SAFETY DATA SHEET OF CHEMICAL PRODUCT

Entered in Safety Data Sheet Register

Registration No 1 3 6 5 7 8 4 2 . 1 9 . 8 9 6 8 7 dated «20» June 2024

Valid until «28» June 2029

Association Non-commercial Partnership
Coordination and Information Centre of CIS member-states
for alignment of regulatory practices

NAME

technical (as per regulatory document)	Coke breeze
chemical (as per IUPAC)	Coal coke
commercial	Coke breeze of KM-1, KM-2 grades
synonyms	Coal coke

OKPD 2 Code 1 9 . 1 0 . 1 0 . 1 1 0

EAEU HS Code 2 7 0 4 0 0 1 9 0 0

Reference designation and name of the regulatory, technical or information document for the product (GOST, TU, OST, STO, (M)SDS)

TY 0763-199-00190437-2004 Coke breeze

HAZARD STATEMENT

Signal word: **Danger**

Brief (word) **description**: low-hazardous in terms of impact on the human body in accordance with GOST 12.1.007. May affect organs (lungs) as a result of repeated or prolonged exposure. Combustible substance. May pollute the environment.

Detailed description: in 16 sections of the enclosed Safety Data Sheet

MAIN HAZARDOUS INGREDIENTS	MAC w.z., mg/m^3	Hazard category	No. CAS	No. EC
Coal coke (by carbon dust)	-/6	4	65996-77-2	266-010-4

APPLICANT: JSC Ural Steel (name of organization) Novotroitsk (city)

Applicant type: manufacturer, ~~supplier, seller, exporter, importer~~
(strike out whichever is not applicable)

OKPO Code: 1 3 6 5 7 8 4 2

Emergency telephone: **(3537) 66-65-88, 66-46-22**

Chief engineer of JSC Ural Steel _____ / **A.I. Bedrinov** /
(signature) (full name)

stamp here

Safety Data Sheet (SDS) complies with UN recommendations ST/SG/AC.10/30 GHS

IUPAC	–	International Union of Pure and Applied Chemistry
GHS	–	UN recommendations ST/SG/AC.10/30 Globally Harmonized System of Classification and Labelling of Chemicals
OKPD 2	–	Russian Classification of Products by Economic Activities
OKPO	–	Russian Classifier of Enterprises and Organizations
HS Code	–	Foreign Economic Activity Commodity Nomenclature
No. CAS	–	substance number in the Register of Chemical Abstracts Service
No. EC	–	substance number in the Register of European Chemicals Agency
MAC w.z.	–	maximum allowable concentration of chemical substance in the air of working zone, mg/m^3
Signal word	–	a word used for drawing attention to the hazardous level of the chemical product and chosen in accordance with GOST 31340

1 Identification of the chemical product and information about manufacturer and/or supplier

1.1 Identification of chemical product

1.1.1 Technical name	Coke breeze (hereinafter referred to as breeze, product) [1].
1.1.2 Brief application recommendations (including limitations on application)	For sintering of iron, nickel ores and for other purposes. No restrictions on use. [1]

1.2 Information about the manufacturer and/or supplier

1.2. Full legal company name	Joint Stock Company Ural Steel (JSC Ural Steel)
1.2.2 Address (postal and legal (postal and legal)	1, Zavodskaya str., Novotroitsk, Orenburg region, 462353
1.2.3 Telephone, including for emergency consultations and hours of work	(3537) 66-46-22; (3537) 66-65-88 (from 06-15 to 15-15 o'clock Moscow time)
1.2.4 E-mail	m.mishchenko@uralsteel.com

2 Hazard(s) identification

2.1 Hazard level of chemical product in general (information on hazard classification in accordance with RF legislation (GOST 12.1.007-76) и GHS (GOST 32419-2022, GOST 32423-2013, GOST 32424-2013, GOST 32425-2013)	A low hazardous substance in terms of impact on the human body, hazard category 4 in accordance with GOST 12.1.007 [2] Classification by GHS: – chemical products with selective toxicity to target organs and/or systems upon repeated or prolonged exposure: category - 2. [2-6]

