SAFETY DATA SHEET

Russian Safety Data Sheet No. 5 3 5 0 5 7 1 1 . 2 4 . 2 3 4

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As of August 05, 2010

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Federal agency for technical regulation and metrology (ROSTECHREGULIROVANIYE)

Information Analysis Center “Substances and products safety”

Federal State Unitary Enterprise "All-Russian Research Center for Standardization, Information and certification of raw products and substances" (FGUP «VNICSVM»)

Head of the Center [Signature] / A.D. Kozlov /

NAME:

Technical (in accordance with regulatory document)

Alcohol-ether concentrate

Chemical (in accordance with IUPAC)

No

Trade name

Alcohol-ether concentrate

Synonyms

No

All-Russian Classification of Products Code:

Information of product registration

Not a subject for registration

Harmonized System code (Foreign Economic Activity Commodity Nomenclature) *

TU 2422-012-53505711-2005 with changes “Alcohol-ether concentrate”

HAZARD CHARACTERISTICS:

Signal word: Handle with care

Brief (verbal) characteristic: Highly inflammable liquid, fire and explosion hazard. In fire conditions it is possible thermal destruction with formation of carbon oxides. Moderately hazardous product as to the severity of exposure on the organism. The product has irritant, narcotic and sensibilizing actions. It can penetrate through intact skin. The product has harmful effects on biological objects.

Detailed characteristic: in 16 attached sections of the Safety Data Sheet.

PRINCIPAL DANGEROUS COMPONENTS

<table>
<thead>
<tr>
<th>Component</th>
<th>OEL (Occupational exposure limit), mg/m³</th>
<th>Class of hazard</th>
<th>CAS No.</th>
<th>EC No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butan-1-ol</td>
<td>30/10</td>
<td>3</td>
<td>71-36-3</td>
<td>200-751-6</td>
</tr>
<tr>
<td>2-Methylpropanol-1</td>
<td>10</td>
<td>3</td>
<td>78-83-1</td>
<td>201-148-0</td>
</tr>
<tr>
<td>2-Ethylhexan-1-ol</td>
<td>10</td>
<td>3</td>
<td>104-76-7</td>
<td>203-234-3</td>
</tr>
</tbody>
</table>

APPLICANT: CJSC “Sibur – Khimprom” , Perm

Type of the applicant: manufacturer, supplier, seller, exporter, importer

All-Russia Nomenclature of Businesses and Organizations Code: 5 3 5 0 5 7 1 1

Safety communication telephone: +7 (342) 290-87-05

Head of the enterprise: [Signature] / S.N. Bagrov /

[Stamp: Closed Joint Stock Company “Sibur – Khimprom”, the Russian Federation, Perm, PSRN 1025901207804, TIN 5905018998, TRRC (KPP) 590501001 * SIBUR KHIMPROM]
1. IDENTIFICATION OF CHEMICAL PRODUCT AND INFORMATION ON MANUFACTURER AND/OR SUPPLIER

1.1 Technical denomination: Alcohol-ether concentrate [1].

1.2 Recommendations and restrictions on the use of: Alcohol-ether concentrate is intended for use as a solvent, as multifunctional oxygen-containing additive for improving of antiknock value of gasolines and increase of the phase stability of gasoline-alcohol fuels and for other purposes. When used as intended - no restrictions [1].

1.3 Full official name and address of the enterprise, responsible for manufacture, import and issues of chemical production: CJSC “Sibur – Khimprom” 98, Promyshlennaya street, Perm, 614055, the Russian Federation

1.4 Telephone (including for extraordinary consultations): +7 (342) 290-87-05 (24 hours a day) – dispatcher
+7 (342) 290-89-53 (from 7.00 to 15.00 – Moscow time) - principal engineer on quality
+7 (342) 290-89-01 (from 7.00 to 15.00 – Moscow time) - chief engineer

1.5 Fax: +7 (342) 290-83-72, 290-86-60

1.6 E-mail: mail@siburperm.ru

2. HAZARDS IDENTIFICATION

2.1 Hazard level of the product in whole: Highly inflammable liquids, fire and explosion hazard [1]. As to the severity of exposure on the organism, alcohol-ether concentrate is related, in accordance with GOST 12.1.007, to the 3-rd class of hazard - moderately hazardous products [1].

