



XCELTHERM® MK1 SOLAR GRADE HEAT TRANSFER FLUID

SAFETY DATA SHEET

Issue Date: 8 August 1993

Revision Date: 16 July 2018

Revision Number: 5.0

SECTION 1. IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1 Product Identifier

Product Name:

XCELTHERM® MK1 Solar Grade Heat Transfer Fluid

ISO 9001:2015 Certification Number:
C2018-00035

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

Liquid or vapor phase to 400°C (750°F)

1.3 Details of the supplier of the safety data sheet

Headquarters and Manufacturing Facility
Radco Industries, Inc.
700 Kingsland Drive
Batavia, IL 60510
CAGE Code 6ZS16

Customer information number: 1-630-232-7966

1.4 Emergency Telephone Number

Advisory Office in case of poisoning: Chemtrec
Chemtrec (North America): 1-800-424-9300

SECTION 2. HAZARDS IDENTIFICATION

Classification of the substance or mixture:

Aquatic toxicity, acute hazards
Aquatic toxicity, chronic hazards
Serious eye irritation
Skin irritation
Specific target organ toxicity – single exposure

Category 1
Category 1
Category 2B
Category 2
Category 3

Classifications of mixture is in accordance with United Nations (UN) Globally Harmonized System of Classification and Labelling of Chemicals (GHS), sixth revised edition (2015), and United States Standard 29 CFR 1910 Occupational Safety and Health Standards.

See SECTION 16 for toxicity category definitions.

2.1 Label elements



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Hazard pictograms:



Exclamation



Environmental Hazard

Signal word:

Warning

Hazard statements

H315:	Causes skin irritation.
H319:	Causes serious eye irritation.
H335:	May cause respiratory irritation.
H410:	Very toxic to aquatic life with long-lasting effects.

Precaution statements

P101:	If medical advice is needed, have product container or label at hand.
P202:	Do not handle until all safety precautions have been read and understood.
P270:	Do not eat, drink or smoke when using this product.
P273:	Avoid release to the environment.
P280:	Wear protective gloves/protective clothing/eye protection/face protection.
P301 + P331 + P315:	IF SWALLOWED: Do NOT induce vomiting. Rinse mouth. Get immediate medical advice/attention.
P303 + P353:	IF ON SKIN (or hair): Rinse skin with water/shower.
P304 + P340 + P342 + P315:	IF INHALED: Remove person to fresh air and keep comfortable for breathing. If experiencing respiratory symptoms, get immediate medical advice/attention.
P305 + P351 + P338 + P310:	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing. Immediately call a POISON CENTER or doctor.
P306 + P363:	IF ON CLOTHING: Wash contaminated clothing before reuse.
P404:	Store in a closed container.
P501:	Dispose of contents/container to in accordance with local/regional/national/international regulation.

2.2 Other hazards

PBT and vPvB

PBT and vPvB assessment is not available as chemical safety assessment has not been conducted.

NFPA Hazard ID

Health: 1
Flammability: 1
Reactivity: 0

HMIS Hazard ID



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Health: 1
Flammability: 1
Reactivity: 0

SECTION 3. Composition/information on ingredients

3.1 Substances

Biphenyl

Index number:
CAS number:
EC number:
REACH number:
Synonyms:

601-042-00-8

92-52-4

202-163-5

Not available

Phenylbenzene, 1,1'-Biphenyl; Diphenyl

Diphenyl oxide

Index number:
CAS number:
EC number:
REACH number:
Synonyms:

Not available

101-84-8

202-981-2

01-2119472545-33

Biphenyl oxide; Diphenyl ether

3.2 Mixtures

Description of mixture:

Binary mixture of synthetic aromatics

Component	CAS Number	EC Number	%Content	Classification of Labeling	M-Factor
Diphenyl oxide	101-84-8	202-981-2	73.0% ± 0.5%	Aquatic Acute 1 - H400 Eye Irrit. 2A - H319	1 --
Biphenyl	92-52-4	202-163-5	27.0% ± 0.5%	Aquatic Acute 1 - H400 Aquatic Chronic 1 - 410 Eye Irrit. 2 - H319 Skin Irrit. 2 - H315 STOT SE 3 - H335	1 1 -- -- --

M-Factor determinations are in accordance with UN GHS, sixth revised edition (2015).

