

SAFETY DATA SHEET

FERRO SILICON 15% & FERRO SILICON 45%

According to EC-Regulation 1907/2006 (REACH) & 1272/2009 (CLP)

Version: 2.0

Release date: 03.11.2011

Revision date: 14.06.2016



SECTION 1: Identification of the Substance / Mixture and of the Company / Undertaking

1.1 Product Identifier: Ferrosilicon FeSi15% and KOVOSIL (FeSi45%) reaction mass of iron, iron disilicide, iron silicide and silicon.
Index Number: -
EC Number: 912-631-7
CAS Number: -
REACH Registration No.: 01-2119485286-28-xxxx

1.2 Relevant identified uses of the substance or mixture and uses advised against:

Relevant identified uses: Metal alloy component

Uses advised against: Not identified

1.3 Details of the supplier of the safety data sheet:

FirstAlloys SA.
11 rue Albert Philippe
L-2331 Luxembourg
Luxembourg

1.4 Notrufnummer / Helpdesks:

AUSTRIA (Vienna Wien) +43 1 40 400 2222; BELGIUM (Brussels Bruxelles) +32 70 245 245; BULGARIA (Sofia) +359 2 9154 409 / +359 887 435 325; DENMARK (Copenhagen) +45 35 31 54 04; ICELAND (Reykjavik) +354 525 111, +354 543 2222; FINLAND (Helsinki) +358 9 471 977; LITHUANIA (Vilnius) +370 2 36 20 52, +370 2 36 2092; FRANCE (Paris) +33 1 40 0548 48; NETHERLANDS (Bilthoven) +31 30 274 88 88; GERMANY (Berlin) +49 30 450 653565; POLAND (Gdansk) +48 58301 65 16 or +48 58 349 2831; GREECE (Athens Athinai) +30 10 779 3777; UNITED KINGDOM (London) 0870 600 6266. HUNGARY (Budapest) +36 80 20 11 99; PORTUGAL (Lisbon Lisboa) 808 250 143 (for use only in Portugal), +351 21 3303284; IRELAND (Dublin) +353 1 8379964; SPAIN (Barcelona) +34 93 227 98 33 or +34 93 227 54 00 bleep 190; ROMANIA (Bucharest) +40 21 230 8000; SWEDEN (Stockholm) +46 8 33 12 31 (International) 112 (National); SLOVAKIA (Bratislava) +421 2 54 77 4 166; CZECH REPUBLIC (Prague Praha) +42 2 2491 9293 or +42 2 2491 5402; SLOVENIA (Ljubljana) +386 41 650 500; ITALY (Rome) +39 06 305 4343; LATVIA (Riga) +371 704 2468; NORWAY (Oslo) +47 22 591300

SECTION 2: Hazards Identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008 [CLP]

Substance does not meet the criteria for classification in accordance with Regulation (EC) No. 1272/2008.

Additional Information: Not mentioned

2.2 Label elements:

Hazard pictogram(s): Not relevant
Signal word(s): Not relevant
Hazard statement(s): Not relevant
Precautionary statement(s): Not relevant
Label elements: No data available

2.3 Other Hazards:

Substance does not meet the criteria for classification as PBT or vPvB substance. Contact of ferrosilicon with water may result in formation of toxic gases. Formation of toxic gases in unventilated or wet transporting or storage places may represent a human health hazard due to possible poisoning. Contact of ferrosilicon with

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water, unventilated places or inhalation of dust from ferrosilicon and thereby formation of toxic gases in lungs may represent a hazard to human health.

SECTION 3: Composition / Information on Ingredients

3.1 Substances

Purity degree: $\leq 95,1\%$

Substance name	EC/CAS	Classification according to Regulation (EC) No 1272/2008:			% content
		Hazard Class	Hazard Category	Hazard Statements	
Silicon ¹	231-130-8 / 7440-21-3	-	-	-	~14-49%
Iron ¹	231-096-4 / 7439-89-6	-	-	-	~51-86%

¹ Substance is not classified in terms of Regulation (EC) No. 1272/2008 Annex VI.

*See all the hazard statements in chapter 16.

