

SAFETY DATA SHEET

Registered under No.

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Valid up to February 13, 2017

Russian Standard

The information-analytical centre
«Safety of substances and materials»
FGUP «VNITSSMB»

Head (signature) D.Kozlov

NAME:

Technical (under ND)

CONDENSED SILICA FUME

Chemical (under IUPAC)

None

Trade name

CONDENSED SILICA FUME OF DIFFERENT GRADES

Synonyms

None

Code of Russian
Classification of
Production
(OKP):5 7 4 3 2 5Code from Harmonized
System Codes:3 8 2 4 4 0 0 0 0 0

Identification code and name of the main regulatory, technical and information document for the product (GOST, TU, OST, STO, (M)SDS, etc.)

TU 5743-048-02495332-96 Condensed Silica Fume. Technical requirements.

HAZARD IDENTIFICATION

Signal word: Carefully

Brief (wordy) characteristics: Moderately dangerous material by influence on organism. It causes irritation, diseases of lungs. Can pollute environment.

Detailed characteristics: in 16 attached sections of the safety data sheet.

MAIN DANGEROUS COMPONENTS:	Threshold limit value, mg/m ³	Danger class	CAS No.	EC No.
Silicon dioxide	3/1 (amorphous silicon dioxide in form of aerosol condensed to 60%)	3	7631-86-9	231-545-4

APPLICANT: JSC «Chelyabinsk Electro-Metallurgical Combine»
(Organization name)Chelyabinsk
(city)Type of applicant: producer, supplier, seller, exporter, importer.
(cross out unnecessary)

OKPO Code: 0 0 1 8 6 5 0 7

Phone in case of emergency: (351) 772-66-09

Head of the organization-applicant:

(signature)

/ A.V Sheikin /
(de-coding)

IUPAC - Nomenclature of organic compounds of the International union of theoretical and applied chemistry

GHS - Globally Harmonized System of Classification and Labeling of Chemicals

OKP – All-Russian production classifier

OKPO – All-Russian classifier of enterprises and organizations

TNVED - Nomenclature of Goods subject to Foreign Trade

CAS No. – substance number in the Register of Chemical Abstracts Service

EC No. - substance number in the Register of European Chemicals Agency

PKD r.z.- maximum permissible concentration of chemical substance in the working zone air, mg/m³

Safety Data Sheet (Material Safety Data Sheet) – translation into Russian - Safety Sheet of Chemical Products (substance, mixture, material, industrial by-product)

Safety Data Sheet corresponds to:

- Recommendations of UN ST/SG/AC. 10/30 “GHS”
- Regulations of EC “Regulation No. 1907/2006 concerning Registration, Evaluation, Authorization and Restriction of Chemicals, Annex II.

Signal word: - one of two words is specified: “**Dangerously**” or “**Carefully**” (or “**None**”) in conformity with GOST (State Standard) 31340-2007 “Warning marking of chemical products. General requirements”.

1. Identification of chemical products and information about producer and/or supplier

1.1. Identification of chemical products

- 1.1.1. Technical name: Condensed silica fume
- 1.1.2. Brief recommendations on application (including restrictions on application): Condensed silica fume is intended for application as highly active mineral additive to concrete and cement [1]. An admissible field of condensed silica fume application in concrete in proportions within 30% by cement weight: all concrete and ferroconcrete constructions of engineering and industrial building, including systems of drinking water supply [1].

1.2. Information about producer and/or supplier

- 1.2.1. Full official organization name: Open joint-stock company "Chelyabinsk electro-metallurgical combine" (OJSC "CHEMK")
- 1.2.2. Address (postal and legal): 454081, Chelyabinsk, Tankograd Heroes str., 80p, building 80
- 1.2.3. Ph. Nos. including for extraordinary consultations and limits in time: (351) 772-66-09
- 1.2.4. Fax No.: (351) 772-96-19
- 1.2.5. E-mail: info@chemk.ru