See SECTION 16 for full text of the toxicity categories and H-statements listed in this section.

Indicative occupational exposure limit values

Component	Specific Concentration limits
Biphenyl	See SECTION 8. for specific



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Component	Specific Concentration limits
	concentration limits.
Diphenyl oxide	See SECTION 8 for specific concentration limits.

SECTION 4. FIRST AID MEASURES

4.1 Description of first aid measures

Eye contact

Upon accidental eye exposure, wash the eyes promptly with water for at least 20 minutes. If wearing contact lenses, remove them if safe to do so, and continue washing. Get medical attention immediately.

Ingestion

If swallowed, do not induce vomiting. Rinse mouth out with water. Get medical attention immediately.

Inhalation

If respiratory irritation, dizziness, or nausea occurs, move to fresh air and keep at rest in a comfortable position for breathing. If symptoms persist or unconsciousness occurs, seek immediate medical assistance.

Skin contact

Wash skin thoroughly with mild soap and plenty of water for at least 20 minutes. If irritation develops, seek medical advice.

Note to physicians

Treat symptomatically.

4.2 Most important symptoms and effects, both acute and delayed

Acute symptoms

Eye exposure symptoms

Direct eye exposure may lead to redness and lacrimation (crying tears).

Ingestion symptoms

Small amounts may cause nausea. Large amounts may lead to abdominal obstruction (cramps), constipation or diarrhea.

Inhalation symptoms

May cause irritation of the nose, throat, and lungs.

Skin exposure symptoms

Short-term exposure is not expected to cause irritation.

Delayed symptoms

Eye exposure symptoms

None expected, however seek medical attention if irritation persists.

Ingestion symptoms

None expected, however seek medical attention if abdominal obstruction, constipation or diarrhea persists.

Inhalation symptoms

None expected, however seek medical attention if respiratory irritation persists.

Skin exposure symptoms

Repeated exposure may lead to irritation. If rash develops, seek medical attention.

4.3 Indication of any immediate medical attention and special treatment needed



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Suggestions for clinical testing and medical monitoring for delayed effects are not known. Use first aid when applicable, and seek guidance from a medical physician for specific treatment.

SECTION 5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media includes alcohol-resistant foam, carbon dioxide, dry chemical or water fog.

5.2 Special hazards arising from the substance or mixture

No data is available.

5.3 Advice for firefighters

Fire-Fighting Equipment

Firefighter should wear normal protective equipment (full bunker gear) and positive-pressure contained breathing apparatus. Water can be used to cool fire-exposed containers, to protect personnel and to disperse vapors and spills. Water runoff can cause environmental damage. Dike and collect water used to fight fires.

Special Fire-Fighting Procedures

Use water spray to cool fire-exposed containers and structures. If a rail or tank truck is involved in a fire, isolate for 800 meters (0.5 mile) in all directions. Shut off fuel to fire if it is possible to do so without hazard. If this is impossible, withdraw from the area and let the fire burn out under controlled conditions. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tank due to fire.

SECTION 6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel

Wear personal protective equipment (PPE). Eliminate sources of ignition, if safe to do so. Avoid breathing vapors or mist. Evacuate to designated safe areas.

For emergency responders

If possible, move individual to safe area, and treat symptomatically.

6.2 Environmental precautions

Contain spill, if safe to do so. Prevent from entering sewers or drains.

6.3 Methods and material for containment and cleaning up

Use oil absorbent material to soak up product on the ground. Should this product enter sewers or drains, it should be pumped out into an open vessel. The recovered material should be discarded as hazardous waste.

6.4 Reference to other sections

If appropriate, refer to SECTION 8 and SECTION 13 for additional information.

SECTION 7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Use personal protective equipment (PPE) when handling this product. Smoking, eating and drinking should be prohibited in the application area.

