Safety Data Sheet

1. Identification of the Substance/Mixture and the Supplier

Supplier	:	National Institute of Advanced Industrial Science and Technology (AIST)
Address	:	1-3-1 Kasumigaseki, Chiyoda, Tokyo, Japan
Office in Charge	:	Reference Materials Office, Center for Quality Management of Metrology, National Metrology Institute of Japan
Person in Charge	:	Certified Reference Material Staff
Telephone No.	:	+81-29-861-4059 Fax No. : +81-29-861-4009
Emergency Contact	:	Same as above
		Prepared on : January 13, 2015
		Revised on : August 31, 2022
		ID Number : 5607001
Identity of Substance/Mixture	:	Reference material NMIJ RM 5607-a Stainless Steel for Positron Defect Measurements
Recommended Use of the Chemical and Restriction on Use	:	This reference material can be used for the accuracy control and the validation of measurement methods and results in the positron annihilation lifetime measurements of metals, semiconductors, and similar samples whose positron lifetime is not exceeding approximately 500 ps. Do not use this reference material for other purposes than testing/research. This CRM is a reference material (specified in the Japanese Industrial Standard (JIS) Q 0030).

2. Hazards Identification

GHS classification:	Severe eye damage/eye irritation	:	Classification 2B
	Respiratory sensitization	:	Classification 1
	Skin sensitization	:	Classification 1
	Germ-cell mutagenicity	:	Classification 2
	Carcinogenicity	:	Classification 2
	Genotoxicity	:	Classification 1B
	Specific target organ / systemic toxicity (single exposure)	:	Classification 1 (respiratory system, kidney) Classification 2 (systemic toxicity) Classification 3 (respiratory tract irritation)
	Specific target organ / systemic toxicity (repeated exposure)	:	Classification 1 (respiratory system, nervous system)
	Aquatic environmental hazard (chronic)	:	Classification 4

GHS-labeling element:	
Signal word:	Danger
Hazard and toxicity information:	Eye irritation If inhaled: May cause allergy, asthma, or difficulty in breathing. May cause allergic cutaneous reaction. Suspected of causing hereditary disease. Suspected of causing cancer. May cause negative impact on reproductive potential or unborn child. Causes damage to organs (respiratory system, kidney). May cause damage to organs (systemic toxicity). May cause respiratory irritation. Causes damage to organs through prolonged or repeated exposure (respiratory system, nervous system). May be harmful to aquatic life with long lasting effects.
Other toxicity information:	As this reference material is solid under normal conditions, it is barely hazardous under ordinary environmental conditions or use.
Cautionary statement:	[Safety Measures] Do not handle unless all the safety precautions are read and understood. Avoid inhalation of fine particles, smoke, gas, mist, steam, and spray. Wash hands thoroughly after handling. Do not eat, drink, or smoke when using this product. Use only outdoors or in a place with sufficient ventilation. Do not take contaminated work clothing out from the workplace. Avoid discharge to the environment. Wear protective gloves. If the ventilation is insufficient, wear respiratory protective equipment. [Emergency Measures] Skin contact: Wash skin with plenty of water and soap. In case of skin irritation or rashes, seek medical attention and treatment. Inhalation: Move to a place with fresh air and rest in a position to secure easy breathing. If the person feels sick, contact a physician. In case of respiratory symptoms, contact a physician. Eye contact: Rinse with water carefully for several minutes. If using contact lenses, take them off if possible, and continue rinsing. If eye irritation persists, seek medical attention and treatment. In case of exposure or concern over exposure, seek medical attention and treatment. Take off any contaminated clothes and wash them well before reuse. [Storage] Store in a clean environment with the temperature between 15 °C

and 35 °C.
Also, keep away from any radiation source during storage.
[Disposal]
Follow the related regulations and ordinances of the local government.
Use a waste-treatment firm certified by prefectural governor.

Classification is impossible or not applicable for hazards not mentioned above.

