## SECTION 1: Identification

### 1.1. Product identifier
- **Product name**: IRON CARBONYL, tech-95
- **Product code**: INFE030
- **Product form**: Substance
- **Physical state**: Liquid
- **Formula**: C₅FeO₅
- **Synonyms**: PENTACARBONYL IRON
- **Chemical family**: METAL CARBONYL

### 1.2. Recommended use of the chemical and restrictions on use
- **Recommended use**: Chemical intermediate
  - For research and industrial use only

### 1.3. Details of the supplier of the safety data sheet
- **GELEST, INC.**
  - 11 East Steel Road
  - Morrisville, PA 19067
  - USA
  - T 215-547-1015 - F 215-547-2484 - (M-F): 8:00 AM - 5:30 PM EST
  - info@gelest.com - www.gelest.com

### 1.4. Emergency telephone number
- **Emergency number**: CHEMTREC: 1-800-424-9300 (USA); +1 703-527-3887 (International)

## SECTION 2: Hazard(s) identification

### 2.1. Classification of the substance or mixture

<table>
<thead>
<tr>
<th>GHS-US classification</th>
<th>Hazard (H) statements</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flammable liquids Category 2</td>
<td>H225</td>
</tr>
<tr>
<td>Acute toxicity (oral) Category 2</td>
<td>H300</td>
</tr>
<tr>
<td>Acute toxicity (dermal) Category 2</td>
<td>H310</td>
</tr>
<tr>
<td>Acute toxicity (inhalation/vapor) Category 1</td>
<td>H330</td>
</tr>
<tr>
<td>Specific target organ toxicity (repeated exposure) Category 1</td>
<td>H372</td>
</tr>
</tbody>
</table>

- Full text of H statements: see section 16

### 2.2. Label elements

#### GHS-US labeling
- **Hazard pictograms (GHS-US)**: ![GHS02](image), ![GHS06](image), ![GHS08](image)
- **Signal word (GHS-US)**: Danger
- **Hazard statements (GHS-US)**: H225 - Highly flammable liquid and vapor
  - H300+H310+H330 - Fatal if swallowed, in contact with skin or if inhaled
  - H372 - Causes damage to organs through prolonged or repeated exposure
- **Precautionary statements (GHS-US)**: P280 - Wear protective gloves/protective clothing/eye protection/face protection
  - P310 - Immediately call a POISON CENTER
  - P210 - Keep away from heat, sparks, open flames. - No smoking
  - P240 - Ground/Bond container and receiving equipment
  - P241 - Use explosion-proof electrical equipment
  - P242 - Use only non-sparking tools
  - P243 - Take precautionary measures against static discharge
  - P260 - Do not breathe vapors
  - P262 - Do not get in eyes, on skin, or on clothing
  - P264 - Wash hands thoroughly after handling
  - P270 - Do not eat, drink or smoke when using this product
  - P271 - Use only outdoors or in a well-ventilated area
  - P284 - In case of inadequate ventilation wear respiratory protection
  - P330 - Rinse mouth
  - P301+P310 - If swallowed: Immediately call a POISON CENTER
  - P303+P361+P353 - If on skin (or hair): take off immediately all contaminated clothing. rinse
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2.3. Hazards not otherwise classified (HNOC)
No additional information available

2.4. Unknown acute toxicity (GHS US)
No data available

SECTION 3: Composition/Information on ingredients

3.1. Substances

<table>
<thead>
<tr>
<th>Substance type</th>
<th>: Mono-constituent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
<td>: IRON CARBONYL, tech-95</td>
</tr>
<tr>
<td>CAS No</td>
<td>: 13463-40-6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Product identifier</th>
<th>%</th>
<th>GHS-US classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Iron carbonyl</td>
<td>(CAS No) 13463-40-6</td>
<td>95 - 100</td>
<td>Flam. Liq. 2, H225, Acute Tox. 2 (Oral), H300, Acute Tox. 2 (Dermal), H310, Acute Tox. 1 (Inhalation: vapour), H330, STOT RE 1, H372</td>
</tr>
</tbody>
</table>

Full text of hazard classes and H-statements : see section 16

3.2. Mixtures
Not applicable

4.1. Description of first aid measures

First-aid measures general : Remove contaminated clothing and shoes. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). If possible show this sheet; if not available show packaging or label.

First-aid measures after inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a poison center or doctor/physician.

First-aid measures after skin contact : Remove/take off immediately all contaminated clothing. Wash with plenty of soap and water. Immediately call a poison center or doctor/physician.