7.2 Conditions for safe storage, including any incompatibilities

Do not store in open or unlabeled containers. Keep container tightly closed in a dry and well-ventilated place.



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7.3 Specific end use(s)

Recommended for PET production, Synthetic Fiber plants and many other applications that require a high temperature heat transfer fluid.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Occupational exposure limits

Component	Form	Exposure Limits
Biphenyl	Vapor	ACGIH (United States, 2001) TWA = 0.2 ppm
	Vapor	TWA = 1 mg/m ³ , 0.2 ppm
	Vapor	OSHA Z-1 (United States, 6/2010) PEL = 1.5 mg/m ³ , 0.2 ppm
Diphenyl oxide		CAL PEL (California, 2/2017)
	Vapor	ACGIH (United States, 2001) TWA = 1 ppm, 7 mg/m ³
	Vapor	STEL = 2 ppm, 14 mg/m ³
	Vapor	ACGIH (United States, 2001) TWA = 1 ppm, 7 mg/m ³
	Vapor	TWA = 1 ppm, 7 mg/m ³
		NIOSH (United States, 4/2016)
		OSHA Z-1 (United States, 6/2010)

Biological exposure limits

None established for any of the disclosed components.

8.2 Exposure controls

Appropriate engineering controls

Practice general industrial hygiene. Do not eat, drink or smoke near product. Wash hands after handling. Remove clothing and wash separate from other laundry.

Personal protective equipment (PPE)

Eye/face protection

Safety glasses, chemical safety goggles and/or face shields are recommended when handling this product.

Skin protection

For extended handling, wear oil resistant gloves such as neoprene. Nitrile gloves may be appropriate for short handling periods use. Contact a government approved or accredited manufacturer for specific recommendations.

Other protections

Wear protective clothing ensuring minimal skin exposure. Protective clothing should be chemically impervious to oils and other solvents.

Respiratory protection

Use with adequate ventilation. Avoid breathing vapor. If heated and ventilation is inadequate, use NIOSH certified respirator, which will protect against organic vapor.

Environmental exposure controls

Do not allow product to reach ground water, water course, or sewage systems. Stop leaks, if safe to do so. Contain spills with absorbent or adsorbent materials.



SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance:	Colorless to straw-colored liquid, or solid below 12°C (54°F)
Odor:	Aromatic
Odor threshold:	1 part per million (ppm)
Auto-ignition temperature:	621°C (1,150°F)
Decomposition temperature:	0.2% mass at 400°C (752°F)
Evaporation Rate:	Not determined
Explosive properties:	Not determined
Flammability (solid, gas):	Non-flammable
Lower flammability limit:	0.8%
Upper flammability limit:	7.0%
Flash point Cleveland Open Cup (ASTM D92):	124°C (255°F)
Flash point Pensky-Martens (ASTM D93):	110°C (230°F)
Normal boiling point:	257°C (495°F)
Melting point/freezing point:	12°C (54°F)
Oxidizing properties:	Not determined
Partition coefficient (n-octanol/water), Log P _{ow} :	Not determined
pH:	Not applicable
Relative density (ASTM D1298) 15.6°C/15.6°C (60°F/60°F):	1.06
Solubility in water:	Insoluble
Vapor density:	Not determined
Vapor pressure:	0.08 mmHg at 20°C (68°F)
Viscosity (ASTM D445):	2.48 mm ² /s (cSt) at 40°C (104°F) 0.99 mm ² /s (cSt) at 100°C (212°F)

9.2 Other information

No further information is available.

SECTION 10. STABILITY AND REACTIVITY

10.1 Reactivity

Non-reactive in its original state.

10.2 Chemical stability

Stable in its original state.

10.3 Possibility of hazardous reactions

Does not occur.

10.4 Conditions to avoid

Oxidizing materials

10.5 Incompatible materials

Keep away from strong oxidizing or reducing agents.

10.6 Hazardous decomposition products

Decomposition of this product under fire conditions may produce carbon oxides, phenols, and other decomposition products.