3. Composition/Information on Ingredients

Single substance or compound	:	Compound
Chemical name (1)	:	Iron
Concentration	:	71.302%
Chemical or structural formula	:	Fe
Molecular weight	:	55.84
Reference Number in Gazetted List in Japan	:	Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc. : - Industrial Safety and Health Act : -
CAS number	:	7439-89-6
Chemical name (2)	:	Chromium
Concentration	:	18.200 %
Chemical or structural formula	:	Cr
Molecular weight	:	51.996
Reference Number in Gazetted List in Japan	:	Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc. : - Industrial Safety and Health Act : -
CAS number	:	7440-47-3
Chemical name (3)	:	Nickel
Concentration	:	8.130 %
Chemical or structural formula	:	Ni
Molecular weight	:	58.693
Reference Number in Gazetted List in Japan	:	Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc. : - Industrial Safety and Health Act : -
CAS number	:	7440-02-0
Chemical name (4)	:	Manganese
Concentration	:	1.640 %

Chemical or structural formula	:	Mn
Molecular weight	:	54.938
Reference Number in Gazetted List in Japan	:	Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc. : - Industrial Safety and Health Act : -
CAS number	:	7439-96-5

Chemical name (5)	:	Silicon
Concentration	:	0.630 %
Chemical or structural formula	:	Si
Molecular weight	:	28.086
Reference Number in Gazetted List in Japan	:	Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc. : - Industrial Safety and Health Act : -
CAS number	:	7440-21-3

Chemical name (6)	:	Carbon
Concentration	:	0.060 %
Chemical or structural formula	:	C
Molecular weight	:	12.011
Reference Number in Gazetted List in Japan	:	Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc. : - Industrial Safety and Health Act : -
CAS number	:	7440-44-0

Chemical name (7)	:	Phosphorous
Concentration	:	0.033 %
Chemical or structural formula	:	P
Molecular weight	:	30.974
Reference Number in Gazetted List in Japan	:	Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc. : - Industrial Safety and Health Act : -
CAS number	:	7723-14-0

Chemical name (8)	:	Sulfur
Concentration	:	0.005 %
Chemical or structural formula	:	S
Molecular weight	:	32.065
Reference Number in Gazetted List in Japan	:	Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc. : - Industrial Safety and Health Act : -

CAS number : 7704-34-9

4. First-aid Measures

*In case of inhalation or digestion of fine particles or fumes generated in processing, etc. of this reference material, or in case of contact of the fine particles and fumes with skin or eyes, seek medical attention or treatment as needed after taking the first-aid measures described below.

Eye contact	:	Rinse with water carefully for several minutes. If using contact lenses, take them off if possible, and continue rinsing.
Skin contact	:	Wash thoroughly with clean water.
Inhalation	:	Move to a place with fresh air and rest in a position for securing easy breathing.
Ingestion	:	Rinse the mouth thoroughly with water.
Estimated acute and late symptom	:	-
Most important symptoms and effects	:	-
Protection of first-aiders	:	-

5. Fire-fighting Measures

*As this reference material is incombustible, there is no danger of ignition or combustion under ordinary environmental conditions. In the event of peripheral fire, implement appropriate measures for extinguishing the burning materials.

Extinguishing media	:	Extinguish fire as the first-aid firefighting by using powder, carbon dioxide, and powder fire extinguishing equipment/extinguisher. Foam extinguishing media for water soluble liquid (alcohol-resistant foam), carbon dioxide, powder, sand, and water.
Specific hazards with regard to fire-fighting	:	Irritating or toxic fumes (or gas) may be generated in the event of fire.
Specific methods of fire-fighting	:	Eliminate the origin of fire and put the fire out with extinguishing media. If possible, move containers to a safe place. If not, cool the peripheral areas with water spray.
Protection for firefighters	:	Work from the windward side to prevent the inhalation of toxic gas. Use fire-prevention clothing, fireproof clothing, fire-protection clothing, respirator, circulating oxygen breathing apparatus, rubber gloves, rubber boots, or other appropriate protective equipment.