2. Danger (dangers) identification

- 2.1. General degree of danger of chemical products: The material is moderately dangerous by the degree of influence on organism, 3^d class of danger [1,2].
(data on danger classification according to the legislation of RF (GOST 12.1.007) and SGS (after approval)
- 2.2. General hygienic regulations for the product in the air of the working area: Not revealed [1,2].
(PDK_{rz.} or OBUV_{rz.})

2.3. Information about marking (on GOST 31340-07)

- 2.3.1. Danger description: Signal word: Carefully.
Danger Symbols:



- 2.3.2. Measures on danger prevention: Brief characteristic of danger: It's harmful to swallow and inhale [3,4].
Brief characteristic of danger: It's harmful to swallow and inhale [3,4].
To use only in the open air or in well ventilated premises. To avoid silica fume inhalation. Not to smoke, drink and eat when using the product. To wash hands thoroughly after work.
Measures on liquidation of emergency situations:
By inhalation- fresh air, rest. By ingestion- to rinse oral cavity. Immediately to consult a doctor.

3. Composition (information about components)

3.1. General information about the product

3.1.1. Chemical name: (no IUPAC)

None [3].

3.1.2. Chemical formula:

None, complex mixture of oxides [3].

3.1.3. General characteristics of composition:
(taking into account grade assortment and data on impurities and functional additives influencing danger of production; the way of production)

Condensed silica fume represents ultra disperse material generated in the process of furnace gas cleaning in production of silicon-containing alloys. The basic component of the material is silicon dioxide of amorphous modification.

Grades of condensed silica fume are as follows: undensified MK-85 and MK-65, densified MKU-85 and MKU-65 and in the form of suspension (paste) - MKS-85. Forms of the product for sale are characterized by the content of the main component – silicon dioxide [1].

3.2. Components

(name, numbers of CAS and EC (if available), mass fraction, GTDKrz or OBUVrz, danger classes, references to the data sources)

Table 1 [1,5]

Components (name, CAS and EC numbers)	Mass fraction, %	PDK rz, mg/m ³	Danger class	CAS No.	EC No.
Mass fraction of silica fume in terms of dry substance, min., including:	40-97	Not established	none	none	none
- mass fraction of silicon dioxide, min.	65-85 (depending on grades)	3/1		112945-52-5	none
- mass fraction of calcium oxide, max.	5	1	2	1305-78-8	215-139-9
- mass fraction of sulfuric anhydride, max.	0,6	1	2	7446-11-9	none
- mass fraction of free alkalis, max	2	0,5	2	none	
Water mass fraction: - undensified - densified - suspension	3 10 40	It cannot be established..		7732-18-5	231-791-2

4. Measures of first aid

4.1. Observable symptoms

4.1.1. If intoxicated by inhalation :

By inhalation - short breath, pain and constraint in breasts, cough, complicated breath, by long ingress in organism - «dust bronchitis» and silicosis [6,7].

4.1.2. Influence on skin:

Consequences of mechanical influence of silica fume particles. It can cause reddening, skin dryness, chaps because of presence of free alkalis and calcium oxide [6,7].

- 4.1.3. Ingress in eyes: Lacrimation, reddening, pain, burning as a result of mechanical influence of silica fume particles and presence of free alkalis and calcium oxide [6,7].
- 4.1.4. If poisoned by oral introduction (by ingestion): Burning, heaviness and pains in gastrointestinal tract, vomiting. In case of chronic influence – enhanced morbidity of gastrointestinal tract [6,7].

4.2. Means of the first aid for injured persons

- 4.2.1. If poisoned by inhalation: Fresh air, heat, rest, consultation with doctor in case of unwell feeling [6,7].
- 4.2.2. If influenced on skin: To wash by flowing water, in case of durable irritation – to call for doctor [3,6].
- 4.2.3. By ingress in eyes: To wash by flowing water, to seek medical attention [3,6] upon occurrence of irritation symptoms.
- 4.2.4. If poisoned by oral introduction: Large water drinking. Urgently to consult a doctor [6, 7]
- 4.2.5. Contraindications: No data [1].
- 4.2.6. Means of first aid (first-aid kit): Standard first-aid set.