2.2 Information on the warning marking as per GOST 31340-2022

2.2.1 Signal word	Danger. [7]
2.2.2 Hazard symbols (pictograms)	 «*Hazard for human health*»
2.2.3 Hazard statements (H-phrases)	H373: May affect organs (lungs) through repeated or prolonged exposure. [7]

3 Composition (information on ingredients)

3.1 Information on the product in general

3.1.1 Chemical name (as per IUPAC)	Coal coke. [8]
3.1.2 Chemical formula	C. [8]
3.1.3 General description of composition (taking into account the grade range; production method)	Coke breeze is coal coke produced in coke ovens by heating hard coal without access to air, sorted by lump size. Lumps smaller than 10 mm are called coke breeze. It consists mainly of carbon. Depending on ash content and conditions of use it is divided into grades KM-1, KM-2. [1]

3.2 Ingredients

(name, CAS and EC numbers, mass fraction (must be 100% in total), MAC w.z. or Approximate Safe Level of Impact (ASLI) w.z., hazard categories, references to information sources)

Table 1 [1,9,10]

Ingredients (name)	Ingredients (name, %	Hygienic standards in the air of working zone		CAS No.	EC No.
		MAC w.z., mg/m^3	Hazard class		
Coal coke (by dust carbon), including:	100	-/6 (a)	4 (Ф)	65996-77-2	266-010-4
Ash content, not more	17 – 20	-	-	-	-
The composition also contains mineral impurities and inorganic components.					
Note: (a) - aerosol; F - strongly fibrogenic aerosols.					

4 First aid measures

4.1 First aid measures

4.1.1 In case of inhalation	Coughing, a tickling in the throat. [1]
4.1.2 In case of skin contact	Redness, dryness. If hot product comes into contact with skin, thermal burns may occur. [1]
4.1.3 In case of ingestion	Lacrimation, conjunctivitis. [1]
4.1.4 In case of ingestion	No cases of acute toxic exposure have been observed in dust ingestion. [1,8,11-13]

4.2 First aid measures for the injured persons

4.2.1 In case of inhalation	Fresh air, rest. Get medical attention if necessary. [8]
4.2.2 In case of skin contact	Wash skin with warm water and soap If there is a thermal burn, submerge the affected skin in cold water, wrap a clean cotton cloth around it. Get medical attention. [8]
4.2.3 In case of skin contact	Rinse with running water with palpebral fissure wide open. Get medical attention if necessary. [1,8]
4.2.4 In case of ingestion	Get a mouth rinse with water. Seek medical attention if necessary. No cases of acute toxic exposure under industrial conditions have been described. [1,8]
4.2.5 Contraindications	If there are thermal burns, do not separate the material from the skin, as this may result in injury to living tissue. Do not use solvents when cleaning skin.

5 Measures and media for fire and explosion safety

5.1 Measures and media for fire and explosion safety (according to GOST 12.1.044-89)	Combustible substance. [1,14]
5.2 2 Indices of fire and explosion hazards (list of indices according to GOST 12.1.044-89)	By coke dust: The auto-ignition temperature of coke breeze is 500°C - 650°C. Autoignition temperature of coke dust aero-suspension: – with a particle size of 13 micrometers 800 °C; – with particle size less than 50 micrometers 610 °C; – lower concentration limit of flame propagation of aeration suspension of coke dust with particle size less than 50 micrometers - 580 g/m^3 .[1]

5.3 Hazards caused by combustion products and/or thermal decomposition	Carbon oxides, sulfur dioxide, nitrogen oxides are released. Sulfur dioxide irritates mucous membranes and respiratory tract, may cause bronchial spasm. Acute toxic exposure with fatal outcome is rare. Nitrogen oxides cause irritation of the respiratory tract, oxygen deficiency, severe cough, headache, vomiting. At high concentrations, pulmonary edema and death may occur. Medical attention is required. Carbon monoxide causes oxygen deficiency, headache, dizziness, amblyopia, nausea, loss of consciousness. Carbon dioxide in fire conditions causes breathing acceleration, headache, dizziness, torpor, loss of consciousness, at high concentrations - fatal outcome. [1,42]
5.4 Recommended fire-fighting media	In case of product fire - sprayed water streams, sand, hand fire extinguishers, air-mechanical foam, powders, carbon dioxide. In case of product dust fire - aerosol spray water, air-mechanical foam. [1,17]
5.5 Recommended fire-fighting media	When dust ignites - water straight streams. [18]
5.6 Personal protective equipment for fire-fighting (PPE of fire-fighters)	Firefighter's bunker gear (jacket and trousers with detachable heat-insulating lining) complete with firefighting rescue belt, gloves, fire helmet, special protective footwear, breathing apparatus with compressed air. [19-23]
5.7 Specific methods of extinguishing	Extinguish from maximum distance. [39]