6. Accidental Release Measures

*This reference material is solid and there is no release under ordinary environmental conditions; however, implement the following measures for fine particles and fumes

generated in the processing, etc. of steel materials.

Personal precautions	:	Wear appropriate protective equipment to avoid contamination of the skin, eyes, and personal clothing.
Protective equipment and emergency measures	:	When accidental release takes place indoors, thoroughly clear the air until the emergency measures are complete. Before the operation, wear appropriate protective equipment to protect skin from droplets and to prevent inhalation of dust and gas.
Environmental precautions	:	Prevent the released product from being drained into a river or other area that might cause environmental damage. Prevent the polluted discharge from being drained into the environment without being processed properly.
Recovery and neutralization	:	Collect the leaked product in an empty container. Then, wash and clean the spilled area with plenty of water.
Prevention of secondary accidents	:	Surround the area with a rope, etc., to prevent unauthorized people from entering the area. Work from the windward side and evacuate people to the leeward side.

7. Handling and Storage

Handling

Technical measures	:	Wear appropriate protective equipment when fine particles, fumes, etc. are generated in the processing of this reference material.
Local ventilation and general ventilation	:	Provide local ventilation and general ventilation at a place where fine particles, fumes, etc. are generated.
Precautions for safe handling	:	Avoid rough handling such as dropping, shocking, dragging, or otherwise agitating the container. Wash hands, face, and other necessary parts thoroughly, and gargle after handling. Do not eat, drink, or smoke in places other than the designated areas. Do not bring gloves and other contaminated protective equipment into the break area. Only authorized people should be allowed in the handling area. Wear appropriate protective equipment to prevent inhalation, or contact with eyes, skin, or clothing. When handling indoors, provide local exhaust ventilation.

Storage

Appropriate storage conditions	:	Store in a clean environment with the temperature between 15 °C and 35 °C. Also, keep away from any radiation source during storage.
Safe packaging materials	:	Plastic

8. Exposure Controls/Personal Protection

Standard control concentration

N/A

Threshold limit values (material name) Iron

- ACGIH TLV-TWA : N/A
- Value recommended by Japanese Society of Occupational Health : N/A
- OSHA PEL TWA : N/A

Threshold limit values (material name) Chromium

- ACGIH TLV-TWA : 0.5 mg/m^3
- Value recommended by Japanese Society of Occupational Health : 0.5 mg/m^3
- OSHA PEL TWA : N/A

Threshold limit values (material name) Nickel

- ACGIH TLV-TWA : 1.5 mg/m^3
- Value recommended by Japanese Society of Occupational Health : 1 mg/m^3
- OSHA PEL TWA : 0.1 mg/m^3

Threshold limit values (material name) Manganese

- ACGIH TLV-TWA : TWA: 0.02 mg/m^3 respirable fraction
  TWA: 0.1 mg/m^3 inhalable fraction
- Value recommended by Japanese Society of Occupational Health : 0.2 mg/m^3
- OSHA PEL TWA : 0.2 mg/m^3

Threshold limit values (material name) Silicon

- ACGIH TLV-TWA : 10 mg/m^3
- Value recommended by Japanese Society of Occupational Health : 2 mg/m^3: inhalant dust, 8 mg/m^3: total dust
- OSHA PEL TWA : 15 mg/m^3: total dust
  5 mg/m^3: respirable fraction

Threshold limit values (material name) Carbon

- ACGIH TLV-TWA : N/A
- Value recommended by Japanese Society of Occupational Health : 0.5 mg/m^3
- OSHA PEL TWA : N/A

Threshold limit values (material name) Phosphorous

- ACGIH TLV-TWA : N/A
- Value recommended by Japanese Society of Occupational Health : N/A
- OSHA PEL TWA : N/A

Threshold limit values (material name) Sulfur

- ACGIH TLV-TWA : N/A
- Value recommended by Japanese Society of Occupational Health : N/A
- OSHA PEL TWA : N/A

Engineering controls

Ventilation and emission	:	Local ventilation equipment or general ventilation equipment
Safety management and gas detection	:	Measuring device, detection tube
Storage precautions	:	When storing the product, avoid a place with water leakage, contact with acid and alkaline, rapid temperature change, or high humidity.