2.2 Hygienic standards for products in whole in air of the working area: They are absent for products in whole [1,2].

2.3 Information on marking

2.3.1 Hazard Description:

<table>
<thead>
<tr>
<th>Symbols</th>
<th>Signal word</th>
<th>Brief hazard description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazardous</td>
<td>Highly inflammable liquids. Vapor forms explosive mixtures with air. At skin and eye contact it causes irritation. At skin contact it may cause an allergic reaction. It may also cause drowsiness and dizziness.</td>
<td></td>
</tr>
</tbody>
</table>

2.3.2 Measures to prevent hazardous situation The product shall be stored in an airtight container. Keep away from sources of ignition, heat, sparks, open flame. No smoking. Use personal protective equipment. Use explosion-proof equipment and lightening. In case of contact with skin, immediately take off all contaminated clothing, wash exposed skin with water. Avoid vapors inhalation. To be stored in cool, well ventilated place [17] (see section 4, 6, 7, 8).
3 COMPOSITION (INFORMATION ON INGREDIENTS)

3.1. Information on product in whole


3.1.2. Chemical formula: No [1].

3.1.3. General characteristic of product composition: Alcohol-ether concentrate represents a co-product of production of butyl alcohols and 2-ethylhexanol - a mixture of aliphatic alcohols, C4, Cg (60%), containing the admixtures of ethers, aldehydes and high-boiling components. Two marks of the product are manufactured: A and B [1].

3.2. Ingredients: (mass fraction, OEL, class of hazard, reference to data source)

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Mass fraction</th>
<th>OEL, mg/m³</th>
<th>Class of hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td>Butan-1-ol (n-butanol) (CAS 71-36-3; EC 200-751-6)</td>
<td>Up to 60 %</td>
<td>30/10</td>
<td>3</td>
</tr>
<tr>
<td>2- Methylpropanol-1 (isobutanol) (CAS 78-83-1; EC 201-148-0)</td>
<td>10</td>
<td>10</td>
<td>3</td>
</tr>
<tr>
<td>2-Ethylhexanol-1-ol (CAS 104-76-7; EC 203-234-3)</td>
<td>10</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

[1, 2, 5, 9, 10, 11]

4 FIRST AID MEASURES

4.1. Observed symptoms:

4.1.1. Inhalation: Congested pipes, cough, dizziness, dimness [8].

4.1.2. Skin contact: Rubeosis, dryness, pruritus [8].

4.1.3. Eye contact: Gripe, bleary-eyedness [8].

4.1.4. Ingestion: Toxic poisoning.

4.2. First aid measures:

4.2.1. Inhalation: Fresh air, repose, warm, if necessary it shall be used artificial ventilation. Call for medical help [1].

4.2.2. Skin contact: Wash with streaming water. Call for a medical specialist [1].

4.2.3. Ingestion: Ample water drinking, use of activated charcoal, saline purge. Call for medical help [1].

4.2.6. Contraindications: Not available [1, 9, 10, 11].

4.2.6. First aid measures: (first aid kit) Activated charcoal, saline purge, drinking water.
5 FIRE-FIGHTING MEASURES

5.1. General characteristic of fire and explosion safety:
Alcohol-ether concentrate in accordance with GOST 12.1.044 is a highly inflammable liquid [1]. Inflammation can occur because of sparks and flame. Vapors together with air form explosive mixtures. Containers may explode when heated. In case of fire and explosions it can cause burns and injuries [8]. Fire and explosion safety during manufacturing shall be assured in accordance with requirements of GOST 12.1.004, GOST 12.1.010 [1, 6, 20].

5.2. Characteristic of fire and explosion safety:

<table>
<thead>
<tr>
<th>Name of index</th>
<th>n-butanol</th>
<th>isobutanol</th>
<th>2-ethylhexanol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flash point, °C:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Open melting pot</td>
<td>41</td>
<td>-</td>
<td>82</td>
</tr>
<tr>
<td>Closed melting pot</td>
<td>35</td>
<td>28</td>
<td>77</td>
</tr>
<tr>
<td>Temperature of inflammation, °C</td>
<td>43</td>
<td>39</td>
<td>86</td>
</tr>
<tr>
<td>Self-ignition temperature, °C</td>
<td>340</td>
<td>390</td>
<td>266</td>
</tr>
<tr>
<td>Temperature limits of flame propagation, °C</td>
<td>34 - 67</td>
<td>26 - 60</td>
<td>70 – 108</td>
</tr>
<tr>
<td>Concentration limits of flame propagation, % vol.</td>
<td>1.8 – 10.9</td>
<td>1.84- 11.4</td>
<td>0.9 – 6.2</td>
</tr>
</tbody>
</table>

Explosion hazard of mixed vapor of product with the air: PA category under GOST R 51330.11, group T2 under GOST R 51330.5 [1, 7, 9, 10, 11].

5.3. Hazard, caused by combustion products and/or by thermal destruction:
At combustion it is possible thermal destruction with formation of carbon oxides [1].

5.4. Recommended extinguishing media:
Chemical and generated mechanical foam, sand, water mist, PBS-3 powder in, CO₂, in premises - volumetric fire extinguishing [1]. At fire extinguishing of alcohols (polar fluids) it is not recommended to use foam, destructed at contact with polar fluids [7].

