SAFETY DATA SHEET

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SECTION 1. IDENTIFICATION

Product Identifier: (4N) 99.99% Ruthenium Nitrate

Product Code: RU-NAT-04

CAS Number: 34513-98-9

Relevant identified uses of the substance: Scientific research and development

Supplier details:

American Elements
10884 Weyburn Ave.
Los Angeles, CA 90024
Tel: +1 310-208-0551
Fax: +1 310-208-0351
Emergency telephone number:
+1 800-424-9300

SECTION 2. HAZARDS IDENTIFICATION

Classification
This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)
Corrosive to metals Category 1
Acute Inhalation Toxicity - Vapors Category 3
Skin Corrosion/irritation Category 1 B Serious Eye Damage/Eye Irritation Category 1
Specific target organ toxicity (single exposure) Category 3
Target Organs - Respiratory system.
Label Elements
Signal Word
Danger
Hazard Statements
May be corrosive to metals
Toxic if inhaled
Causes severe skin burns and eye damage
Causes serious eye damage
May cause respiratory irritation



Precautionary Statements
Prevention
Keep only in original container
Avoid breathing dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wash face, hands and any exposed skin thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection
Response
Call a POISON CENTER or doctor/physician if you feel unwell
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Skin
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse
Immediately call a POISON CENTER or doctor/physician
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
Immediately call a POISON CENTER or doctor/physician
Ingestion
IF SWALLOWED: Rinse mouth. DO NOT induce vomiting
Spills
Absorb spillage to prevent material damage
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Store in corrosive resistant polypropylene container with a resistant inliner
Store in a dry place
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
None identified

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

Component CAS-No Weight %
Water 7732-18-5 ca 93
Ruthenium, tris(nitrato-O)nitrosyl- 34513-98-9 5
Nitric acid 7697-37-2 ca 2

SECTION 4. FIRST AID MEASURES

General Advice Immediate medical attention is required. Show this safety data sheet to the doctor in attendance.
Eye Contact Immediate medical attention is required. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
Skin Contact Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.
Inhalation Move to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance; induce artificial respiration with a respiratory medical device. Immediate medical attention is required.

Ingestion Do not induce vomiting. Call a physician or Poison Control Center immediately.
Most important symptoms/effects Causes burns by all exposure routes. Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation
Notes to Physician Treat symptomatically

SECTION 5. FIREFIGHTING MEASURES

Suitable Extinguishing Media CO 2, dry chemical, dry sand, alcohol-resistant foam.
Unsuitable Extinguishing Media No data available
Flash Point No data available
Method - No data available
Autoignition Temperature No data available
Explosion Limits
Upper No data available Lower No data available Sensitivity to Mechanical Impact No data available Sensitivity to Static Discharge No data available
Specific Hazards Arising from the Chemical
Thermal decomposition can lead to release of irritating gases and vapors. The product causes burns of eyes, skin and mucous
membranes.
Hazardous Combustion Products
Nitrogen oxides (NOx) Thermal decomposition can lead to release of irritating gases and vapors
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full
protective gear. Thermal decomposition can lead to release of irritating gases and vapors.
NFPA
Health
3
Flammability
0
Instability
0
Physical hazards
N/A

SECTION 6. ACCIDENTAL RELEASE MEASURES

Personal Precautions Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Use personal protective equipment. Ensure adequate ventilation.
Environmental Precautions Should not be released into the environment. See Section 12 for additional ecological information.
Methods for Containment and Clean Keep in suitable, closed containers for disposal. Soak up with inert absorbent material.
Up