Protective equipment

Respiratory protection	:	Respiratory protective equipment
Hand protection	:	Protective gloves
Eye protection	:	Protective glasses
Skin and body protection	:	Protective clothing

Hygiene measures

Handle in accordance with the industrial hygiene and safety standards.

9. Physical and Chemical Properties

・Appearance, etc.	:	Thickness: 3 mm, 15 mm angular piece (solid)
・Color	:	Silver white
・Odor	:	Metal smell
・pH	:	No data
・Melting point	:	1370 °C or over
・Boiling point	:	No data
・Flashing point	:	No data
・Explosive range	:	No data
・Vapor pressure	:	No data
・Relative vapor density(Air=1)	:	No data
・Specific gravity or bulk specific gravity	:	7 to 9
・Solubility	:	Insoluble in water
・*n*-Octanol/water partition coefficient (Log Po/w)	:	No data
・Auto-ignition temperature	:	No data

10. Stability and Reactivity

◇Stability

・Stable under normal conditions.

◇Reactivity

・Contact with chemicals such as water and acid can cause deficiency of oxygen and generation of toxic gases.

◇Conditions to avoid

・High humidity, contact with oxidizing substances.

◇Hazardous decomposition products

・Fumes generated during processing can contain metal compounds.

11. Toxicological Information

Acute toxicity	Inhalation (powder / mist) rat LC_{50}(1H): 4.3 mg/l (P)
Severe damage to eyes/eye irritation	Powder can cause (mechanical) irritation (Cr). The results of eye irritation testing with rat: RTECS (204) includes the description that “mild irritation has been indicated.” (Mn) The testing with rabbits (IUCLID 20) has indicated “slightly irritating”. (Si)
Respiratory sensitization	Classification 1 based on the descriptions in the list of the Japanese Society of Occupational and Environmental Allergy. It is also classified by the Japanese Society of Occupational Health as “a substance by which humans may be sensitized.” (Cr) Classification 1 as it is classified by the recommendation on the threshold limit values (208) by the Japanese Society of Occupational Health as a respiratory tract sensitization substance (Group 2) and by the Japanese Society of Occupational and Environmental Allergy (204) and the DFG (MAK/BAT No43 (207)) as a respiratory tract sensitization substance. (Ni)
Skin sensitization	Although skin sensitization is not identified for metal chromium, chromium alloy, or chromium plating, it is classified as Classification 1 based on the description (ECTOC Technical Report 45(192)) that exposure to chromium ions through dissolution by humidity can cause skin sensitization. Note that this is also classified by the Japanese Society of Industrial Health as “a substance by which humans are clearly sensitized.” (Cr) The human-onset cases are reported as eczema (NITE Initial Risk Evaluations ver. 10, No. 69, 208; EHC No. 108,191), contact dermatitis (NITE Initial Risk Evaluations ver. 10, No. 69,208; EHC No. 108, 191; IARC vol. 49, 190), and positive reaction in patch testing (NITE Initial Risk Evaluations ver. 10, No. 69, 208;EHC No. 108, 191). In addition, it is classified as Classification 1 according to the classification as a skin sensitization substance (Group 1) under the recommendation on threshold limit values, etc. by the Japanese Society of Industrial Health (208) and the classification as a skin sensitization substance under the Japanese Society of Occupational and Environmental Allergy (204) and the DFG (207). (Ni)
Germ-cell mutagenicity	Based on the positive result of the in vivo mutagenicity testing using somatic cells (chromosomal abnormality of peripheral blood lymphocytes of rats) (IARC 49(19)), it is classified as Classification 2. (Cr)
Carcinogenicity	Classified as Classification 2 according to the existing classifications: 2B by the IARC (IARC(190)), R (NTP(205)) by the NTP, and Carc. Cat. 3; R40 (EU(207)) by EU. In addition, carcinogenicity testing by inhalation, subcutaneous, intramuscular, and intra-abdominal administration for rats has shown sarcoma generation, respectively (NITE Initial Risk Evaluations ver. 10, No. 69(208); IARC vol. 49(190); Detailed Risk