6 Accidental release measures

6.1 Precautions against Harmful Effects on People, Environment, Buildings, Structures etc. in Case of Emergencies

6.1.1 General emergency response measures	Isolate the hazardous zone. Keep unauthorized persons away. Enter the hazardous zone wearing protective equipment. No smoking. Follow fire safety measures. Give first aid to the injured. Water nearby buildings and structures with water straight streams. [39]
6.1.2 Personal protective equipment in emergency situations (PPE of emergency response teams)	For chemical reconnaissance and incident commander – Protective breathing device PDU-3 (for 20 min). For emergency response teams - insulating protective clothing complete with insulating gas mask or breathing apparatus. Gall-service complex protective suit complete with industrial gas mask (for emergency response teams). In case of low concentrations in the air (exceeding the MAC up to 100 times) – protective clothing, industrial gas mask of small size with a universal protective cartridge, a self-contained protective individual equipment with forced supply of purified air to the breathing zone. Safety glasses, protective gloves, protective clothing, special footwear. In case of fire - fire retardant clothing complete with self-rescuer SPI-20. [18,39]

6.2 Emergency Response Procedure

6.2.1 Spill, leakage, overflow response procedure (including response measures and precautions for environment protection)	Collect the product dry in containers and return it to the process cycle. Wash the area with water, sending the flushes to the treatment facilities. In case of hot coke spillage, start cooling down it with water, after which collect and return it to the process cycle. [39]
6.2.2 Fire response procedure	Call the fire department and keep people out of the fire area. Proceed to extinguish the fire. Enter the accident area wearing protective clothing and breathing apparatus (see section 5 of the Safety Data Sheet). Extinguishing shall be carried out with sprayed water, air-mechanical foam. [39]

7 Handling and Storage

7.1 Safety Precautions for Handling Chemical Products

7.1.1 Systems of engineering safety measures	Availability of supply and exhaust and local ventilation. Sealing and automation of equipment and apparatus. Application of dust suppression and dust collection measures. Installation of backup fans with automatic switching on in case of emergency (accidental) ventilation shutdowns and impossibility to stop the production process. [1,35]
7.1.2 Environmental precautions	Control of hazardous substances, sealing of equipment. Treatment of industrial emissions into the atmosphere and wastewater. Dust-free product discharge. Landscaping and infrastructure development of the company premises. Prevention of product spillage. [1,15,35]
7.1.3 Recommendations on safe handling and transportation	Coke breeze is transported in bulk in open-top gondola car. Unloading from transportation vehicles and storage shall be performed by mechanisms, which shall not overgrind the product. Repeated transshipment of breeze from one site to another leads to its overgrinding (increased abrasion), change of sieve analysis. [1]

7.2 Storage Precautions

7.2.1 Safe storage life and conditions: (including guaranteed shelf life, expiry date; substances and materials incompatible for storing)	Storage at the manufacturer is not provided, at the consumer - it is stored in open specially equipped areas or under a shed. As production proceeds, it is immediately transferred to the consumer. Short-term storage is in bunkers. Safe storage period - not limited. Guaranteed shelf life is not set. Incompatible substances and materials for storage: flammable gases, flammable liquids, spontaneously combustible substances, substances emitting flammable gases, acids, alkalis. [1]

7.2.2 Containers and packing (including materials they are manufactured from)	The product is not packaged. [1]
7.3 Household precautions	The product is not used in the household. [1]

