SAFETY DATA SHEET

DOW CHEMICAL COMPANY LIMITED

Safety Data Sheet according to Reg. (EU) No 2015/830

Product name: DOWCAL™ pGEO Geothermal Fluid

Revision Date: 08.06.2015
Version: 4.0
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DOW CHEMICAL COMPANY LIMITED encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

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

1.1 Product identifier
Product name: DOWCAL™ pGEO Geothermal Fluid

1.2 Relevant identified uses of the substance or mixture and uses advised against
Identified uses: Intended as a heat transfer fluid for closed-loop systems. We recommend that you use this product in a manner consistent with the listed use. If your intended use is not consistent with the stated use, please contact your sales or technical service representative.

1.3 Details of the supplier of the safety data sheet
COMPANY IDENTIFICATION
DOW CHEMICAL COMPANY LIMITED
DIAMOND HOUSE, LOTUS PARK,
KINGSBURY CRESCENT,
STAINES
England
TW18 3AG
UNITED KINGDOM

Customer Information Number: +44 (0) 203 139 4000
SDSQuestion@dow.com

1.4 EMERGENCY TELEPHONE NUMBER
24-Hour Emergency Contact: 0031 115 694 982
Local Emergency Contact: 00 31 115 69 4982

SECTION 2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008:
Not a hazardous substance or mixture according to Regulation (EC) No. 1272/2008.

2.2 Label elements

Labelling according to Regulation (EC) No 1272/2008:
Not a hazardous substance or mixture according to Regulation (EC) No. 1272/2008.

Supplemental information
EUH210 Safety data sheet available on request.

2.3 Other hazards
no data available

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

This product is a mixture.

CASRN / EC-No. / Index-No.	REACH Registration Number	Concentration	Component	Classification: REGULATION (EC) No 1272/2008
CASRN 57-55-6 **EC-No.** 200-338-0 **Index-No.** –	01-2119456809-23	>= 25.0 - <= 96.0 %	Propylene glycol	Not classified
CASRN 7732-18-5 **EC-No.** 231-791-2 **Index-No.** –	–	<= 75.0 %	Water	Not classified
CASRN 532-32-1 **EC-No.** 208-534-8 **Index-No.** –	01-2119460683-35	< 3.5 %	Sodium benzoate	Eye Irrit. - 2 - H319
CASRN 12045-78-2 **EC-No.** 601-707-2 **Index-No.** –	–	< 2.0 %	BORON POTASSIUM OXIDE (B4K2O7), TETRAHYDRATE	Not classified

If present in this product, any not classified components disclosed above for which no country specific OEL value(s) is(are) indicated under Section 8, are being disclosed as voluntarily disclosed components.
For the full text of the H-Statements mentioned in this Section, see Section 16.

SECTION 4. FIRST AID MEASURES

4.1 Description of first aid measures
General advice: If potential for exposure exists refer to Section 8 for specific personal protective equipment.

Inhalation: Move person to fresh air; if effects occur, consult a physician.

Skin contact: Wash off with plenty of water.

Eye contact: Flush eyes thoroughly with water for several minutes. Remove contact lenses after the initial 1-2 minutes and continue flushing for several additional minutes. If effects occur, consult a physician, preferably an ophthalmologist.

Ingestion: No emergency medical treatment necessary.

4.2 Most important symptoms and effects, both acute and delayed: Aside from the information found under Description of first aid measures (above) and Indication of immediate medical attention and special treatment needed (below), any additional important symptoms and effects are described in Section 11: Toxicology Information.

4.3 Indication of any immediate medical attention and special treatment needed
Notes to physician: No specific antidote. Treatment of exposure should be directed at the control of symptoms and the clinical condition of the patient.

SECTION 5. FIREFIGHTING MEASURES

5.1 Extinguishing media
Suitable extinguishing media: Water fog or fine spray. Dry chemical fire extinguishers. Carbon dioxide fire extinguishers. Foam. Alcohol resistant foams (ATC type) are preferred. General purpose synthetic foams (including AFFF) or protein foams may function, but will be less effective.

Unsuitable extinguishing media: Do not use direct water stream. May spread fire.

5.2 Special hazards arising from the substance or mixture
Hazardous combustion products: During a fire, smoke may contain the original material in addition to combustion products of varying composition which may be toxic and/or irritating. Combustion products may include and are not limited to: Carbon monoxide. Carbon dioxide.