	Evaluations Series 19(206)). (Ni)
Genotoxicity	Although descriptions of general toxicity for parent animals are not included in the CIAD 12(19), with the teratogenicity testing for mice by the intra-abdominal administration method, embryonic death and fetal malformation (cerebral prolapse) have been identified and according to the determination by experts, it is classified as "Classification 1B." (Mn)
Specific target organ/systemic toxicity (single exposure)	Based on the descriptions that it may generate metal fume heat (SITIG (47th, 202), HSF (20)), it is classified as Classification 2 (systemic toxicity). (Cr) Based on the report on human respiratory tract irritation (HSDB (205)), it is classified as Classification 3 (respiratory tract irritation). (Cr) In the male rat inhalation (single intra-tracheal administration) testing, alveolar epithelial cell damage was caused with the administration amount of 0.5 mg or greater (NITE Initial Risk Evaluations ver. 10, No. 69(208). In addition, according to the description that inhalation exposure has caused "dropsy of and damage to the alveolar wall in the alveolar region and prominent tubular necrosis in the kidney" for humans (ATSDR (205), it is classified as Classification 1 (respiratory system, kidney). (Ni) According to the description, "rapid exposure to manganese powder and dust (particularly MnO_2 and Mn_3O_4) causes pulmonary inflammation and induces pulmonary functional disorder over time. Toxicity to lungs increases the infectiousness of bronchitis, etc. and results in manganese pneumonia." (CIAD 12(19)), the target organ is considered as a respiratory system. Therefore, it is classified as Classification 1 (respiratory system). (Mn) According to the description that inhalation exposure testing with rats has identified ulceration or edams on the pharynx, pulmonary congestion, edams, or bleeding due to exposure within the guidance value range of Classification 2 (HSDB (2005)), it is determined that the respiratory system is the target organ and the substance is classified as Classification 2. (P) The existing descriptions (PATY (5th, 201)) indicate that exposure of humans to sulfuric powder and dust causes bronchitis in conjunction with coughing, throat pain, and chest pain. In addition, according to the descriptions of the HSDB (203), acute effects of sulfuric inhalation include nasal mucosa catarrhal inflammation that can lead to hyperplasia and cause bronchitis frequently, in conjunction with difficulty in breathing, persistent coughing, and phlegm; sometimes bloody phlegm. Based on these findings, it is classified as Classification 1 (respiratory tract). Note that difficulty in breathing has been identified by the oral administration of 10 mg/kg or greater to rats in the experiments with animals (IUCLID (20)). (S)
Specific target organ/systemic toxicity	According to the report by the Ministry of Health, Labour and Welfare, the probability of death from respiratory disease is high for workers who are exposed to nickel oxide or metal nickel, with a concentration of 0.4