3.2 Mixtures:

Not applicable

SECTION 4: First Aid Measures

4.1 Description of first aid measures:

General notes: No data available

Following inhalation:

The mechanical irritation caused by dust in the airways: Remove person from the dusty places. Seek medical service if problems persist.

Following skin contact:

Wash the skin with soap and water. Remove contaminated clothing.

Following eye contact:

Remove contact lenses and flush eyes thoroughly with water, taking care to rinse under eyelids. If discomfort continues, seek medical attention. Have safety data sheet available. On manipulation with FeSi is necessary to protect the eyes with conventional dust goggles.

Following ingestion:

Rinse mouth with water. Do not induce vomiting. Seek medical attention. Remove the source to avoid the further ingestion. See inhalation.

4.2 Most important symptoms and effects, both acute and delayed:

Sickness, vomiting, diarrhea, weakness

4.3 Indication of any immediate medical attention and special treatment needed:

No data available

SECTION 5: Firefighting Measures

5.1 Extinguishing media:

Suitable extinguishing media: Dry Ferrosilicon Alloy in the form of granules or lump is not combustible. To extinguish the fire use: dry sand, carbon oxide or dry powder extinguisher. Use appropriate fire protection measures with regard to local circumstances and the environment.

Unsuitable extinguishing media: Do not extinguish with water.

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5.2 Special hazards arising from the substance or mixture:

Flammability REACH test (EC Directive) reported that FeSi is not flammable. Although the flammability test of substance under the directives of the United Nations in contact with water was negative, wet material added to molten or hot ferro-silicon may cause an explosion of hydrogen gases. FESI particles suspended in the air can cause an explosion.

5.3 Advice for firefighters:

In unventilated spaces use breathing apparatus. Use appropriate fire protection measures with regard to local circumstances and the environment.

SECTION 6: Accidental Release Measures

6.1 Personal precautions, protective equipment and emergency procedures:

For non-emergency personnel: Ensure adequate ventilation. Avoid formation of dust. Do not allow unprotected persons to approaching the point. Wear suitable protective equipment (see section 8). Avoid inhalation: make sure the place is adequately ventilated or wear suitable respirator, Wear appropriate personal protective equipment (see section 8). Avoid spillage.

For emergency responders: No data available.

6.2 Environmental precautions:

No data available

6.3 Methods and material for containment and cleaning up:

Keep material dry. Avoid generation of dust. Material in the form of dust should be collected in suitable containers. Damp or wet product must be kept away from dry and must not be collected and stored in closed containers. Ferrosilicon in the form of dust should be vacuumed by using a spark proof vacuuming system, rather than swept up.

6.4 Reference to other sections:

For more information on exposure controls or personal protection, please, see section 8.

SECTION 7: Handling and Storage

7.1 Precautions for safe handling:

Avoid generation of dust. Wear protective clothing, gloves, and goggles. Wear suitable respiratory protection where applicable. Avoid generating sparks or other ignition sources (e.g. welding) in areas with high dust concentrations. Addition of wet material to molten ferrosilicon may cause explosions due to formation of flammable hydrogen gas. Avoid reactions with acids like hydrofluoric acid (HF) and nitric acid (HNO₃) leading that lead to the formation of toxic gases.

7.2 Conditions for safe storage, including any inculpabilities:

Store in a cool, dry location in tightly closed receptacles from producers. Store away from acids and bases. Protect against moisture and water contact. Close the open containers.

7.3 Specific end use (s):

No data available

SECTION 8: Exposure controls/Personal Protection

8.1 Control parameters:

Exposure limits were not established for this product for EU.

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Occupational exposure limit (OEL):

Occupational exposure limit values are not available. However, it is advisable not to exceed the following exposure on the basis of 8 hours:

inhalation dust: 10 mg/m³

breathable dust: 3 mg/m³

Derived-No-Effect-Levels (DNEL) by prolonged exposure: 0,3 mg/m³ inhalations of FeSi dust, has been achieved in maintaining on OEL below the threshold of exposure: 4 mg/m³ inhalations of FeSi dust.

PNEC water: FeSi the low solubility is undetermined

PNEC water: Low probability of exposure to the soil of FeSi production and from currently known use of the material downward in the supply chain. On the soil is no direct use of this indicator. PNEC soil is derived using computational methods and data on the known effects of metal components, that suggesting its value at 680 mg/kg dry weight.