SECTION 11. TOXICOLOGICAL INFORMATION



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11.1 Information on toxicological effects

Acute toxicity	Method	Species	Result
Biphenyl	Dermal	Rabbit	LD ₅₀ > 5000 mg/kg
	Inhalation	--	No data available
	Oral	Rat	LD ₅₀ > 2000 mg/kg body-weight
Diphenyl oxide	Dermal	Rabbit	LD ₅₀ > 7940 mg/kg
	Inhalation	--	No data available
	Oral	Rat	LD ₅₀ = 2830 mg/kg body-weight

Aspiration hazard	Result
Biphenyl	No data available
Diphenyl oxide	No data available

Carcinogenicity	Result
Biphenyl	Not a known carcinogen by IARC, NTP or OSHA
Diphenyl oxide	Not a known carcinogen by IARC, NTP or OSHA

Eye damage / irritation	Test Method	Species	Results
Biphenyl	--	--	No data available
Diphenyl oxide	Read across	Rabbit	Moderately irritating

Germ cell mutagenicity	Test Method	Species	Results
Biphenyl	Ames Assay	<i>S. typhimurium</i>	Not mutagenic
Diphenyl oxide	Ames Assay	<i>S. typhimurium</i>	Not mutagenic

Reproductive toxicity	Test Method	Species	Results
Biphenyl	OECD 414	Rat	Not toxic to reproduction
Diphenyl oxide	OECD 414	Rat	Not toxic to reproduction

Respiratory sensitization	Results
Biphenyl	No data available
Diphenyl oxide	No data available

Skin sensitization	Test Method	Species	Results
Biphenyl	OECD 406	Guinea pig	Not sensitizing
Diphenyl oxide	Read across	Human	Not sensitizing

Skin corrosion/irritation	Test Method	Species	Results
Biphenyl	Draize Test	Rabbit	Irritating
Diphenyl oxide	Read across	Rabbit	Not irritating



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Specific target organ toxicity - repeated exposure (STOT-RE)	Route	Results
Biphenyl	Read across	Eyes, respiratory system, liver, central nervous system
Diphenyl oxide	Dermal Inhalation Oral	NOEL = 100 mg/kg/day NOEL = 4.9 ppm after 7 hours NOEL = 318 mg/kg/day

Specific target organ toxicity - single exposure (STOT-SE)

No data available

11.2 Other information

See SECTION 16 for toxicity references.

SECTION 12. ECOLOGICAL INFORMATION

12.1 Toxicity

Aquatic Toxicity	Test Method	Species	Results
Biphenyl	OECD 203 Read Across	<i>P. promelas</i> <i>D. magna</i>	LC ₅₀ = 3 mg/L after 96 hours EC50 = 0.36 mg/L after 48 hours
Diphenyl oxide	OECD 201 OECD 202 Read across	<i>P. subcapitata</i> <i>D. magna</i> <i>O. mykiss</i>	NOEC = 0.32 mg/L after 72 hours LC ₅₀ = 1.7 mg/L after 48 hours LC ₅₀ = 4.2 mg/L after 96 hours

Terrestrial Toxicity	Results.
Biphenyl	No data available
Diphenyl oxide	No data available

12.2 Persistence and degradability

Biodegradation	Test Method	Results
Biphenyl	OECD 301C	84% after 14 days, readily biodegradable
Diphenyl oxide	OECD 301D	64% BOD after 5 days, readily biodegradable

12.3 Bioaccumulative potential

Bioconcentration Factor (BCF)	Results
Biphenyl	BCF = 281
Partition Coefficient n-octanol / water (Log K _{ow})	Results
Biphenyl	No data available
Diphenyl oxide	No data available

12.4 Mobility

in soil

Soil Mobility	Results
Biphenyl	No data available
Diphenyl oxide	LogKoc = 3.3

12.5

Results of PBT and vPvB assessment

Chemical	Results
Biphenyl	PBT and vPvB assessment not available
Diphenyl oxide	This substance is not PBT / vPvB.