5.5. Prohibited extinguishing media:
Straight streams of water [7].

5.6. Personal protective equipment at fire extinguishing:
At inflammation – a fire-protection suit as a set with the self-rescue breathing apparatus SPI-20 [8].

5.7. Advice for firefighters:
Extinguish fire from the maximal distance. Cool water tanks/containers from the maximal distance [8].

6 ACCIDENTAL RELEASE MEASURES

6.1. Measures on prevention of harmful effect on people, ambient environment, buildings, constructions, etc., in case of accidents and emergencies

6.1.1. Necessary actions of general nature:
Isolate the hazardous area within a radius of at least of 200 m. Adjust this distance subsequent to the results of chemical reconnaissance. Remove unauthorized persons. Enter to the hazardous area only in the protective equipment. Keep measures of fire safety. Do not smoke. Eliminate sources of flames and sparks. Keep the windward side. Avoid low areas. Render first aid to the injured persons [8].
6.1.2. Personal protective equipment: (for emergency crews and personnel)

For emergency crews – the isolating protective suit KHX-5 completed with the isolating gas mask ИП-4М or the re-breathing apparatus АСВ-2 [8]. Personal protective equipment for personnel – see section 8.3.

6.2. Procedure for elimination of accidents and emergencies

6.2.1. Actions at leakage, spillage: (including measure of precaution, assuring environmental protection)

Inform to the territorial Administration of the Federal Service on Surveillance for Consumer rights protection and human well-being.
Eliminate leaks observing of safety precautions. Pump the contents into a properly operating tank or in the overflow tank with observance of conditions of fluid mixing. Protect spillages with an earth mound. Prevent ingress of the substance into waterways, sewage collection system. Use diffused water in order to isolate vapors. Cut off the surface layer of polluted soil, collect it and take out for recycling. Places of cuts shall be filled with a fresh soil layer. Surface of the territory (separate locations) shall be burned at threat of entering of the substance into underground water. Soil shall be re-plowed [8].

6.2.2. Actions in case of fire:

Do not approach the burning tanks. Cool containers with water from a maximum distance. Extinguish fire by water mist, generated mechanical foam and chemical foam from the maximal distance [8].

7 HANDLING AND STORAGE

7.1. Safety measures when handling chemical products

7.1.1. Safety measures and collective means of protection: (including system of measures of fire and explosion safety)

Production of alcohol-ether concentrate must comply with PB (safety regulations) 09-540-03. There shall be used the following safety signs in accordance with GOST 12.4.026: P02 "Do not use an open flame and smoking", W01 “Fire hazardous. Highly inflammable substances”. Lower explosive limit concentration in premises is determined by stationary automatic alarm warning devices. In production environment it shall be provided airtight packing of production equipment, suction-and-exhaust ventilation. Do not use open flame and sources of sparks. Electrical equipment and lighting shall be explosion-proof equipment and piping shall be grounded. When pouring and filing operations it is necessary to comply with the rules of protection against static electricity in accordance with the requirements of GOST 12.1.018 [1, 12].

7.1.2. Measures on environmental protection:

The principal means of protecting of the environment from the harmful effects of the product is usage in the process of production of hermetically sealed facility equipment and pipelines, strict observance of technological regime, exception of the product discharge into water basins and soil. Control over the content in the air of harmful substances shall be executed in accordance with the requirements of SanPiN 2.1.6.1032. Requirements for protection of surface water sources are demanded in accordance with SanPiN 2.1.5.980.
7.1.3. Recommendations on safety handling and transportation: The product in tanks is transported in truck tankers in accordance with GOST R 50913, in own tankers of the consignor (consignee) or in leased tank wagons made of carbon steel (of model 15-1547, 15-1566) in accordance with the rules of the transport of hazardous products, acting on this mode of transportation. Tanks shall be filled with the product taking into account the full use of their capacity and volume expansion of the product, with possible temperature difference on passage. It is allowed to transport alcohol-ether concentrate through pipelines from the manufacturer to the consignee. Alcohol-ether concentrate, packed in barrels in accordance with GOST 6247 or GOST 13950, shall be transported by automobile transport, it shall not be transported by railway. After filling with the alcohol-ether concentrate, containers shall be hermetically closed in accordance with the requirements of normative and technical documents on the container and it shall be sealed with the help of the locking-and-sealing device in accordance with GOST 31281 and GOST 18677, or with the help of seal in accordance with GOST 18680. Filling coefficient of the transportation container - 0.9. Packaging shall conform to the requirements of GOST 26319, GOST 18680. When carrying out works on filling, draining, cleaning of transportation vehicles and storage facilities there shall be followed instructions and rules of occupational safety, industrial sanitation and fire safety approved in the established procedure.

