT

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STORAGE AND HANDLING

(PLEASE USE THIS STATEMENT TO SATISTY THE IN-PLANT LABELING REQUIREMENTS OF THE OSHA HAZARD COMMUNICATIONS STANDARD 29CFR 1910.1200)

KEEP CONTAINERS CLOSED WHEN NOT IN USE AND AWAY FROM HEAT AND OPEN FLAMES. PROTECT AGAINST PHYSICAL DAMAGE. STORE AND HANDLE AWAY FROM ANY PRODUCT INVOLVED IN FOOD PROCESSING. USE RESPIRATORY PROTECTION FOR MIST GENERATION (SEE HEALTH HAZARD WARNING). WEAR PROTECTIVE CLOTHING AND GLOVES WHEN HANDLING. IF SPLASHED ON CLOTHING IMMEDIATELY REMOVE CONTAMINATED CLOTHING AND WASH WITH SOAP AND WATER. ALWAYS USE CLEAN CLOTHING. DISCARD ANY CONTAMINATED LEATHER SHOES. PROPERLY LABEL STORAGE TANKS, BINS, VESSELS, CONTAINERS, PALLET LOADS OR STORAGE AREAS WITH NFPA DESIGNATION NO.704 AS SHOWN ON PAGE ONE OF THIS MATERIAL SAFETY DATA SHEET.THIS DESIGNATION WILL ASSIST FIRE FIGHTING AND AND EMERGENCY PERSONNEL, AND ASSIST IN TRAINING/ COMMUNICATIONS OF MATERIAL HAZARDS.

DISPOSAL, SPILL OR LEAK PROCEDURES

PROCEDURE FOR RELEASE.....: OR SPILL

KEEP MATERIAL OUT OF STREAMS AND SEWERS. ABSORB SPILLED MATERIAL ON COMMERCIAL OIL ABSORBANT SAND OR DIRT (SOIL). PUT THE CONTAMINATED ABSORBANT INTO A DOT APPPOVED CONTAINER AND DISPOSE OF ACCORDING TO THE METHODS OUTLINED BELOW FOR WASTE DISPOSAL.

WASTE DISPOSAL METHOD.....:

AN ACCEPTABLE METHOD OF DISPOSAL IS TO BURN IN AN INCINERATOR IN ACCORDANCE WITH ALL LOCAL, STATE AND FEDERAL ENVIRONMENTAL LAWS, RULES, REGULATIONS, STANDARDS AND OTHER REQUIREMENTS. BECAUSE ACCEPTABLE METHODS OF DISPOSAL MAY VARY BY LOCATION, AND BECAUSE REGULATORY REQUIREMENTS MAY CHANGE, THE APPROPRIATE REGULATORY AGENCIES SHOULD BE CONTACTED PRIOR TO DISPOSAL.

DO 085657
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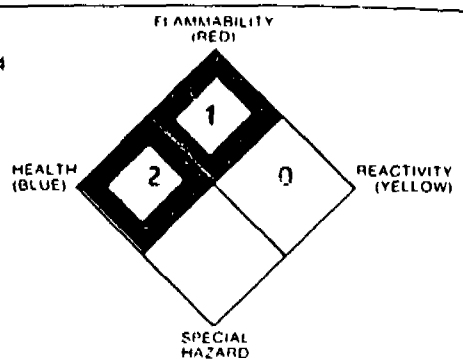
MATERIAL SAFETY DATA 68952 35 2

