1 Identification

- **Product name**
  - **Trade name:** Ruthenium(III) nitrosyl nitrate, solution (1.5% Ru)
- **Item number:** 44-3800
- **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**
  - GHS03 Flame over circle
  - Ox. Liq. 3 H272 May intensify fire; oxidizer.
- **Label elements**
  - **GHS label elements** The product is classified and labeled according to the Globally Harmonized System (GHS).
  - **Hazard pictograms**
    - GHS03

- **Signal word** Warning
- **Hazard statements**
  - H272 May intensify fire; oxidizer.
- **Precautionary statements**
  - P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
  - P262 Do not get in eyes, on skin, or on clothing.
  - P280 Wear protective gloves/protective clothing/eye protection/face protection.
  - 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.
  - P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

- **Classification system:**
- **NFPA ratings (scale 0 - 4)**
  - Health = 0
  - Fire = 3
  - Reactivity = 0

The substance possesses oxidizing properties.

(Contd. on page 2)
Trade name: Ruthenium(III) nitrosyl nitrate, solution (1.5% Ru)

- HMIS-ratings (scale 0 - 4)
  - Health = 0
  - Fire = 3
  - Reactivity = 0

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

3 Composition/information on ingredients

- Chemical characterization: Mixtures
  - Description: Mixture of the substances listed below with nonhazardous additions.
  - Dangerous components: not applicable

4 First-aid measures

- Description of first aid measures
  - After inhalation: Supply fresh air; consult doctor in case of complaints.
  - After skin contact: Immediately rinse with water.
  - After eye contact: Rinse opened eye for several minutes under running water. Then consult a doctor.
  - After swallowing: If symptoms persist consult 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: Use fire fighting measures that suit the environment.
  - 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: Not required.
- Environmental precautions: No special measures required.
- Methods and material for containment and cleaning up:
  - Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
  - Dispose contaminated material as waste according to item 13.
- 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.
Trade name: Ruthenium(III) nitrosyl nitrate, solution (1.5% Ru)

7 Handling and storage

- Handling:
  - Precautions for safe handling: No special precautions are necessary if used correctly.
  - Information about protection against explosions and fires: No special measures required.

- 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: None.
  - 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:
  The product does not contain any relevant quantities of materials with critical values that have to be monitored at the workplace.

- Additional information: The lists that were valid during the creation were used as basis.

- Exposure controls

- Personal protective equipment:

- General protective and hygienic measures: Wash hands before breaks and at the end of work.

- 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. As the product is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.

- 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.
9 Physical and chemical properties

- **Appearance:**
  - **Form:** Liquid
  - **Color:** Orange
  - **Odor:** Odorless
  - **Odor threshold:** Not determined.

- **pH-value:** Not determined.

- **Change in condition**
  - **Melting point/Melting range:** 0 °C (32 °F)
  - **Boiling point/Boiling range:** Undetermined.

- **Flash point:** Not applicable.

- **Flammability (solid, gaseous):** Not determined.

- **Ignition temperature:**
  - **Decomposition temperature:** Not determined.

- **Auto igniting:** Product is not self-igniting.

- **Danger of explosion:** Product does not present an explosion hazard.

- **Explosion limits:**
  - **Lower:** Not determined.
  - **Upper:** Not determined.

- **Vapor pressure at 20 °C (68 °F):** 23 hPa (17 mm Hg)

- **Density at 20 °C (68 °F):** 1 g/cm³ (8.345 lbs/gal)

- **Relative density**
  - Not determined.

- **Vapor density**
  - Not determined.

- **Evaporation rate**
  - Not determined.

- **Solubility in / Miscibility with**
  - **Water:** Not miscible or difficult to mix.

- **Partition coefficient (n-octanol/water):** Not determined.

- **Viscosity:**
  - **Dynamic:** Not determined.
  - **Kinematic:** Not determined.

- **Solvent content:**
  - **Organic solvents:** 0.0 %
  - **Water:** 95.0 %
  - **VOC content:** 0.0 g/l / 0.00 lb/gl

- **Other information**
  - No further relevant information available.