(repeated exposure)	mg/m^3 or greater, on the job. In addition, another report by the Ministry describes nasal inflammation, sinusitis, nasal septum perforation, and nasal mucosa dysplasia in nickel refining and nickel-plating workers (Report by the Ministry of Health, Labour and Welfare: Hazard Assessment on Nickel and the Compounds (209)). According to these reports, it is classified as Classification 1 (respiratory system). In the 13-week inhalation exposure testing of rats with a dose of 1 mg/m^3 (0.1 mg/l) or greater, which is equivalent to Classification 1 of the guidance (OECD TG 413), pulmonary alveolar proteinosis and pulmonary granuloma inflammation have been identified in female rats, and pulmonary monocyte dampness has been identified in male rats (NITE Initial Risk Evaluations ver. 10, No. 69(208)). Also, in the 21-month inhalation exposure testing of rats with a dose of 15 mg/m^3 (0.15 mg/l), equivalent to Classification 1 of the guidance, pleurisy, pneumonia, congestion, and edema have been identified (CaPSAR (194)). Additionally, pneumonia has been identified with a dose of 1 mg/m^3 (0.1 mg/l) in the 6-month inhalation exposure testing of rabbits. (Ni) According to the description, “the most common inorganic matters containing manganese are manganese dioxide, manganese carbonate, manganese silicate, and manganese trioxide. It is commonly considered that exposure of excessive manganese compound for 14 days or shorter (short-term) or exposure for 1 year (medium-term) affects respiratory and nervous systems, while such exposure does not affect other organs.” (CIAD 63(204) CIAD 12(19)), the target organs are considered as the respiratory system and the nervous system. Accordingly, it is classified as Classification 1 (respiratory system, nervous system). (Mn) According to the existing descriptions, chronic impact on the paranasal sinuses and breathing problems have been commonly identified in mine workers exposed to sulfuric powder and dust and sulfuric dioxide. Considering that the information is on List 2, it is classified as Classification 2 (respiratory system). On the other hand, pimple generation on the skin of workers with repeated or long-term occupational exposure has been reported (IUCLID (20)); and the possibility of dermal erythema, eczema, ulceration, etc. have been identified (HSDB (203)). As for experimental animals, hyperkeratosis followed by pimple formation has been identified by the two-week dermal administration of 10% testing substance to rabbits (IUCLID (20)). Based on these findings, and considering that the information is on List 2, it is classified as Classification 2 (skin). (S)
Aquatic environmental hazard (chronic)	Although the following data exists, L(E)C$_{50}$ ≤ 10 mg/L, it is classified as Classification 4 because the material is metal and the aquatic behaviors are not known. (Ni) Although the following data exists, L(E)C$_{50}$ ≤ 10 mg/L, it is classified as Classification 4 because the material is metal and the aquatic behaviors are not known. (Mn)
Additional	-

information

* As there is no information for the compound, the toxicological information is created based on the information on raw materials.

This product is stable under normal conditions and there is no risk of elution of hazardous additive components, etc.; however, use the product with sufficient safety measures in case it is handled under special conditions such as use with heat.

12. Ecological Information

Degradability/Concentration

・No data

Bioaccumulation

・No data

Ecotoxicity

・No data

13. Disposal Considerations

Residues	:	To dispose, follow the related regulations and ordinances of the local government. Use a waste-treatment vendor certified by prefectural governor.
Contaminated containers and packaging	:	To dispose of an empty container, completely remove the contents.

14. Transport Information

UN Dangerous Goods Number	:	Not applicable
UN classification	:	Not applicable
Product name	:	-
Packing group	:	-
Marine pollutant	:	Not applicable
Matters to be attended to	:	Avoid direct sunlight. Prevent leakage and fires caused by overturning, falling, etc. and transport with caution.

15. Regulatory Information

◇PRTR Law (Act on Confirmation, etc. of Release Amounts of Specific Chemical Substances in the Environment and Promotion of Improvements to the Management Thereof (Law concerning Pollutant Release and Transfer Register))

・Class 1 Designated Chemical Substances (Article 2-2 of the Law, Appendix 1 of Article 1 of the Enforcement Order)

Class 1 -No. 87 (Chromium)

Class 1 -No. 308 (Nickel)

Class 1 -No. 412 (Manganese)

16. Other Information

Other

The information in this document is not intended to be exhaustive and is based on currently available information and data. The measures given in this document are applicable only to normal handling conditions. When handling this reference material under special conditions etc., it is recommended to take safety measures appropriate to each specific application and context of use. This document is intended to provide information and not intended to guarantee anything in handling this reference material.