First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical advice/attention.

First-aid measures after ingestion : Never give anything by mouth to an unconscious person. Immediately call a poison center or doctor/physician.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries : Causes damage to organs (lungs) through prolonged or repeated exposure.
Symptoms/injuries after inhalation : Fatal if inhaled. Danger of serious damage to health by prolonged exposure through inhalation. Low levels may cause headache, nausea, dizziness, vomiting and unconsciousness. Prolonged or high levels of exposure may cause cyanosis and circulatory collapse.
Symptoms/injuries after skin contact : Fatal in contact with skin. May cause skin irritation. Repeated exposure to this material can result in absorption through skin causing significant health hazard.
Symptoms/injuries after eye contact : May cause eye irritation.
Symptoms/injuries after ingestion : Fatal if swallowed. Swallowing a small quantity of this material will result in serious health hazard.

4.3. Indication of any immediate medical attention and special treatment needed
No additional information available

SECTION 5: Firefighting measures

5.1. Extinguishing media


Unsuitable extinguishing media : Do not use straight streams.

5.2. Special hazards arising from the substance or mixture

Fire hazard : Highly flammable liquid and vapor. Irritating fumes and organic acid vapors may develop when material is exposed to elevated temperatures or open flame.

skin with water/shower
P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
P314 - Get medical advice/attention if you feel unwell
P320 - Specific treatment is urgent (see first aid instructions on this label)
P361 - Take off immediately all contaminated clothing
P363 - Wash contaminated clothing before reuse
P370+P378 - In case of fire: Use water spray or fog, foam, carbon dioxide, dry chemical to extinguish
P403+P233 - Store in a well-ventilated place. Keep container tightly closed
P403+P235 - Keep in a cool place
P405 - Store locked up
P501 - Dispose of contents/container to licensed waste disposal facility

Print date: 12/09/2016
EN (English US)
SDS ID: INFE030
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Explosion hazard: May form flammable/explosive vapor-air mixture.

5.3. Advice for firefighters

Firefighting instructions: Exercise caution when fighting any chemical fire. Use water spray or fog for cooling exposed containers.

Protection during firefighting: Do not enter fire area without proper protective equipment, including respiratory protection. Avoid all eye and skin contact and do not breathe vapor and mist.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures: Eliminate every possible source of ignition. Use special care to avoid static electric charges.

6.1.1. For non-emergency personnel

Protective equipment: Wear protective equipment as described in Section 8.

Emergency procedures: Evacuate unnecessary personnel.

6.1.2. For emergency responders

Protective equipment: Do not attempt to take action without suitable protective equipment. Equip cleanup crew with proper protection. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions

Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

For containment: Contain any spills with dikes or absorbents to prevent migration and entry into sewers or streams.

Methods for cleaning up: Clean up any spills as soon as possible, using an absorbent material to collect it. Use only non-sparking tools.

6.4. Reference to other sections

See Heading 8. Exposure controls and personal protection.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Additional hazards when processed: Handle empty containers with care because residual vapors are flammable. Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

Precautions for safe handling: Avoid all eye and skin contact and do not breathe vapor and mist. Ground/bond container and receiving equipment. Take precautionary measures against static discharge. Use only outdoors or in a well-ventilated area. Use only non-sparking tools.

Hygiene measures: Wash contaminated clothing before reuse. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures: Proper grounding procedures to avoid static electricity should be followed. Use explosion-proof electrical equipment.

Storage conditions: Keep container tightly closed. Keep in a cool place. Store locked up.


Storage area: Store in a well-ventilated place. Store away from heat.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

<table>
<thead>
<tr>
<th>Iron carbonyl (13463-40-6)</th>
<th>ACGIH TWA (ppm)</th>
<th>ACGIH STEL (ppm)</th>
<th>NIOSH REL (TWA) (mg/m³)</th>
<th>NIOSH REL (TWA) (ppm)</th>
<th>NIOSH REL (STEL) (mg/m³)</th>
<th>NIOSH REL (STEL) (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACGIH</td>
<td>0.1 ppm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACGIH</td>
<td>0.2 ppm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>NIOSH</td>
<td>0.23 mg/m³</td>
<td></td>
<td></td>
<td>0.1 ppm</td>
<td></td>
<td></td>
</tr>
<tr>
<td>NIOSH</td>
<td>0.45 mg/m³</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>0.2 ppm</td>
</tr>
</tbody>
</table>

8.2. Exposure controls

Appropriate engineering controls: Provide local exhaust or general room ventilation.