KRONITEX(R) TCP
TRIARYL PHOSPHATE

NFPA Designation 704

DEGREE OF HAZARD
4 - EXTREME
3 HIGH
2 MODERATE
1 SLIGHT
0 INSIGNFICANT



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TRANSPORTATION DATA

DOT PROPER SHIPPING NAME.:	KRONITEX(R) TCP TRIARYL PHOSPHATE
DOT CLASSIFICATION.....:	NOT REGULATED
DOT LABELS.....:	NONE
DOT MARKING.....:	NONE
DOT PLACARD.....:	NONE
UN NUMBER.....:	NONE
HAZARDOUS SUBSTANCE/RQ...:	NOT LISTED
49 STCC NUMBER.....:	NONE
EMERGENCY ACCIDENT PRECAUTIONS AND PROCEDURE:	KEEP UNNECESSARY PEOPLE AWAY. HANDLE AS A HIGH BOILING ORGANIC LIQUID.
PRECAUTIONS TO BE TAKEN IN TRANSPORTATION..:	PROTECT AGAINST PHYSICAL DAMAGE.
CMA CHEMCARD NUMBER.....:	NONE
TYPE PACKAGES.....:	DRUMS, TANK TRUCK, TANK CARS.
OTHER SHIPPING IDS.....:	

ADDITIONAL REGULATORY INFORMATION

MATERIAL IS REPORTED IN EPA TSCA INVENTORY LIST?	YES
MATERIAL IS LISTED AS A CARCINOGEN/POTENTIAL CARCINOGEN IN FOLLOWING	
NTP ANNUAL REPORT... ?	NO
IARC MONOGRAPHS..... ?	NO
OSHA 29CFR PART 1910 SUBPART Z ?	NO

FMC

MATERIAL SAFETY DATA 68952 35 2

KRONITEX(R) TCP
TRIARYL PHOSPHATE

NFPA Designation 704

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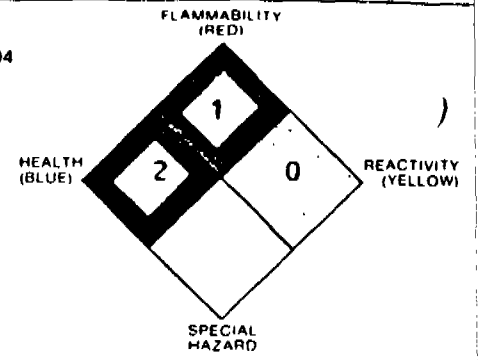

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ADDITIONAL INFORMATION

AQUATIC TOXICITY CLASSIFICATION - NIOSH RTECS NO. 79-100	SOURCE	DATE
96 HR LC50-RAINBOW TROUT 0.75 (0.54-1.04)MG/L ICG/T-79-069	FMC	1979
96 HR LC50-FATHEAD MINNOW 100MG/L ICG/T-79-069	FMC	1979
48 HR LC50-DAPHNIA MAGNA 0.27 (0.21-0.33)MG/L ICG/T-79-069	FMC	1979
96 HR LC50-BLUEGILL SUNFISH 7000MG/L EPA CONTRACT NO. 69-01-4313	EPA	1979
96 HR LC50-TIDEWATER SILVERFISH EPA CONTRACT NO. 69-01-4313	EPA	19

DO 085659
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U.S. DEPARTMENT OF LABOR
Occupational Safety and Health Administration

Form Approved
OMB No. 44-R1387

MATERIAL SAFETY DATA SHEET

Required under USDL Safety and Health Regulations for Ship Repairing, Shipbuilding, and Shipbreaking (29 CFR 1915, 1916, 1917)

SECTION I

MANUFACTURER'S NAME	EMERGENCY TELEPHONE NO.
FMC CORPORATION	304-755-3351

ADDRESS (Number, Street, City, State, and ZIP Code)
Nitro, West Virginia 25143

CHEMICAL NAME AND SYNONYMS	TRADE NAME AND SYNONYMS
Triaryl Phosphate	Kronitex 50 Triaryl phosphate
CHEMICAL FAMILY: Triaryl phosphate	FORMULA: $(RO)_3PO$

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)