8 Exposure Controls and Personal Protection

8.1 Working zone exposure limits subject to obligatory control (MAC w.z. or ASLI w.z.)	MAC w.z. = -/6 mg/m^3 coal coke (carbon dust), aerosol. [9]
8.2 Measures aimed at keeping harmful substances within the exposure limits	Arrangement of dedusting and ventilation systems providing removal of hazardous substances and dust from the places of their release. Periodic removal of dust from dedusting devices. Compliance with sanitary norms of microclimate, noise and vibration, taking into account the peculiarities of the work performed. Daily cleaning of the rooms. [1]
8.3 Personal protective equipment for personnel	
8.3.1 General recommendations	Preliminary (upon employment) and periodic medical examinations (check-ups). Employees shall be trained and certified in occupational, health, fire and safety and fire safety. Pregnant and nursing women are not allowed to work. Workplaces and conditions of industrial practice for persons under the age of 18 shall comply with hygienic standards. PPE sets shall be washed and replaced on a weekly basis. Dedusting of PPE sets shall be carried out on a daily basis. Repair, centralized washing of protective clothing, only in production conditions, within the specified time limits. There shall be equipped sanitary facilities and amenities for eating and personal hygiene of employees, there shall be drinking water supply, water supply, sewerage and heating devices as well. Workers involved in the production and use of the product shall be informed of its hazardous properties. Production facilities shall be provided with primary fire extinguishing equipment. First aid stations shall be arranged and equipped. [1,25]
8.3.2 Respiratory protection (types of respiratory protective equipment)	Filtering means - dust or aerosol respirators, half-masks with filters, respirators, half-masks filtering. When working in confined spaces - fresh-air breathing apparatus with a mask shall be used. [28-32]
8.3.3 Protective equipment (material, type) (protective clothing, protective footwear, hand protection, eye protection)	Protective clothing from general production pollution. Foot protection - safety boots or shoes that protect against mechanical influences. Hand skin protection - gloves made of dense fabric, gloves made of cotton fabric, Protective and preventive dermatological products, fattening creams, ointments and pastes.

	Eye protection - "closed" type safety glasses with symbol 4. [1,26-32]
8.3.4 Personal protective equipment for household use	The product is not used in the household. [1]

9 Physical and chemical properties

9.1 Physical state (aggregate state, colour, odour)	Solid porous lumps less than 10 mm in size. from light to dark gray in color. [1]
9.2 Parameters characterizing the product basic properties (temperature indicators, pH, solubility, n-octanol / water factor and other parameters specific to this type of product)	Fire and explosion hazard values - see clause 5.2 of the Safety Data Sheet. Mass fraction of total moisture: 22 % - 24 %. Ash content: not more than 20.0 %. Mass fraction of lumps larger than 10 mm is 8.0 %. Solubility: insoluble in water, organic solvents, fats. Mass fraction of natural radionuclides: not more than 370 Bq/kg. [1]

10 Stability and reactivity

10.1 Chemical stability (specify decomposition products for unstable products)	The product is stable under transportation and storage conditions. [1]
10.2 Reactivity	It does not interact with other chemicals at ambient temperature. Interacts with fluorine to form fluorides, sulfur (at temperatures from 700 °C to 800 °C), reacts slowly with hydrogen, resistant to concentrated acids and alkalis, oxidized by chromium mixture at temperatures (from 180 °C to 230 °C). It reduces carbon dioxide. [1,10,33]
10.3 Conditions to Avoid (including hazardous manifestations upon contact with incompatible substances and materials)	Open flames in contact with incompatible substances and materials. [1]

11 Toxicological information

11.1 General description of effects (evaluation of a level of hazardous (toxic) effects on the body and the most typical manifestations of hazard)	Low- hazardous products in terms of impact on the body. May affect organs (lungs) as a result of repeated or prolonged exposure. [1,2]
11.2 Routes of exposure (inhalation, ingestion, skin contact and eye contact)	Inhalation, ingestion, skin contact and eye contact. [1,3,9]
11.3 Target human organs, tissues and systems	Respiratory system, gastrointestinal tract, liver, central nervous system [8]
11.4 Information on dangerous to health effects from direct exposure to the product, as well as consequences of this exposure: (irritation of upper respiratory tract, eyes, skin, including skin resorptive and sensitizing effects)	Product dust is mechanically irritating to skin and mucous membranes. Skin-resorptive effect has not been determined. It has sensitizing effect in contact with skin, however, data for classification are insufficient. [1,11,12]
11.5 Information on long-term dangerous to health effects from exposure to the product (influence on reproduction function, carcinogenicity, mutagenicity, cumulativeness and other chronic effects)	The effect on reproductive function and carcinogenic effect of products (on coal coke) on humans and animals has not been studied, mutagenic effect has not been determined. Cumulativeness is weak.