Unusual Fire and Explosion Hazards: Container may rupture from gas generation in a fire situation. Violent steam generation or eruption may occur upon application of direct water stream to hot liquids.

5.3 Advice for firefighters

Fire Fighting Procedures: Keep people away. Isolate fire and deny unnecessary entry. Use water spray to cool fire exposed containers and fire affected zone until fire is out and danger of reignition has passed. Fight fire from protected location or safe distance. Consider the use of unmanned hose holders or monitor nozzles. Immediately withdraw all personnel from the area in case of rising sound from venting safety device or discoloration of the container. Burning liquids may be extinguished by dilution with water. Do not use direct water stream. May spread fire. Move container from fire area if this is possible without hazard. Burning liquids may be moved by flushing with water to protect personnel and minimize property damage.

Special protective equipment for firefighters: Wear positive-pressure self-contained breathing apparatus (SCBA) and protective fire fighting clothing (includes fire fighting helmet, coat, trousers, boots, and gloves). If protective equipment is not available or not used, fight fire from a protected location or safe distance.

SECTION 6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures: Refer to section 7, Handling, for additional precautionary measures. Use appropriate safety equipment. For additional information, refer to Section 8, Exposure Controls and Personal Protection.

6.2 Environmental precautions: Prevent from entering into soil, ditches, sewers, waterways and/or groundwater. See Section 12, Ecological Information.

6.3 Methods and materials for containment and cleaning up: Contain spilled material if possible. Small spills: Absorb with materials such as: Cat litter. Sawdust. Vermiculite. Zorb-all®. Collect in suitable and properly labeled containers. Large spills: Dike area to contain spill. See Section 13, Disposal Considerations, for additional information.

6.4 Reference to other sections: References to other sections, if applicable, have been provided in the previous sub-sections.

SECTION 7. HANDLING AND STORAGE

7.1 Precautions for safe handling: Wash thoroughly after handling. Keep container closed. Use with adequate ventilation. Spills of these organic materials on hot fibrous insulations may lead to lowering of the autoignition temperatures possibly resulting in spontaneous combustion. See Section 8, EXPOSURE CONTROLS AND PERSONAL PROTECTION.

7.2 Conditions for safe storage, including any incompatibilities: Do not store in: Opened or unlabeled containers. Store in a dry place. Avoid moisture. Store away from direct sunlight. Store in tightly closed container. Use only with adequate ventilation. See Section 10 for more specific information. Additional storage and handling information on this product may be obtained by calling your sales or customer service contact.

Storage stability
Shelf life: Use within 24 Month

7.3 Specific end use(s): See the technical data sheet on this product for further information.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Exposure limits are listed below, if they exist.

Component	Regulation	Type of listing	Value/Notation
Propylene glycol	US WEEL	TWA	10 mg/m3
	GB EH40	TWA	474 mg/m3 150 ppm
	GB EH40	TWA	10 mg/m3

8.2 Exposure controls

Engineering controls: Use local exhaust ventilation, or other engineering controls to maintain airborne levels below exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, general ventilation should be sufficient for most operations. Local exhaust ventilation may be necessary for some operations.

Individual protection measures

Eye/face protection: Use safety glasses (with side shields). Safety glasses (with side shields) should be consistent with EN 166 or equivalent. If there is a potential for exposure to particles which could cause eye discomfort, wear chemical goggles. Chemical goggles should be consistent with EN 166 or equivalent.

Skin protection

Hand protection: Use gloves chemically resistant to this material when prolonged or frequently repeated contact could occur. Use chemical resistant gloves classified under Standard EN374: Protective gloves against chemicals and micro-organisms. Examples of preferred glove barrier materials include: Butyl rubber. Natural rubber ("latex"). Neoprene. Nitrile/butadiene rubber ("nitrile" or "NBR"). Polyethylene. Ethyl vinyl alcohol laminate ("EVAL"). Polyvinyl chloride ("PVC" or "vinyl"). Polyvinyl alcohol ("PVA"). When prolonged or frequently repeated contact may occur, a glove with a protection class of 4 or higher (breakthrough time greater than 120 minutes according to EN 374) is recommended. When only brief contact is expected, a glove with a protection class of 1 or higher (breakthrough time greater than 10 minutes according to EN 374) is recommended. NOTICE: The selection of a specific glove for a particular application and duration of use in a workplace should also take into account all relevant workplace factors such as, but not limited to: Other chemicals which may be handled, physical requirements (cut/puncture protection, dexterity, thermal protection), potential body reactions to glove materials, as well as the instructions/specifications provided by the glove supplier.