SECTION III - PHYSICAL DATA

BOILING POINT (°F.) @ 3mmHg	475°F.	SPECIFIC GRAVITY (H_2O=1)	1.1-1.2
VAPOR PRESSURE (mm Hg.) @ 475°F.	3mm	PERCENT, VOLATILE BY VOLUME (%)	Nil
VAPOR DENSITY (AIR=1)	>10	EVAPORATION RATE (Butyl Acetate=1)	<1
SOLUBILITY IN WATER	<0.01%		
APPEARANCE AND ODOR	Liquid light straw colored		

SECTION IV - FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used)	FLAMMABLE LIMITS	Lel	Uel
475°F. OC	Non-Flammable		

EXTINGUISHING MEDIA: Water, Waterfog, CO_2, dry chemical, foam

SPECIAL FIRE FIGHTING PROCEDURES: Full protective clothing

Self contained breathing apparatus

UNUSUAL FIRE AND EXPLOSION HAZARDS: Phosphorous compound fumes

Fire and explosion hazard slight

(Continued on reverse side)

DO 085660
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SECTION V - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE
LD50 = >20,000 mg/kg (rat); LC50 = >200,000 mg/m^3 (rat)

EFFECTS OF OVEREXPOSURE

EMERGENCY AND FIRST AID PROCEDURES
Eyes - Flush with water for 15 minutes, Skin - Flush with soap and water
Inhalation - remove to fresh air, resuscitate if required.

SECTION VI - REACTIVITY DATA

STABILITY			CONDITIONS TO AVOID
	UNSTABLE		
	STABLE	X	

INCOMPATABILITY *(Materials to avoid)*

HAZARDOUS DECOMPOSITION PRODUCTS

HAZARDOUS POLYMERIZATION			CONDITIONS TO AVOID
	MAY OCCUR		
	WILL NOT OCCUR	X	

SECTION VII - SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED

Clean-up same as oil spill

Absorb on inert material

WASTE DISPOSAL METHOD
Biological abatement preferred. Standard methods such as incineration acceptable.

SECTION VIII - SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION *(Specify type)*

VENTILATION	LOCAL EXHAUST	SPECIAL
	MECHANICAL *(General)*	OTHER

PROTECTIVE GLOVES	EYE PROTECTION
Rubber	Safety glasses

OTHER PROTECTIVE EQUIPMENT

SECTION IX - SPECIAL PRECAUTIONS

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORING

Overheating - 200°F. discoloration

OTHER PRECAUTIONS

DO 085661
CONFIDENTIAL

C.P. Hall

FMC

MATERIAL SAFETY DATA 78 51 3

KP-140(R)
TRIBUTOXYETHYL PHOSPHATE

NFPA Designation 704

DEGREE OF HAZARD
4 = EXTREME
3 = HIGH
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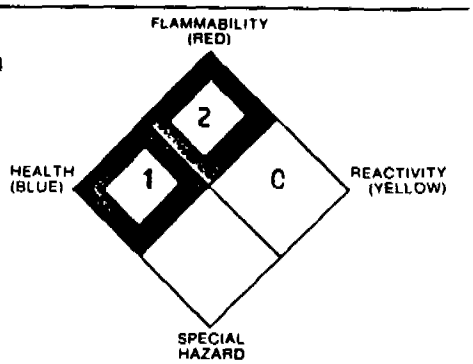