Upper respiratory tract diseases (fibrosis) may occur with prolonged work experience. It has a fibrogenic effect. [1,11,12].

11.6 Values of acute toxicity

(DL_{50}, route of entry (intragastric, cutaneous), animal species; CL_{50}, exposure time (h), animal)

Table 2 [10]

Substance	Effect	Value, mg/l	Route of entry	Animal species
Coal coke	DL50	more than 5,000	intragastric	rats
		more than 2500	cutaneous	rats

12 Ecological information

12.1 General description of effects on environment
(air, water bodies, soil including observable symptoms of exposure)

Product dust can be present in the atmosphere in the form of particles. Absorption of particles by aerosols reduces atmospheric transparency, which reduces the number of sunny days and affects regional climate. After dust is collected, a small amount of dust is released into the air. Dissolved carbon from water bodies partially deposits to the bottom in the form of carbonates. Product dust, when deposited on water surfaces in large quantities, can be harmful to water bodies by reducing oxygen supply. Dust is not harmful to soils.
Observed features. When dust gets into the air, it can be deposited on plant leaves, slowing down their growth. When getting into water bodies it can form films on the surface of water, cause its turbidity, violate the sanitary conditions of water bodies. [1,34]

12.2 Environmental exposure routes

In case of violation of the rules of handling, storage and transportation; in case of uncontrolled waste dumping, as a result of accidents and emergencies.

12.3 The most important characteristics of environmental impact

12.3.1 Hygienic regulations
(allowable concentrations in atmospheric air, water, including fishery water bodies, soil)

Table 3 [1,9,10]

Ingredients	MAC (maximum allowable concentration) in atm. air or ASLI (approximately safe level of impact) in atm. air, mg/m^3 (LHI [1], hazard category)	MAC in water[2] or Approximate Allowable Level in water, mg/l (LHI, hazard category)	MAC in fishery[3] or ASLI in fishery, mg/l (LHI, hazard category)	MAC in soil or Approximate Allowable Concentration in soil, mg/kg (LHI)
Coal coke	0,15/0,05, (рез.), hazard category 3 (by carbon)	control of suspended particles	NA	

12.3.2 Ecotoxicity values

NA. [1]

(CL, EC, NOEC and etc. for fish (96 h.), daphnia (48

[1] LHI – limiting hazard index (tox. – toxicological; s.-t. – sanitary - toxicological; org. – organoleptic with indication of changes in organoleptic properties of water (od. – changes water odour, tur. – increases water turbidity, col. – colours water, foam – causes foaming, film – creates film on the water surface, taste – changes water flavour, op. – causes opalescence); refl. – reflective; res. - resorptive; refl.-res. - reflective-resorptive, fishery – fish industry (change of commercial qualities of aquatic organisms) ; gen. – general sanitary).
[2] Water of water bodies for household and community use
[3] Water of water bodies for fish industry (including seas)

h.), algae (72 or 96 h.), etc.)	
12.3.3 Migration and transformation in the environment due to biodegradation and other processes (oxidation, hydrolysis or similar)	The product is not transformed in the environment. The products of its combustion are assimilated from the troposphere by plants and from the biosphere are returned to the geosphere again. They enter human and animal bodies with plants and then enter the soil in the form of CO2 during decomposition. They dissolve in water and return to the biosphere; they can be deposited in the form of carbonates, sulfates, nitrates. [10,35]

13 Disposal considerations

13.1 Safety precautions for handling waste generated during use, storage, transportation	Safety measures when handling waste are similar to those used when handling product (see Clauses 7,8 of the Safety Data Sheet). PPE shall be used (see Clause 8.3 of the Safety Data Sheet), means and technologies ensuring minimum use of manual labor. [1]
13.2 Information on locations and methods of neutralization, recovery or disposal of waste, including containers (packing)	Waste is disposed of in specially designated places, the location of which shall be agreed with the regional sanitary and environmental supervision authorities. Disposal method - combustion or screening into any size classes, use within the enterprise for energy purposes or as an additive to coal charge, or shipment outside the enterprise as commercial products. Gaseous wastes are neutralized by adsorption treatment followed by vapor combustion, condensation treatment, catalytic afterburning, and burning in furnaces. If sufficiently treated, they can be returned to the pipeline. Wastewater is subjected to mechanical treatment with or without coagulants and (or) chemical treatment (ozonation or chlorination) in combination with physicochemical (sorption) and biological methods. [1]
13.3 Recommendations on disposal of waste from household use	The product is not used in the household. [1]