Personal protective equipment: Avoid all unnecessary exposure. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.
**Hand protection**: Neoprene or nitrile rubber gloves.

**Eye protection**: Chemical goggles or face shield. Contact lenses should not be worn.

**Skin and body protection**: Wear suitable protective clothing. Long-sleeved fire-resistant lab uniform or coverall is recommended.

**Respiratory protection**: Where exposure through inhalation may occur from use, respiratory protection equipment is recommended. NIOSH-certified organic vapor (black cartridge) respirator.

### SECTION 9: Physical and chemical properties

#### 9.1. Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical state</td>
<td>Liquid</td>
</tr>
<tr>
<td>Appearance</td>
<td>Liquid.</td>
</tr>
<tr>
<td>Molecular mass</td>
<td>195.9 g/mol</td>
</tr>
<tr>
<td>Color</td>
<td>dark red.</td>
</tr>
<tr>
<td>Odor</td>
<td>No data available</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>No data available</td>
</tr>
<tr>
<td>Refractive index</td>
<td>1.5196</td>
</tr>
<tr>
<td>pH</td>
<td>No data available</td>
</tr>
<tr>
<td>Relative evaporation rate (butyl acetate=1)</td>
<td>&gt; 1</td>
</tr>
<tr>
<td>Melting point</td>
<td>-20 °C</td>
</tr>
<tr>
<td>Freezing point</td>
<td>No data available</td>
</tr>
<tr>
<td>Boiling point</td>
<td>103 °C</td>
</tr>
<tr>
<td>Flash point</td>
<td>-15 °C</td>
</tr>
<tr>
<td>Critical temperature</td>
<td>285 - 288 °C</td>
</tr>
<tr>
<td>Auto-ignition temperature</td>
<td>55 °C</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>No data available</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>Highly flammable liquid and vapor</td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>30.3 mm Hg @ 40 mm Hg</td>
</tr>
<tr>
<td>Critical pressure</td>
<td>29.6 atm</td>
</tr>
<tr>
<td>Relative vapor density at 20 °C</td>
<td>1.1 (methanol)</td>
</tr>
<tr>
<td>Relative density</td>
<td>0.95</td>
</tr>
<tr>
<td>Solubility</td>
<td>Insoluble in water.</td>
</tr>
<tr>
<td>Organic solvent: Soluble: ether, ethyl acetate, toluene</td>
<td></td>
</tr>
<tr>
<td>Log Pow</td>
<td>No data available</td>
</tr>
<tr>
<td>Log Kow</td>
<td>No data available</td>
</tr>
<tr>
<td>Viscosity, kinematic</td>
<td>No data available</td>
</tr>
<tr>
<td>Viscosity, dynamic</td>
<td>No data available</td>
</tr>
<tr>
<td>Explosive properties</td>
<td>No data available</td>
</tr>
<tr>
<td>Oxidizing properties</td>
<td>No data available</td>
</tr>
<tr>
<td>Explosion limits</td>
<td>3.7 - 12.5 vol % (lower; upper)</td>
</tr>
</tbody>
</table>

#### 9.2. Other information

No additional information available

### SECTION 10: Stability and reactivity

#### 10.1. Reactivity

No additional information available

#### 10.2. Chemical stability

Stable when stored in the dark in sealed containers.

#### 10.3. Possibility of hazardous reactions

Decomposes at temperatures exceeding 100°C. Material decomposes slowly in contact with moist air or with water liberating carbon monoxide.

#### 10.4. Conditions to avoid

Heat. Sparks. Open flame.

#### 10.5. Incompatible materials


#### 10.6. Hazardous decomposition products

SECTION 11: Toxicological information

11.1. Information on toxicological effects


IRON CARBONYL, tech-95 (13463-40-6)