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REVISION: 0	EFFECTIVE: 09/01/85 PRINTED: 11/09/85
PREPARED FOR USE BY.....	C P HALL CO OF ILL 2500 CHANNEL AVE PRESIDENTS ISLAND
==========	**IDENTIFICATION** ==========
INFORMATION PROVIDED BY..:	FMC CORPORATION 2000 MARKET STREET PHILADELPHIA, PA 19103
==========	**PRODUCT INFORMATION** ==========
SYNONYMS.....:	TRIBUTOXYETHYL PHOSPHATE, BUTOXYLETHANOL PHOSPHATE, TRIBUTYL CELLOSOLVE PHOSPHATE, PHOSPHORIC ACID, TRIS (2-BUTOXYLETHYL) ESTER
SHIPPING NAME - DOT.....:	TRI-BUTOXYETHYL PHOSPHATE, PLASTICIZER
IATA.....:	TRI-BUTOXYETHYL PHOSPHATE, PLASTICIZER
IMCO.....:	
FORMULA.....:	(C4H9OC2H4O)3PO
CHEMICAL FAMILY.....:	PHOSPHATE ESTER
==========	**PRECAUTIONARY INFORMATION** ==========
PRECAUTIONARY STATEMENT..: (PLEASE USE THIS STATEMENT TO SATISFY THE IN-PLANT LABELING REQUIREMENTS OF THE OSHA HAZARD COMMUNICATIONS STANDARD 29CFR 1910.1200)	HEALTH: MIST (ROOM TEMPERATURE) AND VAPOR (EVALUATED TEMPERATURE) MAY IRRITATE LUNGS, EYES, NOSE AND THROAT. MAY CAUSE IRRITATION TO SKIN UPON DIRECT CONTACT. PROLONGED INHALATION OF MIST AND/OR VAPOR MAY RESULT IN NERVOUS DISORDERS. PHYSICAL: IN FIRES, PRODUCT WILL DECOMPOSE PRODUCING TOXIC FUMES OF PHOSPHORUS OXIDES. LIQUID WILL BURN AT ROOM TEMPERATURE.
==========	**INGREDIENTS** ==========
CAS# AND COMPONENT.....:	MATERIAL/COMPONENT: TRI-BUTOXYETHYL PHOSPHATE PERCENT.....: 100% CAS #.....: 78-51-3 HAZARD CLASS.....: NONE

DO 085662
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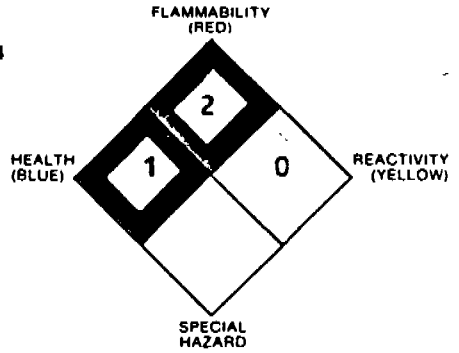

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==========	**PHYSICAL DATA** ==========
MELTING POINT.....:	NA
BOILING POINT.....:	222.2*C (432*F)
VAPOR PRESSURE.....:	1.6 MM HG
VAPOR DENSITY (AIR - 1)..:	13.8
ROOM TEMPERATURE APPEARANCE AND STATE:	WHITE TO STRAW COLORED LIQUID
ODOR.....:	BUTYL ODOR
SPECIFIC GRAVITY (H2O =1):	1.020
SOLUBILITY IN H2O % BY WT:	@ 25*C 0.11%
% VOLATILES BY VOLUME....:	NO DATA
EVAPORATION RATE (BUTYL ACETATE = 1).:	1
PH (AS IS).....:	NA
PH (1% SOLUTION).....:	NA
==========	**FIRE, EXPLOSION AND REACTIVITY DATA** ==========
FLASH POINT.....:	OC 224*C (435*F)
AUTOIGNITION TEMPERATURE.:	260*C (500*F)
FLAMABLE LIMITS UPPER...:	NO DATA
(AIR) LOWER...:	NO DATA
EXTINGUISHING MEDIA.....:	WATER, WATER FOG, CO2, DRY CHEMICAL, FOAM
SPECIAL FIREFIGHTING PROCEDURES.....:	NIOSH APPROVED SELF-CONTAINED BREATHING APPARATUS AND FULL PROTECTIVE CLOTHING.
DEGREE OF FIRE AND EXPLOSION HAZARD .....:	SLIGHT FIRE HAZARD; TOXIC FUMES MAY BE LIBERATED
STABILITY.....:	STABLE
HAZARDOUS POLYMERIZATION.:	WILL NOT OCCUR
CONDITIONS TO AVOID.....:	EXTREME HEAT OR COLD.
MAJOR CONTAMINANTS THAT CONTRIBUTE TO INSTABILITY..:	NONE KNOWN.
INCOMPATIBILITY.....:	NONE KNOWN.
HAZARDOUS DECOMPOSITION PRODUCTS..:	HIGHLY TOXIC FUMES OF PHOSPHORUS OXIDES.