14 Transport information

14.1 UN number (according to UN Recommendations on the Transport of Dangerous Goods)	NA. [36]
14.2 Proper shipping name and name while in shipment	Coke breeze of KM-1; KM-2 grades. [1]
14.3 Applicable means of transport	By rail. [1]
14.4 Cargo hazard classification according to GOST 19433-88:	It is not classified as a dangerous cargo. [37]
14.5 Cargo hazard classification according to the UN Recommendations on the Transport of Dangerous Goods:	It is not classified as a dangerous cargo. [1,36]
14.6 Transport Labels (handling signs according to GOST 14192-96)	Handling signs are not applied. [1,38]
14.7 Emergency cards (if shipped by rail, sea etc.)	They are not used because the cargo is not classified as dangerous. [1,39]

15 Regulatory Information

15.1 National Regulations

15.1.1 Russian Federation laws	Federal Law “On Environmental Protection”; Federal Law “On Occupational Health and Safety of Hazardous Production Facilities”; Federal Law “On Protection of Atmospheric Air”; Federal Law “On Fire Safety”; Federal Law “On Production and Consumption Waste”.
15.1.2 Documentation regulating man safety and environmental protection requirements	Not required. [43]
15.2 International conventions and agreements (whether or not the product is regulated by the Montreal Protocol, Stockholm Convention etc.)	Not subject to international conventions and agreements. [40,41]

16 Additional information

16.1 Information on SDS revision (re-edition) (the following is specified: “SDS is drawn up for the first time” or “SDS is re-registered upon expiry. Previous SDS registration number...” or “Amendments made in clauses…, amendment date…”)	The Safety Data Sheet is developed for the first time.

16.2 List of information sources used to draw up the SDS [4]

1. TS 0763-199-00190437-2004 Coke breeze. Technical specifications.
2. GOST 12.1.007-76 Occupational safety standards system. Noxious substances. Classification and general safety requirements.
3. GOST 32419-2022 Hazard classification of chemicals. General requirements.
4. GOST 32423-2013 Mixtures classification of hazard for health.
5. GOST 32424-2013 Classification of chemicals for environmental hazards. General principles.
6. GOST 32425-2013 Mixtures classification of hazard for environmental.
7. GOST 31340-2022 Labelling of chemicals. General requirements.
8. Automated Distributed Data Retrieval System (ARIPS) "Hazardous Substances" of the Russian Register of Potentially Hazardous Chemical and Biological Substances of Rospotrebnadzor. Available at / http://www.rpohv.ru/arips/.
9. SanPiN 1.2.3685-21 Hygienic standards and requirements for ensuring safety and (or) harmlessness to humans from environmental factors.
10. Data from the information system of ECA (European Chemicals Agency).[Electronic resource]: Available at – http://echa.europa.eu/.
11. Hazardous chemicals. Natural organic compounds. Reference-encyclopaedic publication edited by Filov V.A. Vol.7. - St. Petersburg. SPKHFA, NGO “Peace and Family”, 1998..
12. Hazardous substances in industry. Handbook for chemists, engineers and doctors. 7th ed., trans. and add: in 3 vol. Vol. III. Inorganic substances. Edited by N.V. Lazarev and E.N. Levina. L., Chemistry, 1976..
13. Handbook of Coke Chemical Engineer, ed. by A. K. Shelkov, Vol. 3. - Moscow : Metallurgy, 1966..
14. GOST 12.1.044-89 (ISO 4589-84) Occupational safety standards system. Fire and explosion hazard of substances and materials. Nomenclature of indices and methods of their determination.
15. Sorokin N. D. Environmental protection at the enterprise. - Saint-Petersburg, Integral Company.