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12.6 Other adverse effects

No further information is available

SECTION 13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

This is listed as a hazardous waste in Federal regulations.

SECTION 14. TRANSPORTATION INFORMATION

Canada Transport - Transportation of Dangerous Goods (TDG)

UN Number:

UN Proper shipping name:

Transport hazard class:

Packing group:

UN3082

ENVIRONMENTALLY HAZARDOUS LIQUID, SOLID, N.O.S. (BIPHENYL AND DIPHENYL OXIDE MIXTURE)

9

III

International Carriage of Dangerous Goods by Inland Waterways (AND)

UN Number:

UN Proper shipping name:

Transport hazard class:

Packing group:

UN3082

ENVIRONMENTALLY HAZARDOUS LIQUID, N.O.S. (BIPHENYL AND DIPHENYL OXIDE MIXTURE)

9

III

International Carriage of Dangerous Goods by Rail (RID)

UN Number:

UN Proper shipping name:

Transport hazard class:

Packing group:

UN3082

ENVIRONMENTALLY HAZARDOUS LIQUID, N.O.S. (BIPHENYL AND DIPHENYL OXIDE MIXTURE)

9

III

International Carriage of Dangerous Goods by Road (ADR)

UN Number:

UN Proper shipping name:

Transport hazard class:

Packing group:

UN3082

ENVIRONMENTALLY HAZARDOUS LIQUID, N.O.S. (BIPHENYL AND DIPHENYL OXIDE MIXTURE)

9

III

International Civil Aviation Organization (ICAO)

Not regulated

International Maritime Dangerous Goods Code (IMDG Code)

UN Number:

UN Proper shipping name:

Transport hazard class:

Packing group:

MARPOL73/78 and IBC Code:

Emergency schedules (EmS):

Special provisions:

UN3082



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ENVIRONMENTALLY HAZARDOUS LIQUID, N.O.S. (BIPHENYL AND DIPHENYL OXIDE MIXTURE)

9
III
P
F-A, S-F
274; 335; 969

United States Department of Transportation (DOT)

UN Number:
UN Proper shipping name:
Transport hazard class:
Packing group:
Reportable spill quantity:

UN3082

ENVIRONMENTALLY HAZARDOUS LIQUID, N.O.S. (BIPHENYL AND DIPHENYL OXIDE MIXTURE)

9
III
100 pounds of biphenyl or 370 pounds of XCELTHERM® MK-1 Solar Grade

SECTION 15. REGULATORY INFORMATION

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

Australia Inventory (AICS)

All the ingredients are listed.

California Proposition 65

This product does not contain any chemicals known to the State of California to cause cancer and/or to cause birth defects or other reproductive harm.

Canadian Domestic Substances List/Non-Domestic Substances List (DSL/NDSL)

All the ingredients are listed.

China Inventory of Existing Chemical Substances (IECSC)

All the ingredients are listed.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Reportable Quantity

The reportable spill quantity for biphenyl is 100 pounds (45.36 kg), or 370 pounds (167.83 kg) of XCELTHERM® MK-1 Solar Grade.

International Agency for Research on Cancer (IARC)

None of the ingredients are listed.

Japan Existing and New Chemical Substances (ENCS)

All the ingredients are listed.

Korean Existing and Evaluated Chemical Substances (KECL)

All the ingredients are listed.

Pennsylvania (Worker and Community Right-To-Know Act): Pennsylvania Hazardous Substances List and/or Pennsylvania Environmental Hazardous Substance List

This product contains 27.0% biphenyl, and it is cited in the Pennsylvania Hazardous Substance List and/or the Pennsylvania Environmental Substance List.

Philippines Inventory of Chemicals and Chemical Substances (PICCS)

All the ingredients are listed.

SARA Title III Section 302 Extremely Hazardous Substances (40 CFR Part 355)



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This product is not regulated under Section 302 of SARA and 40 CFR Part 355.

SARA Title III Section 313 (40 CFR Part 372)

This product contains 27.0% biphenyl, and is subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 that is listed in 40 CFR 372.

