1 Identification

- **Product name**
- **Trade name**: Tetrakis(diethylamino)titanium(IV), 99%, 22-1050, contained in 50 ml Swagelok® cylinder (96-1070) for CVD/ALD
- **Item number**: 98-4043
- **CAS Number**: 4419-47-0
- **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**
  - ![Flame Icon]
    GHS02 Flame
    Flam. Liq. 2  H225  Highly flammable liquid and vapor.
    Water-react. 1  H260  In contact with water releases flammable gases, which may ignite spontaneously.
  - ![Corrosion Icon]
    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** Dangerous
- **Hazard-determining components of labeling**: Tetrakis(diethylamino)titanium(IV), 99%
- **Hazard statements**
  - H225 Highly flammable liquid and vapor.
  - H260 In contact with water releases flammable gases, which may ignite spontaneously.
  - H314 Causes severe skin burns and eye damage.
Trade name: Tetrakis(diethylamino)titanium(IV), 99%, 22-1050, contained in 50 ml Swagelok® cylinder (96-1070) for CVD/ALD

- **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.
  - 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 = 3
    Reactivity = 2

  - The substance demonstrates unusual reactivity with water.

  - HMIS-ratings (scale 0 - 4)

    HEALTH Health = 3
    FIRE Fire = 3
    REACTIVITY Reactivity = 2

- **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
  4419-47-0 Tetrakis(diethylamino)titanium(IV), 99%

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.
- For safety reasons unsuitable extinguishing agents: Water with full jet
- Special hazards arising from the substance or mixture: No further relevant information available.
- Advice for firefighters:
  Protective equipment: No special measures required.

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.
- 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.
  Protect against electrostatic charges.
- Conditions for safe storage, including any incompatibilities
- Storage:
  Requirements to be met by storerooms and receptacles: Store in a cool location.
  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.

**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**

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### 9 Physical and chemical properties

**Information on basic physical and chemical properties**

**General Information**

**Appearance:**

- **Form:** Liquid
- **Color:** Yellow
- **Odor:** Amine-like
- **Odor threshold:** Not determined.

**pH-value:** Not determined.

**Change in condition**

- **Melting point/Melting range:** no data °C
- **Boiling point/Boiling range:** 133 /1.2mm °C (271 /34mm °F)

**Flash point:** Not applicable.

**Flammability (solid, gaseous):** 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.

- **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.

  · OSHA-Ca (Occupational Safety & Health Administration)
    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 UN3399

· UN proper shipping name
  
· DOT, IATA Organometallic substance, liquid, water-reactive, flammable (Tetrakis(diethylamino)titanium(IV), 99%)

· IMDG ORGANO METAL LIC SUBSTANCE, LIQUID, WATER-REACTIVE, FLAMMABLE (Tetrakis(diethylamino)titanium(IV), 99%)
### Transport hazard class(es)

**DOT**
- **Class**: 4.3 Substances which, in contact with water, emit flammable gases
- **Label**: 4.3, 3

**IMDG**
- **Class**: 4.3 Substances which, in contact with water, emit flammable gases
- **Label**: 4.3/3

**IATA**
- **Class**: 4.3 Substances which, in contact with water, emit flammable gases
- **Label**: 4.3 (3)

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

### Environmental hazards:
- **Marine pollutant**: No

**Special precautions for user**
- **Danger code (Kemler)**: Not applicable.
- **EMS Number**: F-G, S-N
- **Stowage Category**: D
- **Stowage Code**: SW2 Clear of living quarters.
- **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.
  - SG35 Stow "separated from" acids.

### Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code
- **DOT**: Not applicable.

### Transport/Additional information:
- **DOT**
- **Quantity limitations**
  - On passenger aircraft/rail: Forbidden
  - On cargo aircraft only: 1 L
Trade name: Tetrakis(diethylamino)titanium(IV), 99%, 22-1050, contained in 50 ml Swagelok® cylinder (96-1070) for CVD/ALD

15 Regulatory information

- IMDG
  - Limited quantities (LQ) 0
  - Excepted quantities (EQ) Code: E0
  - Not permitted as Excepted Quantity

- UN "Model Regulation":
  - UN 3399 ORGANOMETALLIC SUBSTANCE, LIQUID, WATER-REACTIVE, FLAMMABLE (TETRAKIS(DIETHYLAMINO)TITANIUM(IV), 99%), 4.3 (3), I

- 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 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  GHS05

- Signal word Danger
Trade name: Tetrakis(diethylamino)titanium(IV), 99%, 22-1050, contained in 50 ml Swagelok® cylinder (96-1070) for CVD/ALD

- Hazard-determining components of labeling:
  Tetrakis(diethylamino)titanium(IV), 99%

- Hazard statements
  H225 Highly flammable liquid and vapor.
  H260 In contact with water releases flammable gases, which may ignite spontaneously.
  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.
  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
  REL: Recommended Exposure Limit
  Flam. Liq. 2: Flammable liquids, Hazard Category 2
  Water-react. 1: Substances and Mixtures which, in contact with water, emit flammable gases, Hazard Category 1
  Skin Corr. 1B: Skin corrosion/irritation, Hazard Category 1B
  Eye Dam. 1: Serious eye damage/eye irritation, Hazard Category 1