[4] Order numbers of information sources are given in each clause of SDS as references

16. Ilichkin V.S. Toxicity of combustion products of polymeric materials. Principles and methods of determination. St. Petersburg : Chemistry, 1993.
17. Korolchenko A. Ya. Fire and explosion hazard of substances and materials and means of their extinguishing. Reference. ed. in 2 parts. - Moscow: Ass. “Pozhnauka”, 2000, 2004.
18. Fire and explosion hazard of substances and materials and means of their extinguishing. Ref. under ed. of A.N. Baratov and others. - M., Chemistry, 1990.
19. GOST 53264-2019 Fire equipment. Special protective clothing for fire-fighter. General technical requirements. Test methods.
20. GOST R 53269-2019 Fire equipment. Helmets for firefighters. General technical requirements. Test methods.
21. GOST R 53268-2009 Fire equipment. Fire safety belt. General technical requirements. Test methods.
22. GOST R 53265-2019 Fire equipment. Personal protective means of fire-fighter's feet. General technical requirements. Test methods.
23. GOST R 53257-2019 Firefighting equipment. Face masks of personal respiratory protective devices. General technical requirements. Test methods.
24. Safety precautions in coke production. Yu.A. Golbraikht - Moscow : Metallurgy, 1969.
25. Order of the Ministry of Public Health of the Russian Federation No. 29n dated 28.01.2021 “On Approval of the Procedure for Mandatory Preliminary and Periodic Medical Examinations of Employees Provided for by Part Four of Article 213 of the Labor Code of the Russian Federation, List of Medical Contraindications to Work with Harmful and (or) Hazardous Production Factors, as well as Work for Which Mandatory Preliminary and Periodic Medical Examinations are Conducted” (Registered 29.01.2021 No. 62277).
26. GOST 12.4.103-2020 Occupational health and safety standards system. Special protective clothes, personal means of hands and feet protection
27. GOST 12.4.253-2013 (EN 166:2001) Occupational safety standards system. Personal eyes and face protection means. General technical requirements.
28. ГОСТ 12.4.041-2001 Occupational safety standards system. Filtering respiratory protective equipment. General technical requirements.
29. GOST 12.4.294-2015 (EN 149:2001+A1:2009) Occupational safety standards system. Respiratory protective devices. Filtering half masks to protect against particles. General technical specifications.
30. GOST 12.4.235-2012 (EN 14387:2008) Occupational safety standards system. Respiratory protective devices. Gas filters and combined filters. General technical requirements. Test methods. Marking.
31. GOST 12.4.236-2012 (EN 138:1994) Occupational safety standards system. Respiratory protective devices. Fresh air hose breathing apparatus, used with masks and half masks. General technical requirements. Test methods. Marking.
32. OST 12.4.238-2015 Occupational safety standards system. Respiratory protective devices. Closed-circuit breathing apparatus compressed air type. Technical requirements. Test methods. Marking. Sampling rules.
33. PubChem [Electronic resource]. - Available at: https://pubchem.ncbi.nlm.nih.gov/.
34. Grushko Y.M. Hazardous inorganic compounds in industrial wastewater, 1979.
35. Order No. 512 dated 09.10.2020 On approval of federal norms and regulations in the field of industrial safety “Safety rules for processes of obtaining or using metals”.
36. Recommendations on transportation of hazardous cargoes. Model Regulations. Twenty-second revised edition. United Nations, New York and Geneva, 2021.
37. GOST 19433-88 Dangerous goods. Classification and marking.
38. GOST 14192-96 Marking of cargoes.
39. Emergency cards for hazardous cargoes transported by railways of the CIS, the Republic of Latvia, the Republic of Lithuania, the Republic of Estonia (as amended on 27.11.2020).
40. The Montreal Protocol on Substances that Deplete the Ozone Layer was adopted on September 16, 1987.

41. Stockholm Convention on Persistent Organic Pollutants. Ratified by the Federal Law No. 164-FZ dated 27.06.2011.
42. Hazardous Substances in Industry. Reference book edited by N.V. Lazarev T. 3 - L : Khi-Miya, 1977.
43. Unified list of products (goods) subject to state sanitary and epidemiological supervision (control) at the customs border and customs territory of the Eurasian Economic Union (as amended on 23.01.2023).