5. Measures and means for providing fire and explosion safety

- 5.1. General characteristics of fire-and-explosion safety: Non-flammable ultra disperse material [1].
- 5.2. Indices of fire-and-explosion danger: (nomenclature of indices by GOST 12.1.044 and GOST P 51330.0) Not reached [1].
- 5.3. The danger caused by products of burning and-or thermal destruction: Is not subject to thermal destruction in the fire seat.
- 5.4. Recommended means of fire suppression: Fire extinguishing means are recommended to be chosen by a main source of ignition [1].
- 5.5. The forbidden means of fire suppression: Forbidden means of fire suppression are recommended - to be chosen by a main source of ignition.
- 5.6. Individual protecting means when fire suppressing: Does not burn. In the fire seat it is recommended to apply fireproof suit completed with self-rescue device SPI-20 [8].
- 5.7. Specificity when fire suppressing: Packing can be involved in the burning process. Water ingress in packing with the product is not recommended because presence of calcium oxide can lead to the heat emission [8].

6. Measures on prevention and liquidation of emergency and extreme situations and their consequences

6.1. Measures on prevention of harmful influence on people, environment, buildings, constructions, etc. at emergency and extreme situations

6.1.1. Necessary actions of the general character: To isolate dangerous zone in radius min. 200 m. To remove outsiders. To enter a dangerous zone in protective means. First aid should be rendered to the suffered people or to send sufferers for medical observation [9].

6.1.2. Individual protective means:
(for emergency brigades and personnel) Protective general military suit completed with industrial gas mask. Overalls for protection against dust influence, gloves, glasses, special footwear, filtering respirator "SHB-1" of Lepestok type, masks and half-masks. In the fire seat – fire-protective suit completed with self-rescue device SPI-20 [9].

6.2. Operation procedure when liquidating emergency and extreme situations

6.2.1. Actions if leaks, flood, scatterings:
(including safety measures providing protection of environment) To collect material in container and after agreement with the manufacturer to hand over for processing or to deliver for burial to the places agreed with the territorial sanitary bodies. Not to allow ingress in water basins and water drains.

6.2.2. Actions in case of fire: It does not burn. Packing can be involved in the burning process. Fire extinguishing means are recommended to be chosen by a main source of ignition. Not to allow ingress of water in packing with the product [9].

7. Rules of storage of chemical production and treatment with it while cargo handling works

7.1.1. Safety measures and collective protection means:
(including system of measures of fire-explosion safety) General forced-air and local system of ventilation in working premises, application of technological processes with minimum dust-formation and devices of dust catching. Use of means of individual protection [1,6].

7.1.2. Environment protection measures: The main requirements providing preservation of environment are:

- periodic control of harmful substance content in the air of the working zone;
- application of dust cleaning constructions when the product processing;
- analysis of industrial drains for presence of harmful substances in them in admissible concentration;
- cleaning of working premises air to approved standards before discharge into the atmosphere;
- prevention from silica fume ingress in the systems of household and storm water drains, in open reservoirs [1,6].

7.1.3. Recommendations for safe moving and transportation: Condensed silica fume packed in flexible specialized containers is transported in open semi-cars or on board motor transport; the material packed in multilayered paper bags is transported in covered transportation vehicles; in unpacked condition – by automobile cement trucks [1]. Condensed silica fume in the form of water suspension (paste) is transported in railway tanks or other steel tanks adapted for its transportation [1].

7.2. Rules of storage of chemical products

7.2.1. Conditions and terms of safe storage:
(Including storing warranty period, working life)

Condensed silica fume should be stored in closed dry warehouses. Flexible containers (big bags) should be stacked on pallets in rows no more than 1,8m by height (easy access should be provided) or in bunkers [1]. Silica fume suspension (paste) is necessary to be stored at the temperature not below +1°C in closed tanks equipped with the system of mixing or barbotage by air [1].

7.2.2. Substances and materials incompatible when storing:

Organic substances, fluoric acid [10].

7.2.3. The materials recommended for tare and packing:

Specialized flexible containers for bulk products of the type MKR-1, OM; MKR-1 OS or MKO-1, OS under the standard documentation. Application of paper bags in accordance with GOST 2226 [1] is possible.

7.3. Security measures and storage rules in a life:

It is not applied in conditions of life [1].