7.2. Storage precautions for chemical products

7.2.1. Terms and periods of the safe storage: (including guaranteed storage life, period of validity) Alcohol-ether concentrate shall be stored in warehouses of the consignor / consignee in pressure tight barrels on closed warehouses or in steel tanks in compliance with fire safety regulations. The temperature range at storage shall be from minus 40 °C to 40 °C. In accordance with GOST 12.1.004, the alcohol-ether concentrate is classified as hazardous product; it is allowed to store the product on warehouses of the I-st, II-nd rating of fire resistance. The manufacturer guarantees compliance of the quality of alcohol-ether concentrate with technical requirements within 3 months from the date of manufacturing, providing observance by the consumer of all conditions of transportation and storage. Upon expiration of the warranty period, alcohol-ether concentrate can be used by the consumer after checking it for compliance with quality specifications.

7.2.2. Substances and products Incompatible at storage: Compatibility of the product storage together with hazardous substances and products is in accordance with GOST 12.1.004, Appendix 7. Avoid contact with oxidizing agents, acids, alkalis, combustibles, highly inflammable liquids.

7.2.3. Products, recommended for manufacturing of containers and packaging: Alcohol-ether concentrate shall be packaged in steel barrels in accordance with GOST 6247 (type 1), GOST 13950 (type 1A1) having capacity of 100 dm³, 200 dm³.
7.3. Safety measures and storage precautions in household use:

The product is not used in household use.

8 EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Parameters which are subject of mandatory control (OEL or TSEL - Tentative Safe Exposure Level of Substance in air of the working area):

OEL (2-ethylhexan-1-ol) = 10 mg/m³, aerosol, class of hazard: 3
OEL (2-methylpropan-1-ol) = 10 mg/m³, vapors, class of hazard: 3
OEL (butan-1-ol) = 30/10 mg/m³, vapors, class of hazard: 3 [1, 2, 30].

8.2. Measures to ensure the content of harmful substances in permissible concentrations:

Control over the content of harmful substances in air of the working area is carried out in accordance with the procedures approved in the prescribed manner and with regularity, specified in Appendix 9 P 2.2.2006 [9, 10, 11, 14].

8.3. Personal protection equipment for personnel:

8.3.1. General recommendations:

Workers shall be trained to work in safe condition [13]. Personnel involved in production of alcohol-ether concentrate shall pass (when applying for a job) preliminary - and in the course of operation - periodic medical examinations [15, 18]. All activities related to production and use of ethanol-ether concentrate shall be conducted in personal protective equipment in accordance with typical industrial standards, duly approved. [19]

8.3.1. Respiratory protection:

Filtering industrial box respirator of marks A or BKF in accordance with GOST 12.4.122, and also with filters of A mark of the 3-rd class in accordance with GOST R 12.4.193 [1].

8.3.3. Eye protection:

Mask-type goggles of G type in accordance with GOST R 12.4.230.1 [1, 19].

8.3.4. Arm protection:

Protective dermatologic means in accordance with GOST 12.4.068, gloves in accordance with GOST 12.4.103 [1, 19].

8.3.5. Protective clothing:

Protective clothing in accordance with typical industrial standards duly approved in the prescribed manner and in accordance with requirement of GOST 12.4.011 [1, 19].

9 PHYSICAL AND CHEMICAL PROPERTIES

9.1. Physical condition:

Homogeneous liquid, color: from colorless to light- yellow, without mechanical impurities [1]. Odor is acrid, pronounced [9, 10, 11].

9.2. Parameters characterizing basic properties of product:

9.2.1. Density at 20 °C: 0.750 - 0.850 g/cm³ [1].

9.2.2. Boiling point: 60 - 230°C [1].

9.2.3. Solubility: Soluble in water [9, 10, 11].
10  STABILITY AND REACTIVITY


10.2. Reactive capability:  In certain conditions (catalytic agent, temperature, etc.) the product is oxidized, recovered, halogenated, dehydrated, and reacted with alkali metals, organic and inorganic acids. At high temperature in the presence of oxygen it is combusted, forming carbon oxides [9, 10, 11].

10.3. Conditions which shall be avoided:  Heating. Performance of work with open fire [1, 8, 9, 10, 11].

11  TOXICOLOGICAL INFORMATION

11.1. General characteristic of exposure:  Alcohol-ether concentrate as to severity of exposure on the human organism is correspond - in accordance with GOST 12.1.007 - to the 3- rd class of hazard - moderately hazardous substances [1, 30].

11.2. Routes of exposure on organism:  Inhalant, per-oral, at skin and eyes contact [1, 8].

11.3. Most affected organs and systems:  Central nervous and respiratory systems, the gastrointestinal tract, lungs, liver, nephros, spleen, blood system, eyes, skin [9, 10, 11].