PNEC sediment: Low probability of exposure to FeSi sediment from production and from currently known use of the material downward in the supply chain.

8.2. Appropriate engineering controls:

Regularly measure the occupational exposure limit in the workplace. If the material handling dust is generated, for maintain occupational exposure dust limits in the air extraction use of ventilation or other means.

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Regularly measure the occupational exposure limit in the workplace. If the material handling dust is generated, for maintain occupational exposure dust limits in the air extraction use of ventilation or other means.

Individual protection measures, such as personal protective equipment:

Never drink, smoke at workplace, wash your hands regularly

8.2.2.1 Eye/face protection: Wear appropriate protective eyewear (EN 166).

8.2.2.2 Skin protection:

Hand protection: Use of safety gloves (EN 374) and barrier cream are recommended.

Other: Protective work clothing to be worn.

8.2.2.3 Respiratory protection: Use a respirator FF P2/P3, if OEL exceeded breathing mask with fine dust filter necessary (EN143), code colour white.

8.2.2.4 Thermal hazards: No data available.

Environmental exposure controls:

Concentration below 4 mg/m³ boldness the environment.

SECTION 9: Physical and Chemical Properties

9.1 Information on basic physical and chemical properties:

Appearance:	Grey, solid, material in varying sizes: granules or powder.
Odour:	Odourless, contact with water leads to formation of gases which have an odour of garlic.
Odour threshold:	Not determined
pH:	Not applicable
Melting point/freezing point:	1 220 – 1 400 °C at 101,3 kPa
Initial boiling point and boiling range:	Not applicable (solid with a melting point > 300°C).
Flash point:	Not applicable (substance inorganic and solid not a liquid).
Evaporation rate:	Not applicable (melting point > 300°C).
Flammability	(solid, gas): Non-flammable.
Upper/lower flammability or explosive limits:	Not applicable (no chemical groups with explosive properties present in the molecule).
Vapour pressure:	Not applicable (melting point > 300°C).
Vapour density:	Not determined.

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Relative density:	2.5-7.5 g/cm ³ at 20 °C
Solubility(ies):	OECD T/D screening test: ≤ 0.02 mg Si/l and ≤ 0.04 mg Fe/l at pH 6 (21.5 °C), ≤ 0.09 mg Si/l and ≤ 0.02 mg Fe/l at pH 8 (21.5 °C) OECD 105: ≤ 0.01 mg Si/l at pH 5.8-5.9 (20 °C) ferrosilicon particles, diameter < 1 mm
Partition coefficient:	n-octanol/water: Not applicable (inorganic substance).
Auto-ignition temperature:	> 400 °C, no signs of combustion (EU method A.16)
Decomposition temperature:	Not determined.
Viscosity:	Not applicable (substance solid not liquid at ambient temperature).
Explosive properties:	Non-explosive.
Oxidising properties:	Not determined

9.2 Other information: Formation of gases: in contact with water

SECTION 10: Stability and Reactivity

10.1 Reactivity:

No data available

10.2 Chemical stability:

No data available

10.3 Possibility of hazardous reactions:

Avoid contact with incompatible materials.

10.4 Conditions to avoid:

Under influence of specific temperature, pressure, lighting, or shock, there are no hazardous reactions.

10.5 Incompatible materials:

Avoid contact with water. A contact with water may lead to a formation of toxic gases which can be harmful to human health. Avoid reactions with acids like hydrofluoric acid (HF) and nitric acid (HNO₃) leading that lead to the formation of toxic gases.

10.6 Hazardous decomposition products:

None

SECTION 11: Toxicological Information

11.1 Information on toxicological effects:

a) acute toxicity: Based on available data the classification criteria are not met.

Ferrosilicon is not acutely toxic.

Nonhuman information:

- *Oral*: LD₅₀ > 5,000 mg/kg bw synthetic amorphous silica (OECD 2004b, rat and mouse)
LD₅₀ > 400 – 800 mg/kg bw barium carbonate (WHO (1999), rat)
- *Inhalation*: LC₅₀ (4 h) > 2.08 mg/l air, synthetic amorphous silica (OECD 2004b, rat)
- *Dermal*: LD₅₀ > 2,000 mg/kg bw strontium compounds (WHO (2010), rat)
LD₅₀ > 5,000 mg/kg bw silicon dioxide [REDACTED], [REDACTED] (1978a – d)

b) skin corrosion/irritation: Based on available data the classification criteria are not met.

