

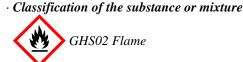
Printing date 07/17/2021

Reviewed on 07/17/2021

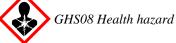
1 Identification

- · Product name
- · Trade name: <u>Ruthenium black (99.9%)</u>
- Item number: 44-3000
- · CAS Number:
- 7440-18-8
- *EC number:* 231-127-1
- 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



Flam. Sol. 2 H228 Flammable solid.



STOT RE 2 H373 May cause damage to organs through prolonged or repeated exposure.

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



- · Signal word Warning
- Hazard-determining components of labeling: ruthenium
 Hazard statements H228 Flammable solid. H373 May cause damage to organs through prolonged or repeated exposure.
 Precautionary statements P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking. P260 Do not breathe dust/fume/gas/mist/vapors/spray.
 - P280 Wear protective gloves/protective clothing/eye protection/face protection.

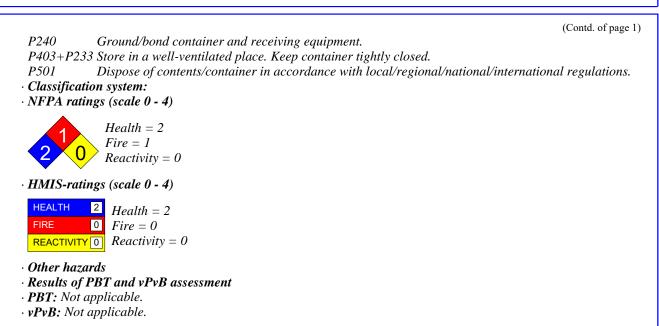
(Contd. on page 2)

US

Printing date 07/17/2021

Reviewed on 07/17/2021

Trade name: Ruthenium black (99.9%)



3 Composition/information on ingredients

- · Chemical characterization: Substances
- · CAS No. Description
- 7440-18-8 ruthenium
- *Identification number(s)* • *EC number: 231-127-1*

4 First-aid measures

· Description of first aid measures

• General information:

Symptoms of poisoning may even occur after several hours; therefore medical observation for at least 48 hours after the accident.

- · After inhalation: Supply fresh air; consult doctor in case of complaints.
- · After skin contact: Generally the product does not irritate the skin.
- After eye contact: Rinse opened eye for several minutes under running water.
- · 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.
- \cdot Special hazards arising from the substance or mixture
- During heating or in case of fire poisonous gases are produced.

(Contd. on page 3)

US

(Contd. of page 2)

Safety Data Sheet according to OSHA HCS

Printing date 07/17/2021

Reviewed on 07/17/2021

Trade name: Ruthenium black (99.9%)

- · Advice for firefighters
- · Protective equipment: Mouth respiratory protective device.

6 Accidental release measures

- Personal precautions, protective equipment and emergency procedures Mount respiratory protective device.
- Wear protective equipment. Keep unprotected persons away.
- Environmental precautions: No special measures required. • Methods and material for containment and cleaning up:
- Dispose contaminated material as waste according to item 13. Ensure adequate ventilation.
- · 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.
- · Protective Action Criteria for Chemicals

• PAC-1:

30 mg/m3

• PAC-2:

· PAC-3:

2,000 mg/m3

330 mg/m3

7 Handling and storage

- · Handling:
- Precautions for safe handling Ensure good ventilation/exhaustion at the workplace.
- · Information about protection against explosions and fires:
- Keep ignition sources away Do not smoke. Protect against electrostatic charges.
- Keep respiratory protective device available.
- · 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.
- · 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.

(Contd. on page 4)

US —

Printing date 07/17/2021

Reviewed on 07/17/2021

Trade name: Ruthenium black (99.9%)

(Contd. of page 3)

- · Exposure controls
- · Personal protective equipment:
- · General protective and hygienic measures: Keep away from foodstuffs, beverages and feed. Wash hands before breaks and at the end of work. Store protective clothing separately.
- · Breathing equipment: A NIOSH approved respirator in accordance with 29 CFR 1910.134.
- · 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

General Information			
Appearance:			
Form:	Powder		
Color:	Black		
Odor:	Odorless		
Odor threshold:	Not determined.		
pH-value:	Not applicable.		
Change in condition			
Melting point/Melting range:	Undetermined.		
Boiling point/Boiling range:	82 °C (180 °F)		
Flash point:	1 °C (34 °F)		
Flammability (solid, gaseous):	Flammable.		
Ignition temperature:	465 °C (869 °F)		
Decomposition temperature:	Not determined.		
Auto igniting:	Not determined.		