10 Stability and reactivity

- **Reactivity** No further relevant information available.
Trade name: Ruthenium(III) nitrosyl nitrate, solution (1.5% Ru)

- 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: No irritant effect.
      - on the eye: No irritating effect.
    - Sensitization: No sensitizing effects known.
  - Additional toxicological information:
  - Carcinogenic categories
    - IARC (International Agency for Research on Cancer)
      None of the ingredients is listed.
    - NTP (National Toxicology Program)
      None of the ingredients is listed.
    - OSHA-Ca (Occupational Safety & Health Administration)
      None of the ingredients is 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: Not known to be hazardous to water.
  - 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.
## 14 Transport information

| UN-Number | DOT, IMDG, IATA | UN3218 |
| UN proper shipping name | DOT | Nitrates, inorganic, aqueous solution, n.o.s. |
| IMDG, IATA | NITRATES, INORGANIC, AQUEOUS SOLUTION, N.O.S. |

**Transport hazard class(es)**

| DOT |
| Class | 5.1 Oxidizing substances |
| Label | 5.1 |

| IMDG, IATA |
| Class | 5.1 Oxidizing substances |
| Label | 5.1 |

**Packing group**

| DOT, IMDG, IATA | III |

**Environmental hazards:**

- Marine pollutant: No

**Special precautions for user**

- Warning: Oxidizing substances
- EMS Number: F-A.S-Q
- Stowage Category: B
- Segregation Code:
  - SG38 Stow "separated from" ammonium compounds.
  - SG49 Stow "separated from" cyanides
  - SG62 Stow "separated from" sulphur

**Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code**

- Not applicable.

**Transport/Additional information:**

| IMDG |
| Limited quantities (LQ) | 5L |
| Excepted quantities (EQ) | Code: E1 |
| Maximum net quantity per inner packaging: 30 ml |
| Maximum net quantity per outer packaging: 1000 ml |
Safety Data Sheet
according to OSHA HCS

Trade name: Ruthenium(III) nitrosyl nitrate, solution (1.5% Ru)

· UN "Model Regulation":
  UN 3218 NITRATES, INORGANIC, AQUEOUS SOLUTION, N.O.S., 5.1, III

15 Regulatory information

· Safety, health and environmental regulations/legislation specific for the substance or mixture
  · Sara
    · Section 355 (extremely hazardous substances):
      None of the ingredients is listed.
    · Section 313 (Specific toxic chemical listings):
      None of the ingredients is listed.
    · TSCA (Toxic Substances Control Act):
      All ingredients are listed.
    · Proposition 65
      · Chemicals known to cause cancer:
        None of the ingredients is listed.
      · Chemicals known to cause reproductive toxicity for females:
        None of the ingredients is listed.
      · Chemicals known to cause reproductive toxicity for males:
        None of the ingredients is listed.
      · Chemicals known to cause developmental toxicity:
        None of the ingredients is listed.
    · Carcinogenic categories
      · EPA (Environmental Protection Agency)
        None of the ingredients is listed.
      · TLV (Threshold Limit Value established by ACGIH)
        None of the ingredients is listed.
      · NIOSH-Ca (National Institute for Occupational Safety and Health)
        None of the ingredients is listed.
    · GHS label elements
      The product is classified and labeled according to the Globally Harmonized System (GHS).
    · Hazard pictograms
      GHS03

· Signal word Warning
· Hazard statements
  H272 May intensify fire; oxidizer.
· Precautionary statements
  P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
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Trade name: Ruthenium(III) nitrosyl nitrate, solution (1.5% Ru)

P403+P233 Store in a well-ventilated place. Keep container tightly closed.
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 02/23/2017 / -
· 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
  EINECS: European Inventory of Existing Commercial Chemical Substances
  ELINCS: European List of Notified Chemical Substances
  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
  Ox. Liq. 3: Oxidizing liquids – Category 3