Nonhuman information:

Ferrosilicon is not irritating to skin (several animals).

Ferrosilicon is unlikely a skin irritant. No classification or further testing is proposed.

c) serious eye damage/irritation: Based on available data the classification criteria are not met.

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Nonhuman information:

Ferrosilicon is not irritating to eye (rabbit).

Ferrosilicon is unlikely an eye irritant. No classification or further testing is proposed. Naturally, like any other dusts, the dusts of ferrosilicon may also cause mechanical irritation of the eye.

d) respiratory or skin sensitisation: Based on available data the classification criteria are not met. No data available. Ferrosilicon is considered not to be a skin or respiratory tract sensitizer.

e) germ cell mutagenicity: Based on available data the classification criteria are not met.

Ferrosilicon is not genotoxic.

Nonhuman information:

Bacterial reverse mutation assay (Ames test, OECD 471): negative

Mammalian cell gene mutation (OECD 476): negative

In vitro mammalian chromosome aberration test (OECD 473): negative

Chromosome aberration assay (OECD 475): negative

Dominant lethal assay (OECD 478): negative

Negative data on amorphous silica in vitro and in vivo, negative in vitro data on calcium silicate. Other main constituents, whose bulk concentration exceeds the classification cut-off limits of 0.1% (cat 1A and B) and 1% (cat 2) and which are dissolved at relevant amounts in artificial biological fluids during one-week incubation (strontium, barium) are not classified as mutagenic, and according to available evidence do not raise concerns for genotoxic effects.

f) carcinogenicity: Based on available data the classification criteria are not met. Ferrosilicon is not carcinogenic. Human epidemiological data from ferrosilicon/silicon manufacturing do not show an increased incidence of cancer attributed to ferrosilicon exposure. Amorphous silica and calcium silicate have not shown carcinogenic responses in animal tests. Also other main constituents, which are dissolved from ferrosilicon in higher amounts than from synthetic amorphous silica particles in artificial biological fluids have not classified as carcinogens.

g) reproductive toxicity: Based on available data the classification criteria are not met. Ferrosilicon is not toxic for reproduction.

Nonhuman information:

Chronic toxicity studies (OECD 452) mouse and rat: negative NOAEC 10 mg/m³ air nominal, rat: no evidence of carcinogenicity

Human epidemiological data from ferrosilicon/silicon manufacturing do not show an increased incidence of cancer attributed to ferrosilicon exposure. Amorphous silica and calcium silicate have not shown carcinogenic responses in animal tests. Also other main constituents, which are dissolved from ferrosilicon in higher amounts than from synthetic amorphous silica particles in artificial biological fluids have not classified as carcinogens.

h) STOT-single exposure: Based on available data the classification criteria are not met.

Nonhuman information:

Ferrosilicon is not irritating to respiratory tract (no study data available). No classification or further testing is proposed. Naturally, like any other dusts, the dusts of ferrosilicon may also cause mechanical irritation of the respiratory tract.

i) STOT-repeated exposure: Based on available data the classification criteria are not met. Ferrosilicon is not toxic via repeated doses.

Toxicity of FeSi via oral route: Studies show that amorphous silicon dioxide does not cause systemic organ toxicity after ingestion; therefore, silicon released from ferrosilicon is unlikely to cause any effects. The release of components from ferrosilicon according to dissolution studies is in comparison to synthetic amorphous silica very limited and is unlikely to affect the repeated dose toxicity of ferrosilicon.

Toxicity of FeSi via dermal route: not enough number of studies.