Printing date 07/17/2021

Reviewed on 07/17/2021

Trade name: Ruthenium black (99.9%)

		(Contd. of page	
• Danger of explosion:	Not determined.		
· Explosion limits:			
Lower:	2 Vol %		
Upper:	13 Vol %		
· Vapor pressure:	Not applicable.		
• Density at 20 •C (68 •F):	12.3 g/cm ³ (102.6435 lbs/gal)		
· Relative density	Not determined.		
· Vapor density	Not applicable.		
· Evaporation rate	Not applicable.		
· Solubility in / Miscibility with			
Water:	Insoluble.		
· Partition coefficient (n-octanol/v	vater): Not determined.		
· Viscosity:			
Dynamic:	Not applicable.		
Kinematic:	Not applicable.		
· Solvent content:			
Organic solvents:	0.0 %		
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.
- · 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)

Substance is not listed.

· NTP (National Toxicology Program)

Substance is not listed.

(Contd. on page 6)



US

Printing date 07/17/2021

CHEMICALS, INC

Reviewed on 07/17/2021

Trade name: Ruthenium black (99.9%)

(Contd. of page 5)

· 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: 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.*
- · Uncleaned packagings:
- Recommendation: Disposal must be made according to official regulations.

· UN-Number	
· DOT, IMDG, IATA	UN3089
· UN proper shipping name	
$\cdot DOT$	Metal powders, flammable, n.o.s.
· IMDG, IATA	METAL POWDER, FLAMMABLE, N.O.S.
· Transport hazard class(es)	
·DOT	
· Class	4.1 Flammable solids, self-reactive substances and sol
Cuiso	desensitised explosives

Printing date 07/17/2021

CHEMICALS, INC.

Reviewed on 07/17/2021

	(Contd. of page
·IMDG	
V	
· Class	4
· Label	4.1
·IATA	
· Class	4.1 Flammable solids, self-reactive substances and solid desensitised explosives
· Label	4.1
	112
· Packing group · DOT, IMDG, IATA	111
	111
• Environmental hazards:	N-
• Marine pollutant:	No
• Special precautions for user	Not applicable.
• EMS Number:	F-G,S-G Heavy metals and their salts (including their organometalli
· Segregation groups	Heavy metals and their salts (including their organometalli compounds), powdered metals
· Stowage Category	A
· Handling Code	H1 Keep as dry as reasonably practicable
· Segregation Code	SG17 Stow "separated from" class 5.1
	SG25 Stow "separated from" goods of classes 2.1 and 3.
	SG26 In addition: from goods of classes 2.1 and 3 when stowed of
	deck of a containership a minimum distance of two container space athwartship shall be maintained, when stowed on ro-ro ships
	distance of 6 m athwartship shall be maintained.
· Transport in bulk according to Annex	· · ·
MARPOL73/78 and the IBC Code	Not applicable.
• Transport/Additional information:	
· IMDG · Limited quantities (LQ)	5 kg
• Excepted quantities (EQ)	Code: El
	Maximum net quantity per inner packaging: 30 g
	Maximum net quantity per outer packaging: 1000 g
· UN "Model Regulation":	UN 3089 METAL POWDERS, FLAMMABLE, N.O.S., 4.1, III

(Contd. on page 8)

Printing date 07/17/2021

CHEMICALS.

Reviewed on 07/17/2021

Trade name: Ruthenium black (99.9%)

(Contd. of page 7)

	_		
15 Po	aulato	my int	ormation
15 16	euuu		

- \cdot Safety, health and environmental regulations/legislation specific for the substance or mixture \cdot 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.

 \cdot 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*



· Signal word Warning

Hazard-determining components of labeling: ruthenium
Hazard statements H228 Flammable solid. H373 May cause damage to organs through prolonged or repeated exposure.
Precautionary statements P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking. P260 Do not breathe dust/fume/gas/mist/vapors/spray. P280 Wear protective gloves/protective clothing/eye protection/face protection.

P240 Ground/bond container and receiving equipment. P403+P233 Store in a well-ventilated place. Keep container tightly closed.

Printing date 07/17/2021

CHEMICALS

Reviewed on 07/17/2021

Trade name: Ruthenium black (99.9%)

(Contd. of page 8)

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 07/17/2021 / -
- · 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 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 Flam. Sol. 2: Flammable solids – Category 2 STOT RE 2: Specific target organ toxicity (repeated exposure) – Category 2