11.4. Information on health risks of exposure at direct contact with the substance, and also consequences of such exposure:

The product has an irritating effect to skin, eyes and respiratory tract. It has percutaneous action, narcotic effect and weak cumulative effect [1, 9, 10, 11]. The product has sensibilizing action [11]. Permanent contact with the product may lead to dermatitis and eczemas, mucosal lesions of the upper respiratory tract, liver damage, vegetative disorders, neurotic reactions and sense shock to the type of polyneuritis [18].

11.5. Information on hazardous remote effect of influence on the organism:

The product has mutagenic activity. Carcinogenic activity has not been studied. It has embryotropic, teratogenic effect, gonadotrophic effect has not been studied [9, 10, 11].

11.6. Acute toxicological characteristics:

<table>
<thead>
<tr>
<th></th>
<th>Value</th>
<th>Route of introduction, time of exposure (h)</th>
<th>Animal species</th>
</tr>
</thead>
<tbody>
<tr>
<td>DL₅₀, mg/kg</td>
<td>500</td>
<td>intraperitoneal</td>
<td>rats</td>
</tr>
<tr>
<td>DL₅₀, mg/kg</td>
<td>&gt;3000</td>
<td>dermatic</td>
<td>rats</td>
</tr>
<tr>
<td>DL₅₀, mg/kg</td>
<td>3730</td>
<td>intragastrically</td>
<td>rats</td>
</tr>
<tr>
<td>DL₅₀, mg/kg</td>
<td>564-759</td>
<td>intraperitoneal</td>
<td>mice</td>
</tr>
<tr>
<td>DL₅₀, mg/kg</td>
<td>2500</td>
<td>intragastrically</td>
<td>mice</td>
</tr>
<tr>
<td>DL₅₀, mg/kg</td>
<td>1970</td>
<td>dermatic</td>
<td>rabbits</td>
</tr>
<tr>
<td>DL₅₀, mg/kg</td>
<td>1860</td>
<td>intraperitoneal</td>
<td>guinea pigs</td>
</tr>
<tr>
<td>CL₉₅ₐₐ₉ₐ, mg/m³</td>
<td>&gt;10834</td>
<td>6</td>
<td>rats</td>
</tr>
<tr>
<td>CL₀, mg/m³</td>
<td>270-370</td>
<td>2</td>
<td>mice</td>
</tr>
</tbody>
</table>
As to \textit{n}-butanol [10]:

<table>
<thead>
<tr>
<th>Value</th>
<th>Route of introduction, time of exposure (h)</th>
<th>Animal species</th>
</tr>
</thead>
<tbody>
<tr>
<td>DL$_{50}$, mg/kg</td>
<td>100-300</td>
<td>intraperitoneal</td>
</tr>
<tr>
<td>DL$_{50}$, mg/kg</td>
<td>3400-5300</td>
<td>dermatic</td>
</tr>
<tr>
<td>DL$_{50}$, mg/kg</td>
<td>3200</td>
<td>subcutaneously</td>
</tr>
<tr>
<td>DL$_{50}$, mg/kg</td>
<td>310</td>
<td>intravenously</td>
</tr>
<tr>
<td>DL$_{50}$, mg/kg</td>
<td>377</td>
<td>intravenously</td>
</tr>
<tr>
<td>DL$_{50}$, mg/kg</td>
<td>200-1122</td>
<td>intraperitoneal</td>
</tr>
<tr>
<td>DL$_{50}$, mg/kg</td>
<td>3484</td>
<td>intragastrically</td>
</tr>
<tr>
<td>DL$_{50}$, mg/kg</td>
<td>2680</td>
<td>intragastrically</td>
</tr>
<tr>
<td>DL$_{50}$, mg/kg</td>
<td>2510-4360</td>
<td>intragastrically</td>
</tr>
<tr>
<td>CL$_{50}$, mg/m$^3$</td>
<td>24666</td>
<td>4</td>
</tr>
</tbody>
</table>

As to isobutanol [11]:

<table>
<thead>
<tr>
<th>Value</th>
<th>Route of introduction, time of exposure (h)</th>
<th>Animal species</th>
</tr>
</thead>
<tbody>
<tr>
<td>DL$_{50}$, mg/kg</td>
<td>340</td>
<td>intravenously</td>
</tr>
<tr>
<td>DL$_{50}$, mg/kg</td>
<td>417</td>
<td>intravenously</td>
</tr>
<tr>
<td>DL$_{50}$, mg/kg</td>
<td>2460</td>
<td>intragastrically</td>
</tr>
<tr>
<td>DL$_{50}$, mg/kg</td>
<td>544-1120</td>
<td>intraperitoneal</td>
</tr>
<tr>
<td>DL$_{50}$, mg/kg</td>
<td>720-1200</td>
<td>intraperitoneal</td>
</tr>
<tr>
<td>DL$_{50}$, mg/kg</td>
<td>3400</td>
<td>dermatic</td>
</tr>
<tr>
<td>CL$_{50}$, mg/m$^3$</td>
<td>32200-48300</td>
<td>4</td>
</tr>
<tr>
<td>CL$_{50}$, mg/m$^3$</td>
<td>19200</td>
<td>4</td>
</tr>
</tbody>
</table>