8. Means of control dangerous influence and personal protective means.

8.1. The parameters of the working zone which are subject to obligatory control (PDK rz or OBUV rz):

Maximum concentration limit=3/1 mg/m³, aerosol - amorphous silicon dioxide in the form of aerosol condensed to more than 60% [1].

8.2. Measures to ensure the content of harmful substances in admissible concentration:

Industrial premises should be equipped with supply-and-exhaust ventilation and dust entrapping devices. Application of technological processes with minimum dust-formation. Control of content of harmful substances in the air of working zone according to the requirements of GOST 12.1.005 and GN 2.2.5.1313-03 [1,2,6].

8.3. Means of personnel individual protection

8.3.1. General recommendations:

To avoid direct contact with the product, to use protective clothes.

To observe rules of personal hygiene, not to smoke and eat at the workplace. To carry out preliminary medical examinations at employment and periodic medical examinations of the personnel involved in works with silica fume. Persons younger 18 years old and pregnant women are not allowed to work [6].

8.3.2. Protection of respiratory organs (types SIZOD):

Respirator SHB-1 "Lepstok-200" [1, 11].

8.3.3. Protective clothes (material, type):

Overalls for protection against dust influence, protective tight glasses, dust-proof mittens or gloves, special shoes [1,11].

8.3.4. Individual defence means by use in life:

It is not applied in conditions of life [1].

9. Physical and chemical properties

9.1. Physical condition:

(aggregate condition, colour, smell)

Solid substance [1].

Grade MK – powder, grade MKU – fine-grained powder-like grey material without smell; grade MKS – fluid dark grey liquid (suspension).

9.2. The parameters characterizing basic properties of chemical production, first of all dangerous ones: (temperature indices, pH, solubility, factor of n-octanol, etc.)

Specific surface of condensed silica fume is 12 m²/g min.

Activity index – 90-95% min.

Bulk density of dry forms – 150-500 kg/m³ depending from the form of production

Density of water suspension is 1280 kg/m³ min.

pH of 5% water suspension is 7 min.

Average particle size – 0.30 μm

It is insoluble in water [1].

10. Stability and reactivity

10.1. Chemical stability:

(to specify decomposition products for non-stable products)

The material is stable under normal conditions [1].

10.2. Reactivity:

It is chemically stable, the main component doesn't react with acids except hydrofluoric acid. When fusing with alkalis it generates silicates [6].

10.3. Conditions which should be avoided:

(including dangerous displays while contacting with the incompatible substances and materials)

None.

11. Information on toxicity

11.1. General characteristic of influence:

(estimation of danger (toxicity) degree of influence on organism)

Moderately dangerous by degree of influence on organism, causes diseases of lungs and gastrointestinal tract [6,7].

11.2. Ways of influence:

(inhalation, peroral, by ingress on skin and in eyes)

Inhalation, ingress in organism while swallowing, skin, eyes [12,13].

11.3. Damaged organs, tissues and systems of man:

Lungs, top respiratory ways, gastrointestinal tract, lymph nodes. Presence of alkalis and calcium oxide in the product can lead to the skin and eye injury [1].

11.4. Data on influences hazardous to health by direct contact with substance, and also consequences of such influences:

(irritating action on the upper respiratory tracts, eyes, skin including skin-resorptive action; sensitization)

Irritates respiratory tracts, can cause sensitizing effect, skin and eye irritation. Skin-resorptive effect is not revealed for the basic components of the product [1].

11.5. Data on the dangerous remote consequences of influence on organism:

(influence on reproduction function, carcinogenicity, cumulative effect, etc.)

In whole such data about the product are absent, for the main component - silicon dioxide - influence on the reproduction function, mutagen and carcinogenic effects are not revealed, cumulative effect is weak [12]. For other components of the product the remote consequences have not been studied or not revealed [13,14].