Toxicity of FeSi via inhalation: Increased incidence of COPD among FeSi/silicon metal workers cannot be attributed to ferrosilicon but rather to general dust exposure. The lung effects of amorphous silicon dioxide are likely to be affected by particle characteristics, such as surface area. These effects were seen at levels of 5 – 9 mg/m³, but were mostly reversible. Amorphous silicon dioxide has a limit value of 4 mg/m³ derived by German

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MAK commission (DFG 1991). However, experimental results of toxicity for amorphous silicon dioxide are likely to overestimate the inhalation hazard of FeSi due to the other characteristics of particles used in these studies when compared with FeSi.

j) aspiration hazard: Based on available data the classification criteria are not met.

Further information: Toxic-kinetics: Poor solubility and low dissolution of metal components in ferrosilicon, hazard assessment of ferrosilicon can be based on toxicity of silicon and silica, taking into account the impact of slightly soluble strontium and barium.

SECTION 12: Ecological Information

12.1 Toxicity:

Does not meet the classification for chronic aquatic toxicity.

12.1.1 Acute/Prolonged Toxicity to Fish

Short-term toxicity: This information is not available. Short-term fish test results (OECD 203/C.1) were needed to fulfil the information requirement. Short-term effects in fish are unlikely at the level of solubility of FeSi grades.

Long-term toxicity: Study is scientifically unjustified due to low solubility of FeSi grades.

12.1.2 Acute/Prolonged Toxicity to Aquatic Invertebrates

Short-term toxicity: High loadings and short test duration often raise problems with physical effects causing behavioural effects and immobility in test species. Short-term, high-load testing is not seen as important or necessary for FeSi alloys. Long-term toxicity: EC50 not known, daphnia magna reproduction test (OECD 211) Ongoing

12.1.3 Acute/Prolonged Toxicity to Aquatic Plants

Growth inhibition study with algae/cyanobacteria technically not feasible due to low solubility of FeSi grades.

12.1.4 Acute/Prolonged Toxicity to Sediment Organisms

This information is not available. For classification and labelling purposes sediment tests are not necessary. Only FeSi powders and lower end size grains may trigger further testing.

12.1.5 Acute/Prolonged Toxicity to Soil Macro-organisms

This information is not available. Based on existing exposure and effects information, it is currently not seen necessary to conduct any targeted ecotoxicological testing of FeSi.

12.1.6 Acute/Prolonged Toxicity to Terrestrial Plants

This information is not available. Based on existing exposure and effects information, it is currently not seen necessary to conduct any targeted ecotoxicological testing of FeSi.

12.1.7 Acute/Prolonged Toxicity to Soil Micro-organisms

Justification for test waiving is based on current information on use of FeSi alloys. Exposure of FeSi alloys directly to soil compartment is expected to be low. If direct or indirect exposure of the substance to soil cannot be ruled out, the results of tests may be necessary.

12.1.8 Acute/Prolonged Toxicity to Aquatic Micro-organisms

Study is scientifically unjustified due to low solubility of FeSi grades.

12.1.9 Acute/Prolonged Toxicity to Birds

This information is not available. The solubility/bioavailability of FeSi is low and based on the already existing exposure and effects information; it is currently not seen necessary to conduct any targeted ecotoxicological testing of FeSi.

12.1.10 General Conclusion

A preliminary PNEC aqua (freshwater) has been derived based on read across information from FeSi constituent metals applying precautionary principles. PNEC will be finalised after the standard long term test results are

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available. Solubility of FeSi in 7 day dissolution test was 0.3 % max (alt pH 7.2 and 1.5) (KTH 2010). Highest solubility's were measured for Si, Fe, Sr and Ba and small amounts of Cu, Zn, Pb.

12.2 Persistence and degradability:

Not relevant for inorganic substances.

12.3 Bioaccumulative potential:

For aquatic bioaccumulation, the study is scientifically unjustified. General intrinsic tendency of soluble silica to bio-concentrate in plants is low. Silicon is not known to be bio concentrated or bio accumulated to soil dwelling organisms at harmful levels. Terrestrial bioaccumulation of Fe and other relevant FeSi metal constituents is regarded low. These elements are known not to bio-magnify in terrestrial food web.

12.4 Mobility in soil:

FeSi in particulate form is immobile in soil and sediment. Adsorption/desorption behaviour of dissolved FeSi constituents is governed mainly by inorganic soil and sediment materials. Each constituent behaves in a characteristic way, depending highly on local environmental conditions. Generally, the adsorption of these constituents in organic materials is weak and therefore less important.