SARA Title III Sections 311/312 Hazardous Categorization (40 CFR Part 370)

Hazardous categories for this product are:

Acute =	Chronic =	Fire =	Pressure =	Reactive =
Yes	No	No	No	No

United States Toxic Substances Control Act (TSCA)

All the ingredients are listed.

15.2 Chemical safety assessment

A Chemical Safety Assessment has not been conducted.

SECTION 16. OTHER INFORMATION

Safety Data Sheet Creation Date:

8 August 1993

Safety Data Sheet Revision Date:

16 July 2018

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THIS INFORMATION RELATES TO THE SPECIFIC MATERIAL DESIGNATED AND MAY NOT BE VALID FOR SUCH MATERIAL USED IN COMBINATION WITH ANY OTHER MATERIALS OR IN ANY PROCESS. SUCH INFORMATION STATED IS TO THE BEST OF RADCO'S KNOWLEDGE AND BELIEF, ACCURATE AND RELIABLE AS OF THE DATE COMPILED. HOWEVER, NO REPRESENTATION, WARRANTY OR GUARANTEE IS MADE TO ITS ACCURACY, RELIABILITY, OR COMPLETENESS, AND RADCO DOES NOT ACCEPT LIABILITY FOR ANY LOSS OR DAMAGE THAT MAY OCCUR FROM THE USE OF THIS INFORMATION. FINAL DETERMINATION OF SUITABILITY OF ANY MATERIAL IS THE SOLE RESPONSIBILITY OF THE USER. ALL MATERIAL SHOULD BE USED WITH CAUTION TO GUARD AGAINST UNKNOWN HAZARDS. ALTHOUGH CERTAIN HAZARDS ARE DESCRIBED HEREIN, RADCO DOES NOT GUARANTEE THAT THESE ARE THE ONLY HAZARDS THAT EXIST.

XCELTHERM® is a registered trademark of Radco Industries, Inc.

Toxicological References

"Biphenyl." *National Center for Biotechnology Information. PubChem Compound Database*. U.S. National Library of Medicine. Web. 22 May 2017.

"Diphenyl." *The National Institute for Occupational Safety and Health (NIOSH)*. Centers for Disease Control and Prevention, 11 Apr. 2016. Web. 22 May 2017.

"Diphenyl Ether." *Registration Dossier*. European Chemicals Agency, 12 Apr. 2017. Web. 22 May 2017.

Definitions

ACGIH

American Conference of Governmental Industrial Hygienists

H315

Causes skin irritation

H319

Causes serious eye irritation

H400

Very toxic to aquatic life

H410

Very toxic to aquatic life with long-lasting effects

HMIS

Hazardous Materials Identification System

LC₅₀

Lethal concentration that causes 50% death in test population.



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LD₅₀

Lethal dose that causes 50% death in test population.

NFPA

National Fire Protection Association

NIOSH

National Institute for Occupational Safety and Health

OECD

Organisation for Economic Co-operation and Development

OECD 201

OECD Guideline 201: Freshwater Alga and Cyanobacteria, Growth Inhibition Test

OECD 202

OECD Guideline 202: Daphnia sp. Acute Immobilisation Test

OECD 203

OECD Guideline 203: Fish, Acute Toxicity Test

OECD 301B

OECD Guideline 301B: Ready Biodegradability CO₂ Evolution (Modified Sturm Test)

OECD 301C

OECD Guideline 301C: Ready Biodegradability MITI (Ministry of International Trade and Industry, Japan)

OECD 301D

OECD Guideline 301D: Ready Biodegradability Closed Bottle

OECD 406

OECD Guideline 406: Skin Sensitization Test

OECD 414

OECD Guideline 414: Prenatal Development Toxicity Study

OSHA

United States Department of Labor Occupational Safety and Health Administration

PBT

Persistence Bioaccumulation and Toxicity

PEL

Permissible exposure limit

ppm

Parts per million

TWA

Time-weighted average

vPvB

Very persistent and very bioaccumulative