MATERIAL SAFETY DATA SHEET

Product name: FYROL FR-2
Product id: 7007
Revision date: 20/11/2011
Supersedes: 22/11/2010

1. Identification of the substance & the company

Chemical name: Tris(1,3-dichloro-2-propyl) phosphate
Synonym(s): Tri(B,B'-dichloroisopropyl) phosphate; 2-Propanol,1,3-dichloro- phosphate (3:1), TDCP
Chemical formula: C9H15Cl6O4P
Chemical family: Alkyl phosphate
Molecular weight: 430.91
Type of product and use: Flame retardant
Supplier: ICL-IP America Inc.
622 Emerson Road - Suite 500
St Louis, Missouri 63141, USA
Tel:(314)983-7884 Fax:(314)983-7607

Emergency Telephone: Chemtrec (800)424-9300
Medical: PROSAR 1-888-875-1685 (24HRS)

2. Hazards identification

Emergency overview: May cause mild eye, skin and respiratory tract irritation.
May cause liver, kidney, adrenal and testicular toxicity after repeated exposures
HMIS Ratings (Scale 0-4): Health = 1, Fire =1, Reactivity = 0.

3. Composition / information on ingredients

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS No.</th>
<th>Weight %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,3-Dichloro-2-propanol phosphate (3:1)</td>
<td>13674-87-8</td>
<td>93 - 97</td>
</tr>
</tbody>
</table>
4. First-aid measures

**Eye contact**
Holding the eyelids apart, flush eyes promptly with copious flowing water for at least 20 minutes. Get medical attention immediately.

**Skin contact**
Remove contaminated clothing. Wash skin thoroughly with mild soap and plenty of water for at least 15 minutes. Wash clothing before re-use. Get medical attention if irritation occurs.

**Inhalation**
In case of inhalation, remove person to fresh air. Keep him quiet and warm. Apply artificial respiration if necessary and get medical attention immediately.

**Ingestion**
If swallowed, wash mouth thoroughly with plenty of water. Get medical attention immediately.

************************************************************************
NOTE:  Never give an unconscious person anything to drink.
************************************************************************

**Notes to the physician**
Repeated exposure to very high doses of this product may result in cholinesterase inhibition. Additional symptoms resulting from the repeated exposure could include salivation, sweating, headache, nausea, diarrhea and tremors. Should cholinesterase inhibition occur, atropine may be used as an antidote.

5. Fire - fighting measures

**Suitable extinguishing media**
Water, water fog, carbon dioxide (CO2), dry chemical, foam

**Fire fighting procedure**
Fire fighters should wear full protective clothing and self-contained breathing apparatus (SCBA). Contain runoff to prevent entry into water or drainage systems.

**Unusual fire and explosion hazards**
When heated to decomposition, may release poisonous and corrosive fumes of Carbon Dioxide, Carbon Monoxide, Hydrogen Chloride and Phosphorus Oxides.

6. Accidental release measures

**Personal precautions**
Wear appropriate safety clothing and eye/face protection (see Section 8)
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Methods for cleaning up
Collect in suitable and properly labeled containers.
Soak up with sand or other suitable absorbant and dispose of as solid waste.
Ventilate area and wash spill site after material pickup is complete.

Environmental precautions
Prevent product from entering drains, ditches and rivers.

7. Handling and storage

Handling
Avoid bodily contact.
Keep containers tightly closed.

Storage
Store in a dry, cool, well-ventilated area away from incompatible materials (see "materials to avoid").
Maximum recommended storage temperature of 54.4°C (130°F)
Crystallizes at temperatures below 15°C (59°F).

8. Exposure controls / personal protection

Exposure Limits:

<table>
<thead>
<tr>
<th>Components</th>
<th>ACGIH-TLV Data</th>
<th>OSHA (PEL) Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>1,3-Dichloro-2-propanol phosphate (3:1)</td>
<td>Not determined</td>
<td>Not determined</td>
</tr>
<tr>
<td>13674-87-8</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Ventilation requirements
Adequate ventilation is recommended to control potential employee exposure.