Silicon: Normally Si in the environment is always bound primarily with oxygen as silica/silicic acid. Silicon present in FeSi alloys exists both in Si (0) and Si (IV) oxidation states/forms. The released form is expected to be in the Si(IV) oxidation state. Si(IV) in fresh water or seawater can occur in a number of chemical species, dissolved monomeric Si(OH)₄, dimerized, trimerized, colloidal or in the form of aggregated colloids of different physical size or entirely as insoluble particulate matter. Saturated monomeric concentration range upper limits are ca. 60-140 mg/l (temperature controlled).

Iron: Dissolved iron is present in the environment in two oxidation states Fe (II/III) with Fe(II) easily oxidising to Fe(III). Normally Fe (III) reacts with water (hydrolysis) to form colloidal and insoluble ferric hydroxide Fe(OH)₃ which in typical aquatic environmental conditions slowly precipitates to sediments. Formation of ferric hydroxide at pH levels above 5.0 limits the presence of iron in aqueous systems. Heavy metals and organic matter may be strongly adsorbed to Fe precipitates. Fe (III) forms precipitates with phosphate. Iron ions, especially Fe(II) ions may be also adsorbed to dissolved organic material and some dissolved iron in natural waters may be present as soluble organic-complexes.

12.5 Results of PBT and vPvB assessment:

Substance is not classified as PTB or vPvB substance.

12.6. Other adverse effects:

No other adverse effects are identified.

SECTION 13: Disposal Considerations

13.1 Waste treatment methods:

Dispose of ferrosilicon should be in accordance with local and national regulations. Unused contents should be consumed at the user's side.

SEKTION 14: Angaben zum Transport

14.1 UN-Nummer:

The mixture is not subject to international regulations on transport of dangerous goods.

14.2 UN proper shipping name:

-

14.3 Transport hazard class(es):

-

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14.4 Packing Group: -

14.5 Environmental hazards: -

14.6 Special precautions for user: -

14.7 Transport in bulk according to Annex II of Marpol and the IBC Code: -

SECTION 15: Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture:

On the substance is not subject for authorization under Title VII and not the restrictions under Title VIII of the European Parliament and Council Regulation (EC).1907/2006. There is no knowledge of the inclusion of specific legislation.

15.2 Chemical Safety assessment:

Chemical safety assessment was performed.

SECTION 16: Other Information

Full text of the listed hazard statements:

Not applicable

Instructions for the training:

Product handling instruction shall be included into the educational system about the safety work (initial training, training at the workplace, repeated training) according to specific conditions at the workplace.

Recommended restrictions on use:

Mixture should not be used for any other purpose than for which is appointed (point 1.2). Because of the fact that specific conditions of use of substance are out of supplier's control, it is responsibility of the user to adjust the prescribed warnings to local laws and regulations. Safety information describes the product in terms of safety and it cannot be considered as technical information about product.

Purpose of SDS:

Purpose of this SDS is to provide relevant information for users of product to ensure proper handling and control of risks/ hazards.

Sources of key data used to compile the Safety Data sheet:

SDS was elaborated according to requirements set in Annex II of Regulation (EC) No 1907/2006 of the European Parliament and of the Council. SDS was prepared using data from the: KOVOHUTY Dolný Kubín, s.r.o.

Classification and procedure used to derive the classification for mixtures according to Regulation (EC) 1272/2008 [CLP]:

Substance does not meets the criteria for classification in accordance with Regulation (EC) No. 1272/2008.

Revision changes:

Changes in format of safety data sheet in accordance with Commission Regulation (EU) 2015/830 of 28 May 2015. Additional data in sections 2 + formal adjustments.

Key to abbreviations and acronyms used in the safety data sheet:

COPD: chronic obstructive pulmonary disease

DNEL: derived no-effect level

EC50: median effective concentration

LC50: median lethal concentration

LD50: median lethal dose

NOAEC: no observable adverse effect concentration

NOEC: no observable effect concentration

OEL: occupational exposure limit

PBT: persistent, bioaccumulative, toxic chemical

PNEC: predicted no-effect concentration

T/D test: test on dissolution of substance

vPvB: very persistent, very bioaccumulative chemical