11.7. Doses (concentrations), having a minimal toxic effect, and other numerical values that characterize effects of exposure of chemical products on human health:

As to 2-ethylhexanol [9]:

$\Pi K_{ap}$ (limiting concentration with regard to chronic effect) $= 1.5$ mg/m$^3$, by inhalation, 3 months, rats
(as to change of characteristics of the general toxic effect);

$\text{Lim}_{ac} = 210$ mg/m$^3$, by inhalation, 4 h, rats
(as to change of characteristics of the central nervous system);

$\text{Lim}_{ac} = 270-370$ mg/m$^3$, by inhalation, 2 h, mice
(as to change of characteristics of the general toxic effect);

$\Pi K_{an}$ (odor concentration limits) $= 1.5$ mg/m$^3$, by inhalation, human being;

$\text{Lim}_{ir} = 100$ mg/m$^3$, by inhalation, human being.

As to \textit{n}-butanol [101]:

$\text{Lim}_{ir} = 0.8$ mg/m$^3$, by inhalation, human being;

$\Pi K_{ir}$ (limiting concentration with regard to effect on encephalon) $= 0.2$ mg/m$^3$, by inhalation, human being (as to change of biological activity of the encephalon);

$\Pi K_{an} = 1.2$ mg/m$^3$, by inhalation, human being;

$\text{Lim}_{ac} = 4000$ mg/m$^3$, by inhalation, 40 min., rabbits, (as to exposure on the central nervous system);

$\Pi D_{ap} = 0.05$ mg/kg, intragastrically, 6 months, rats (as to exposure on the central nervous system, liver);

$\text{Lim}_{ac} = 1$ mg/m$^3$, by inhalation, rats, around the clock, 100 days (as to exposure on the central nervous system);

$\text{Lim}_{ac} = 65$ mg/m$^3$, by inhalation, 4 h., rats (as to abnormality of the conditioned reflex activity).
As to isobutanol [11]:

ПКхр. = 0.5 mg/m³, by inhalation, 6 months, rats (as to change of the general toxic effect);
ПКзап. = 0.4 mg/m³, by inhalation, human being.

12 ECOLOGICAL INFORMATION

12.1. General characteristics of impact on objects of the environment: (atmospheric air, water bodies/basins, soil)

The product has toxic effect on fish, daphnia, waterweeds. In concentrations higher than 0.5 mg/l (ПКобщ. – total limiting concentration) it impacts on processes of natural self-purification of water body [9, 10, 11].

12.2. Routes of exposure to the environment:

The harmful effect of the product on the environment may occur in emergency situations when there is a possibility of getting of the product to urban airshed and water basin, soil [1].

12.3. Observable symptom of impact:

The product modifies organoleptic properties of water, flavoring it (ПКорг.зап. - limiting concentration for change of organoleptic properties, odor) = 2.5 mg/l) [10, 11].

12.4. Critical characteristic of impact on the environment:

12.4.1. Hygienic standards in objects of the environment:

- As to 2-ethylhexanol:
  MACatm (maximum allowable concentration in atmospheric air) = 0.15 mg/m³, reflex activity, the 4-th class of hazard [3].
  MAC water (maximum allowable concentration in water) = 0.15 mg/l, general activity, the 3-rd class of hazard [4].
  MAC fishing industry (maximum allowable concentration for fishing industry) = 0.09 mg/dm³, toxicity, the 4-th class of hazard [26].

- As to n-butanol:
  MACatm = 0.1 mg/m³, reflex activity, the 3-rd class of hazard [3].
  MAC water = 0.1 mg/l, c.-r., the 2-nd class of hazard [4].
  MAC fishing industry = 0.03 mg/dm³, toxicity, the 3-rd class of hazard [26].

- As to isobutanol:
  MACatm = 0.1 mg/m³, reflex activity, the 4-th class of hazard [3].
  MAC water = 0.15 mg/l, c.-r., the 3-rd class of hazard [4].
  MAC fishing industry = 2.4 mg/dm³, toxicity, the 4-th class of hazard [26].

