1 Identification

· Product name
  · Trade name: Tetrakis(ethylmethylamino)zirconium(IV) 99% TEMAZ, 40-1710, contained in 50 ml Swagelok® cylinder (96-1070) for CVD/ALD

· Item number: 98-4039
· CAS Number: 175923-04-3

· Details of the supplier of the safety data sheet
· Manufacturer/Supplier:
  Strem Chemicals, Inc.
  7 Mulliken Way
  NEWBURYPORT, MA 01950
  USA
  info@strem.com

· Information department: Technical Department
· Emergency telephone number:
  EMERGENCY: CHEMTREC: + 1 (800) 424-9300
  During normal opening times: +1 (978) 499-1600

2 Hazard(s) identification

· Classification of the substance or mixture
  GHS02 Flame
  Water-react. 2 H261 In contact with water releases flammable gas.

  GHS05 Corrosion
  Skin Corr. 1B H314 Causes severe skin burns and eye damage.
  Eye Dam. 1 H318 Causes serious eye damage.

· Label elements
  · GHS label elements
    The substance is classified and labeled according to the Globally Harmonized System (GHS).
  · Hazard pictograms
    GHS02 GHS05

· Signal word Danger

  · Hazard-determining components of labeling:
    Tetrakis(ethylmethylamino)zirconium, 99% TEMAZ
  · Hazard statements
    H261 In contact with water releases flammable gas.
    H314 Causes severe skin burns and eye damage.
  · Precautionary statements
    P231+P232 Handle under inert gas. Protect from moisture.

(Contd. on page 2)
Trade name: Tetrakis(ethylmethylamino)zirconium(IV) 99% TEMAZ, 40-1710, contained in 50 ml Swagelok® cylinder (96-1070) for CVD/ALD

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P303+P361+P335 If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P403+P233 Store in a well-ventilated place. Keep container tightly closed.
P422 Store contents under inert gas.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

· Classification system:
· NFPA ratings (scale 0 - 4)

- Health = 3
- Fire = 0
- Reactivity = 0

· HMIS-ratings (scale 0 - 4)

- Health = 3
- Fire = 0
- Reactivity = 0

· Other hazards
· Results of PBT and vPvB assessment
· PBT: Not applicable.
· vPvB: Not applicable.

3 Composition/information on ingredients

· Chemical characterization: Substances
· CAS No. Description
  175923-04-3 Tetrakis(ethylmethylamino)zirconium, 99% TEMAZ

4 First-aid measures

· Description of first aid measures
· General information: Immediately remove any clothing soiled by the product.
· After inhalation: In case of unconsciousness place patient stably in side position for transportation.
· After skin contact: Immediately wash with water and soap and rinse thoroughly.
· After eye contact: Rinse opened eye for several minutes under running water. Then consult a doctor.
· After swallowing: Drink copious amounts of water and provide fresh air. Immediately call a doctor.
· Information for doctor:
· Most important symptoms and effects, both acute and delayed No further relevant information available.
· Indication of any immediate medical attention and special treatment needed
  No further relevant information available.

5 Fire-fighting measures

· Extinguishing media
· Suitable extinguishing agents:
  Sand. Do not use water.
  CO2, sand, extinguishing powder. Do not use water.

(Contd. on page 3)
### 6 Accidental release measures

- **Personal precautions, protective equipment and emergency procedures**
  - Wear protective equipment. Keep unprotected persons away.
- **Environmental precautions:** Prevent seepage into sewage system, workpits and cellars.
- **Methods and material for containment and cleaning up:**
  - Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
  - Use neutralizing agent.
  - Dispose contaminated material as waste according to item 13.
  - Ensure adequate ventilation.
  - Do not flush with water or aqueous cleansing agents.
- **Advice for fire-fighters**
- **Protective equipment:** No special measures required.
- **Reference to other sections**
  - See Section 7 for information on safe handling.
  - See Section 8 for information on personal protection equipment.
  - See Section 13 for disposal information.

### 7 Handling and storage

- **Handling:**
  - **Precautions for safe handling** Open and handle receptacle with care.
  - **Information about protection against explosions and fires:** Keep ignition sources away - Do not smoke.
- **Conditions for safe storage, including any incompatibilities**
- **Storage:**
  - **Requirements to be met by storerooms and receptacles:** No special requirements.
  - **Information about storage in one common storage facility:** Not required.
  - **Further information about storage conditions:**
    - Keep receptacle tightly sealed.
    - Store in cool, dry conditions in well sealed receptacles.
- **Specific end use(s)** No further relevant information available.