DO 085663
CONFIDENTIAL
02

FMC

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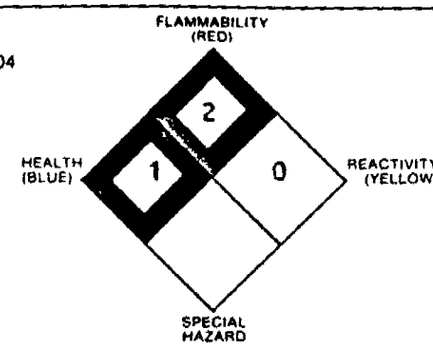

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ROUTES OF EXPOSURE

		SOURCE	DATE
EYE CONTACT:	MILDLY IRRITATING (RABBIT) REF: ICD/T.76.019	FMC	1976
SKIN CONTACT:	NON-IRRITATING (RABBIT) REF: ICD/T.76.019	FMC	1976
SKIN ABSORPTION:	NO SIGNIFICANT HAZARD (RABBIT) LD50 ABOVE 10G/KG (RABBIT) REF: ICD/T.76.019	FMC	1976
INHALATION:	PROBABILITY OF EXPOSURE LOW DUE TO LOW VOLATILITY NO SIGNIFICANT HAZARD LC50 = 30 MG/LITER (RATS) NO TLV PUBLISHED REF: FDRC LAB NO. 2734H	FMC	1976
INGESTION:	NO SIGNIFICANT HAZARD LD50 9.49/KG (RAT) REF: ICD/T.76.019	FMC	1976

EXPOSURE LIMITS

EFFECTS OF OVEREXPOSURE

ACUTE EXPOSURE: MAY BE IRRITATING TO SKIN, RESPIRATORY SYSTEM, MUCOUS MEMBRANES AND EYES. SEE EMERGENCY AND FIRST AID PROCEDURES AND NOTES TO THE PHYSICIAN.

CHRONIC EXPOSURE: MAY CAUSE IRRITATION TO SKIN, MUCOUS MEMBRANES, RESPIRATORY SYSTEM AND EYES. REPEATED (ORAL) EXPOSURE OF RATS CAUSED CLINICAL SIGNS (INCLUDING ATAXIA AND DYSPNEA) AND ELECTROPHYSIOLOGIC AND MORPHOLOGIC CHANGES IN THE NERVOUS SYSTEM. SEE EMERGENCY AND FIRST AID PROCEDURES AND NOTES TO THE PHYSICIAN.

DO 085664
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FMC

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TRIBUTOXYETHYL PHOSPHATE

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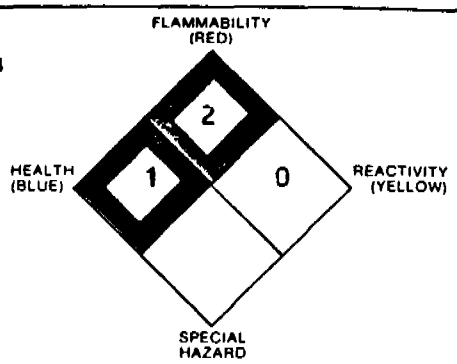