Personal protective equipment:
- Respiratory protection: Gas mask with a new organic vapour canister.
- Hand protection: Neoprene or nitrile rubber
- Eye protection: Chemical safety goggles
- Skin and body protection: Body covering clothes and boots

Hygiene measures
Safety shower and eye bath should be provided. Do not eat, smoke or drink where material is handled, processed or stored. Wash hands carefully before eating or smoking.
9. Physical and chemical properties

Appearance
Clear colorless liquid

Odour
Mild

Boiling point/range
326°C (1013hPa)

Melting point/range
-20°C (1013 hPa) This product is a supercooled liquid and may crystallize

Flash point
>200°C

Ignition temperature
513°C (955 °F)

Auto-ignition temperature
Not self-ignitable

Vapour pressure
0.0000056Pa (25°C)

Viscosity
1715mPa.s(dynamic) (20°C)

Solubility:
- Solubility in water
18.1mg/l at 20°C

Specific gravity
1.51(20°C)

Decomposition temperature
326°C

Partition coefficient
Log Kow - 3.69

(n-octanol/water)

Oxidising properties
Not oxidising

10. Stability and reactivity

Stability
Stable under normal conditions

Materials to avoid
Strong oxidizers, strong acids and strong alkalis.

Conditions to avoid
Heating above 50 °C

Hazardous decomposition products
Carbon dioxide and carbon monoxide

Hydrogen Chloride

Phosphorus oxides,

Hazardous polymerization
Not expected to occur

11. Toxicological information

Acute toxicity:
- Rat oral LD50
>2000 mg/kg

- Rat dermal LD50
>2000 mg/kg

- Rat inhalation LC50
>5220 mg/m³

- Eye irritation (rabbit)
Slightly irritant

- Dermal irritation (rabbit)
Slightly irritating to skin but not sufficient for classification.

Dermal sensitization
Not a sensitizer
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Sub-chronic toxicity:
A 90-day study (rabbit, dermal application of 1450 mg/kg) produced an increase in kidney weight, but no histological changes in any tissue.
A 90-day study (rat, oral doses of 25 or 250 mg/kg/day) produced mortality and an increase in liver and kidney organ weights, but no histological changes in any tissue.

Chronic toxicity
NOEL: 5 mg/kg/day (rat)
Certain high dose female rats showed plasma cholinesterase inhibition of up to 30 percent

Mutagenicity
Mutagenic by the Ames Test
Unscheduled DNA synthesis (rat liver) - not mutagenic
Not mutagenic in the mouse lymphoma L5178Y test system.
Negative in the Chromosomai aberrations test (hamster's V79 cells)
Not clastogenic in chromosome aberration test with Chinese hamster cells.
In vivo mouse bone marrow cytogenicity: not mutagenic
In vivo Drosophia melanogaster test: not mutagenic

Carcinogenicity
Not classified by IARC
Not included in NTP 11th Report on Carcinogens
Not classified as a carcinogen by USA OSHA
Daily ingestion of 20 mg/kg or 80 mg/kg for two years was oncogenic to rats. No significant effects were observed at 5 mg/kg/day. Microscopic examination of the tissues and organs of the mid and high dose animals revealed significant increases in the incidence of liver nodules, benign renal cortical tumors and interstitial cell tumors or the testes.
Females recieving the high dose showed an increase in adrenal cortical adenomas.
No significant increase in tumor incidence was observed in the low dose animals.
The substantial decrease in body weights seen in the high dose animals confirmed that the Maximum Tolerated Dose was achieved, and possibly exceeded.

Although there was a significant increase in the incidence of benign tumors in mid and high dose animals, the lack of a significant incidence of malignant tumors in any treatment group confirms that the product did not demonstrate carcinogenic activity. This is consistent with the results of the mutagenicity tests which show the product is not a genotoxin and thus not a genotoxic carcinogen.

In spite of the above the EU authorities reviewed the carcinogenicity of TDCP and decided to classify it as Category 3 Carcinogen. This category includes substances which cause concern to man owing to possible carcinogenic effects but in respect of which the available information is not adequate for making a satisfactory assessment.

Reproductive toxicity
Reproductive studies showed that oral administration of this product to male rabbits for 12 weeks did not adversely affect fertility or sperm quantity.
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Teratogenicity: Not teratogenic

Neurotoxicity: All of neurotoxicity tests conducted consistently showed the product lacked neurotoxic activity

12. Ecological information

Aquatic toxicity:
- 96 Hour-LC50, Fish: 1.1 mg/l (Oncorhynchus mykiss)
- 48 Hour-EC50, Daphnia magna: 3.8 mg/l

Biodegradation: Not readily biodegradable

Bioaccumulative potential: Not bioaccumulative
Measured fish BCF of 31-59

Note: TDCP can be considered to be potentially persistent (P) or potentially very persistent (vP) based on its ultimate mineralisation. The available information on bioaccumulation shows that TDCP does not meet the B or vB criterion. The T criterion is not met.

13. Disposal considerations

Waste disposal: Observe all federal, state and local environmental regulations when disposing of this material

Disposal of Packaging: Dispose of in a safe manner in accordance with local/national regulations.