11.6. Indicators of acute toxicity:(DL₅₀ (LD₅₀), way of ingress (v/zh, n/k), kind of animal;
CL₅₀ (LK₅₀), exposition time (h), kind of animal)

Substance	Effect	Value, mg/kg	Way of ingress	Kind of animal
Silicon dioxide	DL ₅₀	3160-15000	в/ж	Rats
	DL ₅₀	> 5000	н/к	Rabbits
Calcium oxide	DL ₅₀	500-2000	в/ж	Rats
Sulfuric anhydride	DL ₅₀	2140	в/ж	Rats

11.7. Doses (concentration) possessing the minimum toxic action:

No data for the product in whole.

12. The information on influence on environment

12.1. General characteristic of influence on objects of environment:

(atmospheric air, reservoirs, soil)

It can pollute water objects and atmospheric air,

12.2. Ways of influence on environment:

Infringement of storage rules, transportation, unorganized placement of wastes, disposal in water reservoirs.

12.3. Observable signs of influence:

Dustiness of atmospheric air, formation of ground and coastal deposits [13].

12.4. The most important characteristics of influence on environment

12.4.1. Hygienic standards:

(admissible concentrations in the atmospheric air, water, in fish reservoirs, soil)

Table 3 [16,17,18,19]

Components	PDK atm air or OBUV atm air, mg/m ³ (LPV ¹ , class of danger)	PDK water ² or ODU water, mg/l, (LPV, class of danger)	PDK fishery ¹¹ or OBUV fishery, Mg/l (LPV, class of danger)	PDK or ODK of soil, mg/kg (LPV)
Silicon dioxide	OBUV atm.air = 0,2 (amorphous silicon dioxide)	PDK water = 10, 2d class of danger (silicon)	Not revealed.	Not revealed.
Calcium oxide	OBUV atm.air = 0,3	Not revealed.	Disposal before full completion of hydrolysis is prohibited. PDK fishery = 180, san. tox. 4th class of danger, ecological (calcium, all forms soluble in water); PDK fishery = 610, tox. 4th class of danger, ecological (calcium, all forms soluble in water); Control of H index in the water of basins (pH 6,5-8,5)	Not revealed.
Sulfuric anhydride	PDK atm.air =0.3/0.1	PDK water =500	PDK fishery =100	PDK soil =160

¹ LPV - limiting indicator of harm (tox- toxicological; st. - sanitary-toxicological; org- organoleptic; reflex - reflectory; res. - resorptive; ref.-res.- reflectory-resorptive, fish- fishery (change of commodity qualities of trade water organisms); gen – general sanitary).² Water of water objects of economic-drinking and cultural and everyday water use³ Water of water objects having fishery value (including sea)

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	Reflectory-resorptive 2d class of danger (sulphuric acid)	Organoleptic 4d class of danger; 3500, toxic at 12-18% (for sea basins)	General sanitary
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12.4.2. Indicators of ecological toxicity:
(CL, EU for fishes, Daphnias, seaweed, etc.)

In whole there are no data on the product, indices of acute toxicity are given for the main component silicon dioxide.

Fish

EC₀ > 10000 mg/l, Brachydanio rerio, exposure time - 96 hours.

EC₀ > 10000 mg/l, Magna Daphnia, exposure time - 24 hours.

Toxic effect on water plants (in culture)

EC₅₀ 440 mg/l, Selenastrum capricomutum, 72 hours[12].

12.4.3. Migration and transformation in the environment at the expense of biological decomposition and other processes (oxidation, hydrolysis, etc.):

It is not transformed in the environment [6,7,15].

13. Recommendations on waste disposal (rests)

13.1. Security measures while handling with wastes formed by application, storage, transportation, etc.

Safety measures while working with wastes are similar to the measures applied in work with condensed silica fume (refer to sections 5.7 and 8 of safety data sheet).

13.2. Information about places and ways of neutralization, recycling or liquidation of wastes of substance (material), including tare (packing):

Wastes, off-grade products not subject to processing, transient containers should be delivered for liquidation to the refuse dump for industrial toxic wastes or to the places approved by the local sanitary or nature protection bodies [20].

13.3. Recommendations on waste disposal formed when applying in life:

It is not applied in life conditions [1].

14. Information on transportation

14.1. UN number:

(according to the recommendations of the United Nations about transportation of dangerous cargoes (typical rules), last edition)

It is not applied [21].