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==========	**EMERGENCY AND FIRST AID PROCEDURES** ==========
EYES.....	WASH WITH LARGE AMOUNTS OF WATER FOR 15 MINUTES WHILE HOLDING THE EYELIDS APART. SEE AN OPHTHALMOLOGIST.
SKIN.....	WASH WITH SOAP AND WATER. IF IRRITATION OCCURS AND PERSISTS, OBTAIN MEDICAL ATTENTION.
INHALATION.....	REMOVE TO FRESH AIR, ADMINISTER OXYGEN AND/OR ARTIFICIAL RESPIRATION IF NEEDED. IF DISCOMFORT OCCURS AND PERSISTS, OBTAIN MEDICAL ATTENTION.
INGESTION.....	GIVE 1 OR 2 GLASSES OF WATER AND INDUCE VOMITING BY TOUCHING BACK OF THROAT WITH FINGER, OR IF AVAILABLE, BY ADMINISTERING SYRUP OF IPECAC. DO NOT INDUCE VOMITING OR GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON. OBTAIN MEDICAL ATTENTION. SEE NOTES TO PHYSICIAN BELOW.
DECONTAMINATION PROCEDURE:	WASH WITH SOAP AND WATER.
NOTES TO PHYSICIAN.....	MAY BE IRRITATING TO SKIN, MUCOUS MEMBRANES AND EYES. CONTAMINATED AREA SHOULD BE FLOODED WITH WATER, AND ANY EYE CONTACT CASES SHOULD RECEIVE OPHTHALMOLOGIC EVALUATION. HUMAN SYSTEMIC TOXICITY INFORMATION IS UNAVAILABLE, BUT IS EXPECTED TO BE LOW OR NONEXISTENT. IMPORTANTLY, STRUCTURE-ACTIVITY RELATIONSHIPS SUGGESTED THE ABSENCE OF APPRECIABLE ANTICHOLINESTERASE ACTIVITY SUCH AS POSSESSED BY STRUCTURALLY DISSIMILAR ORGANOPHOSPHATES. TREATMENT OF ANY TOXICITY SHOULD BE SYMPTOMATIC AND SUPPORTIVE AFTER TERMINATING EXPOSURE THROUGH ABOVE MEANS OR, IN CASE OF INGESTION, GASTRIC EVACUATION VIA EMESIS INDUCTION OR GASTRIC LAVAGE.
==========	**SPECIAL PROTECTION** ==========
VENTILATION REQUIREMENTS.:	USE IN VENTILATED AREAS.
RECOMMENDED PERSONAL.....: PROTECTIVE EQUIPMENT RESPIRATORY.....:	IN HIGH TEMPERATURE APPLICATION OR EXPOSURE TO MISTING, USE A NIOSH CERTIFIED SELF-CONTAINED BREATHING APPARATUS.

DO 085665
CONFIDENTIAL

FMC

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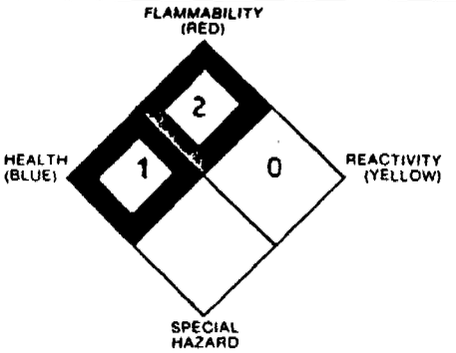