12.4.2. Characteristics of environmental toxicity:

As to 2-ethylhexanol [9]:

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
<th>Time of exposure (h)</th>
<th>Kind</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute toxicity for fish:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CL50, mg/l</td>
<td>32-37</td>
<td>96</td>
<td>Salmo gairdneri (rainbow trout)</td>
</tr>
<tr>
<td>CL50, mg/l</td>
<td>17.1</td>
<td>96</td>
<td>Leuciscus idus melanotus (gold orpheus)</td>
</tr>
<tr>
<td>CL50, mg/l</td>
<td>27-29.5</td>
<td>96</td>
<td>Pimephales promelas (fathead minnow)</td>
</tr>
</tbody>
</table>

Acute toxicity for daphnia Magna: EC50 = 39 mg/l, 48 h.;
Toxic effect on waterweeds (in culture):
EC50 = 10-50 mg/l, 48 h., Chlorella emersonii;
EC50 = 11.5 mg/l, 72 h., Scenedesmus subspicatus.
Educed effects on model ecological systems:
EC 10 = 540 mg/l, 18 h., Pseudomonas putida (Bacteria);
EC50=19 mg/l, 24 h., Artemia salina.
As to n-butanol [10]:

<table>
<thead>
<tr>
<th>Value</th>
<th>Time of exposure (h)</th>
<th>Kind</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL₅₀, mg/l</td>
<td>1900</td>
<td>24 Carassius auratus (crucian carp)</td>
</tr>
<tr>
<td>CL₅₀, mg/l</td>
<td>1200</td>
<td>48 Leuciscus idus melanotus (gold orpheus)</td>
</tr>
<tr>
<td>CL₅₀, mg/l</td>
<td>1900-2400</td>
<td>96 Pimephales promelas (fathead pimephales)</td>
</tr>
</tbody>
</table>

Acute toxicity for daphnia Magna:
EC₅₀ = 1880 - 2337 mg/l, 24 h.;
CL₅₀ = 1900 - 2300 mg/l, 96 h.

Toxic effect on waterweeds (in culture):
EC₅₀ = 875 mg/l, 192 h., scenedesmus quadricauda (green);
EC₅₀ = 312 mg/l, 192 h., microcytik aeruginosa (blue-green).

Educed effects on model ecological systems:
EC₅₀ = 2250 mg/l, 16 ч., pseudomonas putida (bacteria).

As to isobutanol [11]:

<table>
<thead>
<tr>
<th>Value</th>
<th>Time of exposure (h)</th>
<th>Kind</th>
</tr>
</thead>
<tbody>
<tr>
<td>CL₅₀, mg/l</td>
<td>1430</td>
<td>96 Pimephales promelas</td>
</tr>
<tr>
<td>CL₅₀, mg/l</td>
<td>&gt;1000</td>
<td>96 Alburnus alburnus</td>
</tr>
<tr>
<td>CL₅₀, mg/l</td>
<td>2600</td>
<td>24 Carassus auratus (crucian carp)</td>
</tr>
<tr>
<td>CL₅₀, mg/l</td>
<td>1520-1750</td>
<td>24 Leuciscus idus melanotus (gold orpheus)</td>
</tr>
</tbody>
</table>

Toxic effect on waterweeds
EC₅₀, mg/l | 1250 | 48 Scenedesmus subspicatus

Educed effects on model ecological systems:
EC₅₀ = 1124.6 mg/l, 0.25 h., Photobacterium phosphoreum.

12.4.3. Migration and transformation of the product to the environment due to the biodegradation or other processes (oxidation, hydrolysis etc.):

The product is characterized by high stability in abiotic conditions. It is transformed in the environment [1]. Products of transformation - aldehydes, acids [10, 11].

13 DISPOSAL CONSIDERATIONS

13.1. Recommendation on safety waste (residues) treatment of chemical products:

Safety measures for waste management are similar to that, which are used when handling the product.

Observance of measures of treatment with flammable substances; avoid contact of waste with an open flame (sections 5, 7, 8, 9).

13.2. Information on disposal, recycling and/or management of waste in accordance with the current national legislation:

Waste emplacement (storage, disposal) shall be made on spoils for industrial waste and on sludge depositories in accordance with SanPiN 2.1.7.1322. Waste disposal shall be made by incineration [1, 21, 24].
13.3. Methods and places for waste management (disposal) and disposal of contaminated packing (containers):

It is admissible to re-use containers after elimination of remaining residue [16].

14 TRANSPORT INFORMATION

14.1. UN number in accordance with UN recommendation:

1993 [29, 22].

14.2. Proper shipping name and/or name for transportation:

HIGHLY INFLAMMABLE LIQUIDS, N.U.K. (petroleum products) (non-viscous liquid) [22]. Alcohol-ether concentrate [1].

14.3. Type of applicable means of transport:

Railway and automobile transport [1].

14.4. Hazard classification of shipment:

Class - 3, subclass - 3.3, classificatory reference number - 3313, drawing - 3 [1, 25].

14.5. Transport marking:

Handling marks “Keep away from sunlight”, “Sealed package” – in accordance with GOST 14192 [23].