<table>
<thead>
<tr>
<th>Component</th>
<th>Route of Exposure</th>
<th>Toxicity Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>ATE US (oral)</td>
<td>31,000 mg/kg body weight</td>
<td></td>
</tr>
<tr>
<td>ATE US (dermal)</td>
<td>56,000 mg/kg body weight</td>
<td></td>
</tr>
<tr>
<td>ATE US (vapors)</td>
<td>0.320 mg/l/4h</td>
<td></td>
</tr>
<tr>
<td>Iron carbonyl (13463-40-6)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LD50 oral rat</td>
<td>31 mg/kg</td>
<td></td>
</tr>
<tr>
<td>LD50 oral mouse</td>
<td>62 mg/kg</td>
<td></td>
</tr>
<tr>
<td>LD50 oral rabbit</td>
<td>12 mg/kg</td>
<td></td>
</tr>
<tr>
<td>LD50 oral guinea pig</td>
<td>22 mg/kg</td>
<td></td>
</tr>
<tr>
<td>LD50 dermal rabbit</td>
<td>56 mg/kg RTECS Number: NO4900000</td>
<td></td>
</tr>
<tr>
<td>LC50 inhalation rat (mg/l)</td>
<td>0.32 mg/l/4h</td>
<td></td>
</tr>
<tr>
<td>LC50 inhalation rat (ppm)</td>
<td>10 ppm/4h</td>
<td></td>
</tr>
<tr>
<td>LC50 inhalation rat</td>
<td>43.5 mg/m³</td>
<td></td>
</tr>
<tr>
<td>ATE US (oral)</td>
<td>31,000 mg/kg body weight</td>
<td></td>
</tr>
<tr>
<td>ATE US (dermal)</td>
<td>56,000 mg/kg body weight</td>
<td></td>
</tr>
<tr>
<td>ATE US (gases)</td>
<td>10,000 ppmV/4h</td>
<td></td>
</tr>
<tr>
<td>ATE US (vapors)</td>
<td>0.320 mg/l/4h</td>
<td></td>
</tr>
<tr>
<td>ATE US (dust, mist)</td>
<td>0.320 mg/l/4h</td>
<td></td>
</tr>
</tbody>
</table>

Skin corrosion/irritation: Not classified
Serious eye damage/irritation: Not classified
Respiratory or skin sensitization: Not classified
Germ cell mutagenicity: Not classified
Carcinogenicity: None of the components in this product at concentrations >0.1% are listed by IARC, NTP, OSHA or ACGIH as a carcinogen
Reproductive toxicity: Not classified
Specific target organ toxicity – single exposure: Not classified
Specific target organ toxicity – repeated exposure: Causes damage to organs through prolonged or repeated exposure.
Aspiration hazard: Not classified
Potential Adverse human health effects and symptoms: While toxicity data is available, it is reasonable to assume that the iron carbonyl will generate carbon monoxide which complexes with hemoglobin.
Symptoms/injuries after inhalation: Fatal if inhaled. Danger of serious damage to health by prolonged exposure through inhalation. Low levels may cause headache, nausea, dizziness, vomiting and unconsciousness. Prolonged or high levels of exposure may cause cyanosis and circulatory collapse.
Symptoms/injuries after skin contact: Fatal in contact with skin. May cause skin irritation. Repeated exposure to this material can result in absorption through skin causing significant health hazard.
Symptoms/injuries after eye contact: May cause eye irritation.
Symptoms/injuries after ingestion: Fatal if swallowed. Swallowing a small quantity of this material will result in serious health hazard.
Reason for classification: Expert judgment

SECTION 12: Ecological information

12.1. Toxicity

Iron carbonyl (13463-40-6)

<table>
<thead>
<tr>
<th>Test</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>EC50 Daphnia 1</td>
<td>130 mg/l (Exposure time: 48 h - Species: Daphnia magna)</td>
</tr>
</tbody>
</table>

12.2. Persistence and degradability

No additional information available

12.3. Bioaccumulative potential

Iron carbonyl (13463-40-6)

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Log Pow</td>
<td>3 (at 25 °C)</td>
</tr>
</tbody>
</table>

12.4. Mobility in soil

No additional information available
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12.5. Other adverse effects
Other adverse effects: This substance may be hazardous to the environment.
Effect on ozone layer: No additional information available
Effect on the global warming: No known effects from this product.
GWPmix comment: No known effects from this product.

SECTION 13: Disposal considerations
13.1. Waste treatment methods
Sewage disposal recommendations: Do not dispose of waste into sewer.
Waste disposal recommendations: Dispose in a safe manner in accordance with local/national regulations. In a well ventilated area, treat a dilute basic (pH 10-11) slurry of the material with 50% excess of sodium hypochlorite (laundry bleach). Control temperature by rate of addition. Absorb slurry onto clay or other inert material and landfill in accordance with regulations. Dispose of contents/container to licensed waste disposal facility.