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==========	**SPECIAL PROTECTION** ==========
EYES.....:	SAFETY GOGGLES OR FACE SHIELD IN CASE OF SPLASHING.
GLOVES.....:	RUBBER OR PLASTIC LIQUID PROOF GLOVES.
SPECIAL CLOTHING..: AND EQUIPMENT	FULL PROTECTIVE CLOTHING.
==========	**STORAGE AND HANDLING** ==========
(PLEASE USE THIS STATEMENT TO SATISTY THE IN-PLANT LABELING REQUIREMENTS OF THE OSHA HAZARD COMMUNICATIONS STANDARD 29CFR 1910.1200)	USE FULL FACEPIECE WITH ORGANIC CARTRIDGE OR CANISTER TO PROTECT AGAINST IRRITATION. USE FACE SHIELDS, RUBBER GLOVES, APRONS OR PROTECTIVE CLOTHING WHERE SPLASHING IS EXPECTED. PROTECT FROM PHYSICAL DAMAGE. STORE IN COOL VENTILATED AREA. KEEP AWAY FROM FOOD PRODUCTS AND FOOD HANDLING AREAS.
==========	**DISPOSAL, SPILL OR LEAK PROCEDURES** ==========
PROCEDURE FOR RELEASE....: OR SPILL	KEEP MATERIAL OUT OF STREAMS AND SEWERS. ABSORB SPILLED MATERIAL ON COMMERCIAL OIL ABSORBANT SAND OR DIRT (SOIL). PUT THE CONTAMINATED ABSORBANT INTO A DOT APPROVED CONTAINER AND DISPOSE OF ACCORDING TO THE METHODS OUTLINED BELOW FOR WASTE DISPOSAL.
WASTE DISPOSAL METHOD....:	AN ACCEPTABLE METHOD IS TO BURN IN AN INCINERATOR IN ACCORDANCE WITH ALL LOCAL, STATE AND FEDERAL ENVIRONMENTAL LAWS, RULES, REGULATIONS, STANDARDS AND OTHER REQUIREMENTS. BECAUSE ACCEPTABLE METHODS OF DISPOSAL MAY VARY BY LOCATION, AND BECAUSE REGULATORY REQUIREMENTS MAY CHANGE, THE APPROPRIATE REGULATORY AGENCIES SHOULD BE CONTACTED PRIOR TO DISPOSAL.

DO 085666
CONFIDENTIAL

FMC

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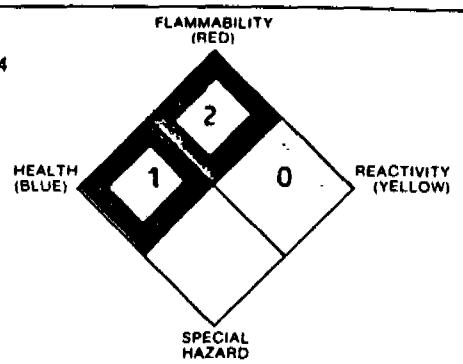

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TRANSPORTATION DATA

DOT PROPER SHIPPING NAME.:	KP-140(R) TRI-BUTOXYETHYL PHOSPHATE
DOT CLASSIFICATION.....:	NOT REGULATED
DOT LABELS.....:	NONE
DOT MARKING.....:	NONE
DOT PLACARD.....:	NONE
UN NUMBER.....:	NONE
HAZARDOUS SUBSTANCE/RQ...:	NOT LISTED
49 STCC NUMBER.....:	NONE
EMERGENCY ACCIDENT PRECAUTIONS AND PROCEDURE:	OBSERVE PRECAUTIONS AS FOR ANY HIGH BOILING ORGANIC LIQUID.
PRECAUTIONS TO BE TAKEN IN TRANSPORTATION..:	PROTECT AGAINST PHYSICAL DAMAGE.
CMA CHEMCARD NUMBER.....:	NONE
TYPE PACKAGES.....:	TANK CARS, TANK TRUCKS, DRUMS
OTHER SHIPPING IDS.....:	

ADDITIONAL REGULATORY INFORMATION

MATERIAL IS REPORTED IN EPA TSCA INVENTORY LIST?	YES
MATERIAL IS LISTED AS A CARCINOGEN/POTENTIAL CARCINOGEN IN FOLLOWING	
NTP ANNUAL REPORT... ?	NO
IARC MONOGRAPHS..... ?	NO
OSHA 29CFR PART 1910 SUBPART Z ?	NO

ADDITIONAL INFORMATION

AQUATIC TOXICITY CLASSIFICATION - NIOSH RTECS NO. 79-100
NO DATA AVAILABLE

DO 085667
CONFIDENTIAL