### 8 Exposure controls/personal protection

- **Additional information about design of technical systems:** No further data; see item 7.
- **Control parameters**
- **Components with limit values that require monitoring at the workplace:** Not required.
- **Additional information:** The lists that were valid during the creation were used as basis.
- **Exposure controls**
- **Personal protective equipment:**
  - **General protective and hygienic measures:**
    - Keep away from foodstuffs, beverages and feed.
    - Immediately remove all soiled and contaminated clothing.
    - Wash hands before breaks and at the end of work.
    - Avoid contact with the eyes.
    - Avoid contact with the eyes and skin.
Safety Data Sheet
according to OSHA HCS

Trade name: Tetrakis(ethylmethylamino)zirconium(IV) 99% TEMAZ, 40-1710, contained in 50 ml Swagelok® cylinder (96-1070) for CVD/ALD

· Breathing equipment: Not required.
· Protection of hands:

Protective gloves

The glove material has to be impermeable and resistant to the product/ the substance/ the preparation. Due to missing tests no recommendation to the glove material can be given for the product/ the preparation/ the chemical mixture.
Selection of the glove material on consideration of the penetration times, rates of diffusion and the degradation
· Material of gloves
The selection of the suitable gloves does not only depend on the material, but also on further marks of quality and varies from manufacturer to manufacturer.
· Penetration time of glove material
The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.
· Eye protection:

Tightly sealed goggles

9 Physical and chemical properties

· Information on basic physical and chemical properties
· General Information
· Appearance:
  · Form: Liquid
  · Color: Light yellow
· Odor:
· Odor threshold:
  · Not determined.
· pH-value:
  · Not determined.
· Change in condition
  · Melting point/Melting range:
  · Boiling point/Boiling range: 81/0.1mmHg °C (178/32mmHg °F)
· Flash point:
  · Not applicable.
· Flammability (solid, gaseous):
  · Not determined.
· Ignition temperature:
  · Decomposition temperature:
  · Not determined.
· Auto igniting:
  · Not determined.
· Danger of explosion:
  · Not determined.
· Explosion limits:
  · Lower:
  · Not determined.
  · Upper:
  · Not determined.
· Vapor pressure:
  · Not determined.
### 10 Stability and reactivity

- **Reactivity**: No further relevant information available.
- **Chemical stability**
- **Thermal decomposition / conditions to be avoided**: No decomposition if used according to specifications.
- **Possibility of hazardous reactions**: No dangerous reactions known.
- **Conditions to avoid**: No further relevant information available.
- **Incompatible materials**: No further relevant information available.
- **Hazardous decomposition products**: No dangerous decomposition products known.

### 11 Toxicological information

- **Information on toxicological effects**
- **Acute toxicity**:
- **Primary irritant effect**:
  - on the skin: Caustic effect on skin and mucous membranes.
  - on the eye:
  - Strong caustic effect.
  - Strong irritant with the danger of severe eye injury.
- **Sensitization**: No sensitizing effects known.
- **Additional toxicological information**:
  - Swallowing will lead to a strong caustic effect on mouth and throat and to the danger of perforation of esophagus and stomach.
- **Carcinogenic categories**
  - **IARC (International Agency for Research on Cancer)**
    - Substance is not listed.
  - **NTP (National Toxicology Program)**
    - Substance is not listed.
12 Ecological information

- **Toxicity**
- **Aquatic toxicity:** No further relevant information available.
- **Persistence and degradability** No further relevant information available.
- **Behavior in environmental systems:**
  - **Bioaccumulative potential** No further relevant information available.
  - **Mobility in soil** No further relevant information available.
- **Additional ecological information:**
  - **General notes:** Must not reach bodies of water or drainage ditch undiluted or unneutralized.
  - **Results of PBT and vPvB assessment**
    - **PBT:** Not applicable.
    - **vPvB:** Not applicable.
  - **Other adverse effects** No further relevant information available.

13 Disposal considerations

- **Waste treatment methods**
- **Recommendation:** Must not be disposed of together with household garbage. Do not allow product to reach sewage system.
- **Uncleaned packagings**
- **Recommendation:** Disposal must be made according to official regulations.

14 Transport information

- **UN-Number**
  - DOT, IMDG, IATA: UN3129

- **UN proper shipping name**
  - DOT, IATA: Water-reactive liquid, corrosive, n.o.s.
  - IMDG: WATER-REACTIVE LIQUID, CORROSIVE, N.O.S.