SECTION 7. HANDLING AND STORAGE

Handling Do not breathe vapors or spray mist. Do not get in eyes, on skin, or on clothing. Use only

under a chemical fume hood. Wear personal protective equipment. Do not ingest.
Storage Corrosives area. Keep containers tightly closed in a dry, cool and well-ventilated place.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure Guidelines:
Component ACGIH TLV OSHA PEL NIOSH IDLH
Nitric acid TWA: 2 ppm
STEL: 4 ppm (Vacated) TWA: 2 ppm (Vacated) TWA: 5 mg/m3 (Vacated) STEL: 4 ppm (Vacated)
STEL: 10 mg/m3
TWA: 2 ppm
TWA: 5 mg/m3 IDLH: 25 ppm TWA: 2 ppm TWA: 5 mg/m3
STEL: 4 ppm
STEL: 10 mg/m3
Component Quebec Mexico OEL (TWA) Ontario TWAEV
Nitric acid TWA: 2 ppm
TWA: 5.2 mg/m3
STEL: 4 ppm
STEL: 10 mg/m3 TWA: 2 ppm
TWA: 5 mg/m3
STEL: 4 ppm
STEL: 10 mg/m3 TWA: 2 ppm
STEL: 4 ppm
Legend
ACGIH - American Conference of Governmental Industrial Hygienists
OSHA - Occupational Safety and Health Administration
NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health
Engineering Measures Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.
Personal Protective Equipment
Eye/face Protection Tightly fitting safety goggles. Face-shield.
Skin and body protection Long sleeved clothing.
Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.
Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State Liquid
Appearance Amber
Odor Odorless
Odor Threshold No data available
pH 1.98
Melting Point/Range No data available
Boiling Point/Range No data available
Flash Point No data available
Evaporation Rate No data available
Flammability (solid,gas) N/A
Flammability or explosive limits

Upper No data available
Lower No data available
Vapor Pressure No data available
Vapor Density No data available
Relative Density 1.070
Solubility No data available
Partition coefficient; n-octanol/water No data available
Autoignition Temperature No data available
Decomposition Temperature No data available
Viscosity No data available
Molecular Formula N4 O10 Ru
Molecular Weight 317.09

SECTION 10. STABILITY AND REACTIVITY

Reactive Hazard None known, based on information available
Stability No data available.
Conditions to Avoid Incompatible products. Excess heat.
Incompatible Materials Organic materials, Powdered metals, Alkali metals, Alcohols, Reducing agents
Hazardous Decomposition Products Nitrogen oxides (NOx), Thermal decomposition can lead to release of irritating gases and vapors
Hazardous Polymerization Hazardous polymerization does not occur.
Hazardous Reactions None under normal processing.

SECTION 11. TOXICOLOGICAL INFORMATION

Acute Toxicity
11. Toxicological information
Product Information
Oral LD50 Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg. Dermal LD50 Based on ATE data, the classification criteria are not met. ATE > 2000 mg/kg. Vapor LC50 Category 3. ATE = 2 - 10 mg/l.
Component Information
Component LD50 Oral LD50 Dermal LC50 Inhalation
Nitric acid Not listed Not listed 130 mg/m3 (Rat) 4 h
67 ppm (Rat) 4 h
Toxicologically Synergistic
Products
No data available
Delayed and immediate effects as well as chronic effects from short and long-term exposure
Irritation Causes burns by all exposure routes
Sensitization No data available
Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.
Component CAS-No IARC NTP ACGIH OSHA Mexico
Water 7732-18-5 Not listed Not listed Not listed Not listed Not listed
Ruthenium, tris(nitrato-O)nitrosyl- 34513-98-9 Not listed Not listed Not listed Not listed Not listed
Nitric acid 7697-37-2 Not listed Not listed Not listed Not listed Not listed
IARC: (International Agency for Research on Cancer) IARC: (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans

Group 2A - Probably Carcinogenic to Humans
Group 2B - Possibly Carcinogenic to Humans
Mutagenic Effects No data available Reproductive Effects No data available. Developmental Effects No data available. Teratogenicity No data available.
STOT - single exposure Respiratory system
STOT - repeated exposure None known
Aspiration hazard No data available
Symptoms / effects,both acute and delayed
Product is a corrosive material. Use of gastric lavage or emesis is contraindicated. Possible perforation of stomach or esophagus should be investigated: Ingestion causes severe swelling, severe damage to the delicate tissue and danger of perforation
Endocrine Disruptor Information No data available
Other Adverse Effects The toxicological properties have not been fully investigated. See actual entry in RTECS for complete information.