14.2. Proper shipping and/or transport name:

Silica fume (grade) [1].

14.3. Kinds of the applied vehicles:

Silica fume is transported by railway, automobile and air transport in conformity with the rules for these types of transport [1].

14.4. Classification of cargo danger:

(in accordance with the GOST 19433 and recommendations of the United Nations about transportation of dangerous - cargoes)

It is not classified as dangerous cargo by the criteria of GOST 19433 and UN Recommendations on transportation of dangerous cargoes [1,21,22].

14.5. Transport marking: (manipulation signs; basic, additional and information inscriptions)

Transport marking according to GOST 14192 [1,23].

14.6. Packing group:

(according to the recommendations of the United Nations about transportation of dangerous cargoes)

Is not regulated [24].

14.7. Information about danger by motor transportation (KEM):

The information about danger is not applied because the cargo is not classified as dangerous cargo [25].

14.8. Emergency cards:
(by railway, sea, etc. transportations)

They are not used because the cargo is not classified as dangerous cargo [9, 22, 25].

14.9. Kinds of information about danger by international cargo delivery:
(by SMGS, ADR (DOPOG), RID (MPOG), IMDG Code (MMOG), ICAO/IATA (IKAO), etc. including data on danger to environment, including about «sea contaminants»)

It is not applied.

15. Information about the national and international legislation

15.1. The national legislation

15.1.1. Laws of the Russian Federation:

«About sanitary-and-epidemiologic well-being of population».

15.1.2. The documents regulating requirements on protection of man and environment:
(Certificates, CEZ, certificates, etc.)

Not required [28].

15.2. The international legislation

15.2.1. The international conventions and agreements: (whether the product is regulated by the Montreal Protocol, the Stockholm convention, etc.)

No data.

15.2.2. The precautionary marking acting in the EU countries:
(symbols of danger, phrases of risk and safety, etc.)

Marking of risks and measures on safe handling applied in the EU countries:

Danger symbol: Xn - harmful substance.

R: 20/21 – it's dangerous at inhalation and ingress in organism

S: 36/38-45 - it is necessary to use corresponding clothes. In case of insufficient ventilation it's necessary to use corresponding protection of respiratory organs. In case of accident or poor state it's necessary to consult a doctor immediately (it is desirable to have the manufacturer label) [28].

16. Additional information

16.1. Data on revision of safety data sheet: (it is underlined: «Safety data sheet has been developed for the first time» or other cases specifying a principal cause of revision of safety data sheet)

The safety data sheet has been revised in connection with the termination of validity period.

16.2. The list of data sources used for preparation of the safety data sheet:

1. Technical Requirements (TU) 5743-048-02495332-96 Condensed silica fume. Technical requirements.
2. GN 2.2.5.1313-03 "Maximum permissible concentration (maximum concentration limit) of harmful substances in working zone air". GN 2.2.5.2308-07 "Approximate safe levels of influence (PZK) of harmful substances in working zone air". Hygienic standards. - M: Russian register of potentially dangerous chemical and biological substances of Ministry of Health of Russia, 2003, 2008.
3. GOST 31340-2007. Interstate standard. Precautionary marking of chemical production. General requirements.
4. The system of danger classification and chemical product marking (SGS) approved at the global level. The 3d revised edition. The United Nations Organization, New York and Geneva, 2009.