- **Transport hazard class(es)**
  - **DOT**
    - **Class:** 4.3 Substances which, in contact with water, emit flammable gases
    - **Label:** 4.3, 8
Trade name: Tetrakis(ethylmethylamino)zirconium(IV) 99% TEMAZ, 40-1710, contained in 50 ml Swagelok® cylinder (96-1070) for CVD/ALD

- **IMDG**
  - **Class:** 4.3 Substances which, in contact with water, emit flammable gases
  - **Label:** 4.3/8

- **IATA**
  - **Class:** 4.3 Substances which, in contact with water, emit flammable gases
  - **Label:** 4.3 (8)

- **Packing group**
  - **DOT, IMDG, IATA:** II

- **Environmental hazards:**
  - **Marine pollutant:** No
  - **Special precautions for user**
  - **EMS Number:** F-G-S-N
  - **Stowage Category:** E
  - **Stowage Code**
    - SW3 Shall be transported under temperature control.
  - **Handling Code**
    - H1 Keep as dry as reasonably practicable
  - **Segregation Code**
    - SG26 In addition: from goods of classes 2.1 and 3 when stowed on deck of a containership a minimum distance of two container spaces athwartship shall be maintained, when stowed on ro-ro ships a distance of 6 m athwartship shall be maintained.

- **Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**
  - **DOT**
    - **Quantity limitations**
      - On passenger aircraft/rail: 1 L
      - On cargo aircraft only: 5 L
  - **IMDG**
    - **Limited quantities (LQ)**
      - Code: E2
      - Maximum net quantity per inner packaging: 30 ml
      - Maximum net quantity per outer packaging: 500 ml
    - **Excepted quantities (EQ)**
      - Code: E2
  - **UN "Model Regulation":**
    - UN 3129 WATER-REACTIVE LIQUID, CORROSIVE, N.O.S., 4.3 (8), II
15 Regulatory information

- Safety, health and environmental regulations/legislation specific for the substance or mixture
- Sara
  - Section 355 (extremely hazardous substances):
    Substance is not listed.
  - Section 313 (Specific toxic chemical listings):
    Substance is not listed.
- TSCA (Toxic Substances Control Act):
  Substance is not listed.
- Proposition 65
  - Chemicals known to cause cancer:
    Substance is not listed.
  - Chemicals known to cause reproductive toxicity for females:
    Substance is not listed.
  - Chemicals known to cause reproductive toxicity for males:
    Substance is not listed.
  - Chemicals known to cause developmental toxicity:
    Substance is not listed.
- Carcinogenic categories
  - EPA (Environmental Protection Agency)
    Substance is not listed.
  - TLV (Threshold Limit Value established by ACGIH)
    Substance is not listed.
  - NIOSH-Ca (National Institute for Occupational Safety and Health)
    Substance is not listed.
- GHS label elements
  The substance is classified and labeled according to the Globally Harmonized System (GHS).
- Hazard pictograms
  
  ![GHS02](GHS02)  ![GHS05](GHS05)

- Signal word Danger
- Hazard-determining components of labeling:
  Tetrakis(ethylmethylamino)zirconium, 99% TEMAZ
- Hazard statements
  H261 In contact with water releases flammable gas.
  H314 Causes severe skin burns and eye damage.
- Precautionary statements
  P231+P232 Handle under inert gas. Protect from moisture.
  P303+P361+P353 If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
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P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P403+P233 Store in a well-ventilated place. Keep container tightly closed.
P422 Store contents under inert gas.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

- Department issuing SDS: Technical Department.
- Contact: Technical Director
- Date of preparation / last revision 08/01/2016 / -
- Abbreviations and acronyms:
  ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
  IMDG: International Maritime Code for Dangerous Goods
  DOT: US Department of Transportation
  IATA: International Air Transport Association
  ACGIH: American Conference of Governmental Industrial Hygienists
  CAS: Chemical Abstracts Service (division of the American Chemical Society)
  NFPA: National Fire Protection Association (USA)
  HMIS: Hazardous Materials Identification System (USA)
  VOC: Volatile Organic Compounds (USA, EU)
  PBT: Persistent, Bioaccumulative and Toxic
  vPvB: very Persistent and very Bioaccumulative
  NIOSH: National Institute for Occupational Safety
  OSHA: Occupational Safety & Health
  TLV: Threshold Limit Value
  PEL: Permissible Exposure Limit
  REL: Recommended Exposure Limit
  Water-react. 2: Substances and Mixtures which, in contact with water, emit flammable gases, Hazard Category 2
  Skin Corr. 1B: Skin corrosion/irritation, Hazard Category 1B
  Eye Dam. 1: Serious eye damage/eye irritation, Hazard Category 1