SECTION 14: Transport information
14.1. UN number
UN-No.(DOT): 1994
DOT NA no.: UN1994

14.2. UN proper shipping name
Proper Shipping Name (DOT): Iron pentacarbonyl
Inhalation Hazard Zone A

14.3. Additional information
Emergency Response Guide (ERG) Number: 131
Other information: No supplementary information available.

Transport by sea
DOT Vessel Stowage Location: D - The material must be stowed “on deck only” on a cargo vessel and on a passenger vessel carrying a number of passengers limited to not more than the larger of 25 passengers or one passenger per each 3 m of overall vessel length, but the material is prohibited on passenger vessels in which the limiting number of passengers is exceeded

DOT Vessel Stowage Other: 40 - Stow “clear of living quarters”

Air transport
DOT Quantity Limitations Passenger aircraft/rail: Forbidden
DOT Quantity Limitations Cargo aircraft only: Forbidden

SECTION 15: Regulatory information
15.1. US Federal regulations
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Iron carbonyl (13463-40-6)
Listed on the United States TSCA (Toxic Substances Control Act) inventory
Listed on the United States SARA Section 302
Subject to reporting requirements of United States SARA Section 313

<table>
<thead>
<tr>
<th>SARA Section 302 Threshold Planning</th>
<th>100</th>
</tr>
</thead>
<tbody>
<tr>
<td>SARA Section 313 - Emission Reporting</td>
<td>1.0 %</td>
</tr>
</tbody>
</table>

15.2. International regulations

CANADA
Iron carbonyl (13463-40-6)
Listed on the Canadian DSL (Domestic Substances List)

WHMIS Classification
Class B Division 2 - Flammable Liquid
Class D Division 1 Subdivision A - Very toxic material causing immediate and serious toxic effects

EU-Regulations
Iron carbonyl (13463-40-6)
Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

National regulations
Iron carbonyl (13463-40-6)
Listed on the AICS (Australian Inventory of Chemical Substances)
Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory
Listed on the Korean ECL (Existing Chemicals List)
Listed on NZIoC (New Zealand Inventory of Chemicals)
Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)
Listed on the Canadian IDL (Ingredient Disclosure List)
Listed on INSQ (Mexican National Inventory of Chemical Substances)

15.3. US State regulations
Iron carbonyl (13463-40-6)
U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List
U.S. - Pennsylvania - RTK (Right to Know) List

SECTION 16: Other information
Full text of H-phrases:

| H225 | Highly flammable liquid and vapor |
| H300 | Fatal if swallowed |
| H310 | Fatal in contact with skin |
| H330 | Fatal if inhaled |
| H372 | Causes damage to organs through prolonged or repeated exposure |

Abbreviations and acronyms:
Abbreviations: ND: Not Determined, No Data; NA: Not Applicable; LD: Lethal Dose; LC: Lethal Concentration; ATE: Acute Toxicity Estimates; H: hour; °: °C unless otherwise stated; mm: millimeters Hg, torr; PEL: permissible exposure level; TWA: time weighted average; TLV: threshold limit value; TG: Test Guideline; NIOSH: National Institute for Occupational Safety and Health; IARC: International Agency for Research on Cancer; NTP: National Toxicology Program; HMIS: Hazardous Material Information System; CAS No.: Chemical Abstract Service Registration Number; EC No.: European Commission Registration Number; EC Index No.: European Commission Index Number; OECD: The Organisation for Economic Co-operation and Development; GHS: The Globally Harmonized System of Classification and Labelling.

HMIS III Rating
Health: 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given.
Flammability: 3 Serious Hazard - Materials capable of ignition under almost all normal temperature conditions. Includes flammable liquids with flash points below 73 F and boiling points above 100 F. as well as liquids with flash points between 73 F and 100 F. (Classes IB & IC)
Physical: 0 Minimal Hazard - Materials that are normally stable, even under fire conditions, and will NOT react with water, polymerize, decompose, condense, or self-react. Non-Explosives.
Prepared by safety and environmental affairs.

Date of issue: 12/09/2016  Version: 1.0

SDS US (GHS HazCom 2012) - Custom

According to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

The information contained in this document has been gathered from reference materials and/or Gelest, Inc. test data and is to the best knowledge and belief of Gelest, Inc. accurate and reliable. Such information is offered solely for your consideration, investigation and verification. It is not suggested or guaranteed that the hazard precautions or procedures described are the only ones which exist. Gelest, Inc. makes no warranties, express or implied, with respect to the use of such information and assumes no responsibility therefore. Information on this safety data sheet is not intended to constitute a basis for product specifications.

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