14.6. Packaging Group:

III [29].

14.7. Information on danger at automobile transportation (Emergency Measures Code):

345КЭ [28].

14.8. Transport emergency card:

No. 328 [8, 22].

14.9. Information on danger at international freight traffic:

Agreement on International Goods Transport by Rail: classificatory reference number - 3013, classificatory code - F1, hazard code - 30, danger sign number - 3 [22].

ADR/RID (ДОПОГ/МПОГ): class of hazard - 3, classificatory code - F1, hazard identification number - 30, danger sign - 3 [33].

15 REGULATORY INFORMATION

15.1. National legislation

15.1.1. Laws of the Russian Federation:


15.1.2. Documentation, regulating requirements for the protection of human and environment:

Sanitary-and-Epidemiological Conclusion No. 59.55.20.242.П1.000529.03.09 as of 17.03.2009, issued by the Directorate of the Federal Supervision Agency for Customer Protection and Human Welfare in the Perm Territory.
15.2. International legislation

15.2.1. International conventions and agreements: (whether the product is regulated in accordance with the Montreal Protocol, the Stockholm Convention)

15.2.2. Warning marking, applied in EC countries: As to 2-ethylhexan-1-ol [27], n-butanol (butan-1-ol) [31], isobutanol (2-methylpropan-1-ol) [32]:

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Value</th>
<th>Interpretation</th>
</tr>
</thead>
<tbody>
<tr>
<td>☢️</td>
<td></td>
<td>Irritating products</td>
</tr>
<tr>
<td>☢️</td>
<td></td>
<td>Harmful hazardous product</td>
</tr>
<tr>
<td>Risk factors (R)</td>
<td></td>
<td>Inflammable (combustible) product. Harmful at inhalation, in case of contact with skin and if ingested. Irritating to eyes, respiratory system and skin.</td>
</tr>
<tr>
<td>Safety factor (S)</td>
<td></td>
<td>Keep away from ignition sources – do not smoke. In case of eyes contact r and obligatory call for the medical help. After skin contact immediately wash with a great quantity of water. Wear suitable protective clothing, gloves and eye and face protection.</td>
</tr>
</tbody>
</table>

16 OTHER INFORMATION

16.1. Information on revision (re-edition) the Product Safety Data Sheet: The Product Safety Data Sheet is revised in connection with termination of the period of validity in accordance with GOST 30333-2007 “MSDS on chemical products. General requirements”

16.2. The list of data sources, used at composing of the product safety data sheet:

2. GN (health standards) 2.2.5.1313-03 Maximum allowable concentration (MAC) of hazardous substances in the air of the working area.
3. GN 2.1.6.1338-03 Maximum allowable concentration (MAC) of hazardous substances in the air of populated area.
4. GN 2.1.5.1315-03 Maximum allowable concentration (MAC) of chemical substances in water reservoirs of objects of household water use and cultural and general water use.
5. GOST 12.1.007-76 Occupational safety standards system. Harmful substances. Classification and general safety requirements.
8. Transport emergency card for dangerous goods carried by railways of the CIS, the Republic of Latvia, the Republic of Lithuania, the Republic of Estonia, approved by the Council for Rail Transport of countries - members of the Commonwealth, Minutes No. 48 as of 30.05.20008.


15. Order No. 83 of the Ministry of Public Health and Social Development of the Russian Federation as of 16.08.2004 “On approval of lists of harmful and (or) hazardous production factors and work, at performance of which there shall be conducted preliminary and periodic medical examinations (surveys), and on approval of procedures for these examinations (surveys)”.

16. **GOST 1510-84** Petroleum and petroleum products. Marking, packing, transportation and storage.

17. **GOST 31340-2007** Warning marking of chemical products. General requirements.


19. Typical industry standards of free issue of industrial clothing, safety footwear and other personal protective equipment to employees of chemical plants, the Minister of Labour and Social Protection of the Russian Federation No. 26 as of 22.07.1999.


22. Alphabetical index of dangerous goods permitted for carriage by railway transport. Appendix No. 2 to the Regulation of dangerous goods transportation by railways.

23. **GOST 14192-96** Marking of cargoes.

24. SanPiN 2.1.7.1322-03 Hygienic requirements for placement and decontamination of production and consumption wastes.

25. **GOST 19443-88** Dangerous goods. Classification and marking.

26. Order No. 20 of the Russian Federal Fisheries Agency as of 18.01.2010 “On approval of the water quality standards of bodies of water of commercial fishing importance, including limits of maximum allowable concentrations of harmful substances in waters of bodies of water of commercial fishing importance”.


30. Sanitary-and-Epidemiological Conclusion No. 59.55.20.242.II.000529.03.09 as of 17.03.2009.