14. Transportation information

UN No.: 3082
# DOT

Proper shipping name: Environmentally hazardous substances, liquid, n.o.s (tris(1,3-Dichloroisopropyl)phosphate)
Class: 9 - Miscellaneous Hazardous Material  
Label: 9  
Packing Group: III

Not regulated for surface and air transport in non-bulk (<119 gallons) packagings.

# IMO

Proper shipping name: Environmentally hazardous substance, liquid, n.o.s (tris(1,3-Dichloroisopropyl)phosphate)
Class: 9 - Miscellaneous Dangerous Substances and Articles  
Label: 9  
Packing Group: III  
Mark: MARINE POLLUTANT

# ICAO/IATA

Proper shipping name: Environmentally hazardous substance, liquid, n.o.s (tris(1,3-Dichloroisopropyl)phosphate)
Class: 9  
Hazard label(s): Miscellaneous  
Packing group: III  
Marking: Environmentally hazardous substance

## 15. Regulatory information

### USA

- **SARA 313**
  
  Reported in the EPA TSCA Inventory.  
  This product does not contain a chemical listed at or above de minimis concentrations.

- **California-Prop 65**
  
  WARNING: This product contains chemicals known to the State of California to cause cancer and/or reproductive toxicity: [1,3-Dichloro-2-propanol phosphate (3:1) (CAS# 13674-87-8), 93-97%; 1-chloro-2,3-epoxypropane (CAS No. 106-89-8), <0.2%; 1,2,3-trichloropropane (CAS No. 96-18-4), <0.03%; tetrachloroethylene (CAS No. 127-18-4), <0.02%; 1,2-dichloropropane (CAS No. 78-87-5), <0.002%; and 1,3-Dichloro-2-propanol (1,3-DCP, CAS No. 96-23-1), <0.02%.]

- **Waste Classifications**
  
  This material does not meet RCRA’s characteristic definition of ignitability, corrosivity, or reactivity, and is not listed in 40CFR 261.33.

- **Workplace Classification**
  
  This product is considered hazardous under the OSHA Hazard Communication Standard (29CFR 1910.1200).
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Canada
- WHMIS hazard class: D2A very toxic materials

EU
- Reported in EINECS

Japan
- ENCS no. (2)-1914
- ISHL no. (2)-1914

Australia
- Listed in AICS

New Zealand Inventory
- Listed in NZIoC

China inventory
- Listed in IECSC

Korea
- Listed in ECL (KE-34801)

Philippines
- Listed in PICCS

16. Other information

GHS classification

Signal word: Warning

Hazard statements
- H351 - Suspected of causing cancer
- H411 - Toxic to aquatic life with long lasting effects

Precautionary statements
- P202 - Do not handle until all safety precautions have been read and understood.
- P281 - Use personal protective equipment as required.
- P308 + P313 - IF exposed or concerned: Get medical advice/ attention.
- P273 - Avoid release to the environment
- P391 - Collect spillage
- P405 - Store locked up.
- P501 - Dispose of contents/container in accordance with national and international regulations

This data sheet contains changes from the previous version in section(s)
1 & 4 (REACH), 10, 11, 12 & 15 (not REACH)
Health, Safety & Environment Policy

We will strive to ensure that our operations and products meet the needs of the present global community without compromising the ability of future generations to meet their needs.

We accept that the success of our business is dependent on the supply of products and services that will benefit society whilst ensuring human safety and protection of the environment and natural resources.

Within the framework of our commitment to the Responsible Care program, we will provide a healthy and safe work environment for employees and will responsibly manage our products at all stages of their life cycle in order to protect human health and the environment whilst maintaining high production standards of operation.

TO MEET THIS COMMITMENT WE WILL:

Comply with or exceed applicable national and international regulatory requirements and other requirements to which we subscribe.

Communicate openly and actively encourage dialogue with employees, customers and community concerning our products and operations.

Implement documented management systems consistent with and for promotion of the Responsible Care ethics.

Develop and supply products that can be manufactured, transported, used and disposed of safely whilst best meeting the needs of our customers.

Regularly assess, continually improve and responsibly manage health, safety and environmental risks associated with products and processes throughout their life-cycles.

Share knowledge and expertise with others and seek to learn from and incorporate improved practices into our own operations.

Educate and train employees, contractors and customers to improve their HSE performance.

Communicate up-to-date information to enable our workers, customers and other interested parties to handle our products in a safe and environmentally responsible manner.

Endeavor to work with customers, suppliers, distributors and contractors to foster the safe use, transport and disposal of our chemicals.

Support Product Stewardship programs in cooperation with customers, distributors and transporters.

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In an event of discrepancy between the contents of this MSDS and the English version of it, the English version shall prevail.
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End of safety data sheet