5. ESIS (European chemical Information Substances) / Data Sheet: Result for EC.
6. Harmful substances in industry. T 3. Inorganic and element organic compounds. Directory for chemists, engineers and physicians./Edited by N.V. Lazarev and I.D. Gadaskin: Chemistry, 1971.
8. A.Ya. Korolchenko. Fire-hazardous / dangerously explosive substances and materials and means of suppression. Directory in two parts. Part P: Ace. "Pozhnauka", 2000.
9. Safety rules and order of liquidation of emergencies with dangerous cargoes when transporting by railway/ approved by Ministry of Railways of Russia № TsM-407 d.d. 25.11.96 and Ministry of emergency situations of Russia № 9-733/3-2 d.d. 31.10.96. M: Ministry of Railways of the Russian Federation, 1997.
Emergency cards for dangerous cargoes transported by railways of the CIS, the Latvian Republic, the Lithuanian Republic, the Estonian Republic. - M: "Transport" 2000. Emergency cards for dangerous cargoes transported by railways of the CIS, the Latvian Republic, the Lithuanian Republic, the Estonian Republic (edited with amendments and additions d.d. 21.11.08 and 22.05.09).
10. Chemical encyclopedia./Edited by Knunyants I.L. and others. M: Soviet Encyclopedia, 1990.
11. Collective and individual protection means. Control of protective means. Encyclopedia «Ekometria» from the series of reference works on ecological and medical measurements. M: FID «Business Express», 2002.
12. Information card of potentially dangerous chemical and biological substance. Silicon dioxide. Series AT No. 002015 dd 21.06.2001
13. Information card of potentially dangerous chemical and biological substance. Calcium oxide. Series AT No. 000470 dd 11.05.1995
14. Information card of potentially dangerous chemical and biological substance. Sulfuric anhydride. **Series** AT No. 000622 dd 25.09.1995
15. Ya.M. Grushko. Harmful inorganic compounds in industrial sewage. Directory.- L.: Chemistry, 1979.
16. GN 2.1.6.1338-03 "Maximum permissible concentration (maximum concentration limit) of polluting substances in atmospheric air in populated areas". GN 2.1.6.2309-07 "Approximate safe levels of influence (OBUV) of polluting substances in atmospheric air of populated areas". Hygienic specifications.- M: Russian Register of potentially dangerous chemical and biological substances of Ministry of Health of Russia, 2003, 2008.
17. H 2.1.5.1315-03 "Maximum permissible concentration (maximum concentration limit) of chemical substances in water of water objects of economic-drinking and cultural and general water use". GN 2.1.5.2307-07 "Approximate admissible levels (ODU) of chemical substances in water of water objects of economic-drinking and cultural and general water use". Hygienic specifications. - M: Russian register of potentially dangerous chemical and biological substances of Ministry of Health of Russia, 2003, 2008.
18. Standards on quality of water of water objects of fishery aim, including standards on maximum permissible concentration of harmful substances in waters of water objects of fishery aim. Approved by the Order No. 20 d.d. 18.01.2010 of Federal Agency on fishery.
19. Maximum permissible concentration (maximum concentration limit) of chemical substances in soil. Decision of the Main state health officer of the Russian Federation d.d. 23.01.06, No. 1. GN 2, approved on January 19, 2006 - M., Federal centre of hygiene and epidemiology of Federal Supervision Agency for Customer Protection and Human Welfare, 2006.
20. Sanitary-and-epidemiologic rules and standards. Sanitary regulations and norms 21.7.1322-03. Hygienic requirements for disposal and neutralization of wastes of production and consumption.
21. Recommendations on transportation of dangerous cargoes. Typical rules. 16th amended edition. The United Nations Organization. New York and Geneva, 2009.
22. GOST 19433-88. Dangerous cargoes. Classification and marking - M: Publishing house of standards, 1988.
23. GOST 14192-96. Marking of cargoes. - M: Publishing house of standards, 1998.
24. Rules of transportation of dangerous cargoes by motor transport. - M: Ministry of transport of the Russian Federation, 1996.
25. The international sea code on dangerous cargoes. Code MMOG, book 1,2. - Sankt-Petersburg: ZAO TSNIIMF, 2007.
26. European Agreement on international road transportation of dangerous cargoes. DOPOG. U.N.O., New York and Geneva, 2006.
27. Rules of transportations of dangerous cargoes. Appendix 2 to "Agreement about international railway

cargo traffic (SMGS)”, Ministry of Railways of the Russian Federation.

28. Agreement of Customs Union of Republic of Byelorussia, Republic of Kazakhstan and the Russian federation.

29. A.K. Chernyshev and others. Indices of danger of substances and materials. T1/A/edited by Gusev V.K.-M: Fund of I.D.Sytin, 1999.

30. GOST 30333-2007. Interstate standard. Safety Data Sheet of chemical production. General requirements.