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity
Do not empty into drains.
12. Ecological information
Component Freshwater Algae Freshwater Fish Microtox Water Flea
Nitric acid Not listed 72 mg/L LC50 96 h Not listed Not listed
Persistence and Degradability No data available
Bioaccumulation/ Accumulation No data available.
Mobility No data available.
Component log Pow
Nitric acid -2.3

SECTION 13. DISPOSAL CONSIDERATIONS

Waste Disposal Methods
Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

SECTION 14. TRANSPORT INFORMATION

DOT
14. Transport information
UN-No UN2031
Proper technical name Ruthenium, tris(nitrato-O)nitrosyl- ,Nitric acid
Hazard Class 8
Packing Group II
TDG
UN-No UN2031
Hazard Class 8
Packing Group II
IATA
UN-No UN3264
Proper Shipping Name Corrosive liquid, acidic, inorganic, n.o.s

Hazard Class 8
Packing Group II
IMDG/IMO
UN-No UN3264
Proper Shipping Name Corrosive liquid, acidic, inorganic, n.o.s
Hazard Class 8
Packing Group II

SECTION 15. REGULATORY INFORMATION

International Inventories
Component TSCA DSL NDSL EINECS ELINCS NLP PICCS ENCS AICS IECSC KECL
Water X X - 231-791-2 - X - X X X
Ruthenium, tris(nitrato-O)nitrosyl- X - X 252-068-8 - - - - - X
Nitric acid X X - 231-714-2 - X X X X X
Legend:
X - Listed
E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA. F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.
N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.
P - Indicates a commenced PMN substance
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA. S - Indicates a substance that is identified in a proposed or final Significant New Use Rule
T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.
XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base
Production and Site Reports (40 CFR 710(B).
Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.
Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.
U.S. Federal Regulations
TSCA 12(b) N/A
SARA 313
Component CAS-No Weight % SARA 313 - Threshold
Values %
Nitric acid 7697-37-2 ca 2 1.0
SARA 311/312 Hazardous Categorization
Acute Health Hazard Yes Chronic Health Hazard Yes Fire Hazard No Sudden Release of Pressure Hazard No Reactive Hazard No
Clean Water Act
Component CWA - Hazardous
Substances CWA - Reportable
Quantities CWA - Toxic Pollutants CWA - Priority Pollutants
Nitric acid X 1000 lb - -
Clean Air Act N/A
OSHA Occupational Safety and Health Administration
N/A
Component Specifically Regulated Chemicals Highly Hazardous Chemicals
Nitric acid - TQ: 500 lb
CERCLA

N/A
Component Hazardous Substances RQs CERCLA EHS RQs
Nitric acid 1000 lb 1000 lb
California Proposition 65 This product does not contain any Proposition 65 chemicals
State Right-to-Know
Component Massachusetts New Jersey Pennsylvania Illinois Rhode Island
Water - - X - -
Ruthenium, tris(nitrato-O)nitrosyl- - X - X -
Nitric acid X X X X X
U.S. Department of Transportation
Reportable Quantity (RQ): N DOT Marine Pollutant N DOT Severe Marine Pollutant N
U.S. Department of Homeland Security
This product does not contain any DHS chemicals.
Component DHS Chemical Facility Anti-Terrorism Standard
Nitric acid 2000 lb STQ
Other International Regulations
Mexico - Grade No data available
Canada
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR
WHMIS Hazard Class E Corrosive material
D2B Toxic materials
D1A Very toxic materials

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16. OTHER INFORMATION

Safety Data Sheet according to Regulation (EC) No. 1907/2006 (REACH). The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. American Elements shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale. COPYRIGHT 1997-2022 AMERICAN ELEMENTS. LICENSED GRANTED TO MAKE UNLIMITED PAPER COPIES FOR INTERNAL USE ONLY.