Other protection: Wear clean, body-covering clothing.

Respiratory protection: Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, wear respiratory protection when adverse effects, such as respiratory irritation or discomfort have been experienced, or where indicated by your risk assessment process. In misty atmospheres, use an approved particulate respirator. Use the following CE approved air-purifying respirator: Organic vapor cartridge with a particulate pre-filter, type AP2.

Environmental exposure controls

See SECTION 7: Handling and storage and SECTION 13: Disposal considerations for measures to prevent excessive environmental exposure during use and waste disposal.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	
Physical state	Liquid.
Color	Color is variable
Odor	Characteristic
Odor Threshold	No test data available
pH	7.2 - 8.2 50% *Literature*
Melting point/range	Not applicable to liquids
Freezing point	-51 - -12 °C *Literature*
Boiling point (760 mmHg)	170 °C *Literature*
Flash point	**closed cup** 101 °C at 760 mmHg *Literature*
Evaporation Rate (Butyl Acetate = 1)	<0.5 *Estimated.*
Flammability (solid, gas)	Not applicable to liquids
Lower explosion limit	2.6 % vol *Literature* (based on major component)
Upper explosion limit	12.5 % vol *Literature* (based on major component)
Vapor Pressure	3 mbar *Literature*
Relative Vapor Density (air = 1)	>1.0 *Literature*
Relative Density (water = 1)	1.045 - 1.055 at 20 °C / 20 °C *Literature*
Water solubility	Miscible in all proportions
Partition coefficient: n-octanol/water	no data available
Auto-ignition temperature	420 °C *Literature* Propylene glycol.
Decomposition temperature	No test data available
Kinematic Viscosity	50 - 75 mm2/s at 20 °C *Literature*
Explosive properties	no data available
Oxidizing properties	no data available

9.2 Other information

Molecular weight	No test data available

NOTE: The physical data presented above are typical values and should not be construed as a specification.

SECTION 10. STABILITY AND REACTIVITY

10.1 Reactivity: no data available

10.2 Chemical stability: Stable under recommended storage conditions. See Storage, Section 7. Hygroscopic

10.3 Possibility of hazardous reactions: Polymerization will not occur.

10.4 Conditions to avoid: Exposure to elevated temperatures can cause product to decompose. Generation of gas during decomposition can cause pressure in closed systems. Avoid direct sunlight or ultraviolet sources.

10.5 Incompatible materials: Avoid contact with: Strong acids. Strong bases. Strong oxidizers.

10.6 Hazardous decomposition products: Decomposition products depend upon temperature, air supply and the presence of other materials. Decomposition products can include and are not limited to: Aldehydes. Alcohols. Ethers. Organic acids.

SECTION 11. TOXICOLOGICAL INFORMATION

Toxicological information appears in this section when such data is available.

11.1 Information on toxicological effects
Acute toxicity

Acute oral toxicity
Very low toxicity if swallowed. Harmful effects not anticipated from swallowing small amounts.

As product: Single dose oral LD50 has not been determined.

For the major component(s):
LD50, Rat, > 20,000 mg/kg

Acute dermal toxicity
Prolonged skin contact is unlikely to result in absorption of harmful amounts.

As product: The dermal LD50 has not been determined.

For the major component(s):
LD50, Rabbit, > 20,000 mg/kg

Acute inhalation toxicity
Vapors are primarily water; single exposure is not likely to be hazardous. Mist may cause irritation of upper respiratory tract (nose and throat).

As product: The LC50 has not been determined.

For the major component(s):
LC50, Rat, 4 Hour, vapour, 6.15 mg/l No deaths occurred following exposure to a saturated atmosphere.

Skin corrosion/irritation
Prolonged contact is essentially nonirritating to skin.
Repeated contact may cause flaking and softening of skin.

Serious eye damage/eye irritation
May cause slight temporary eye irritation.
Corneal injury is unlikely.
Mist may cause eye irritation.

Sensitization
For the major component(s):
Did not cause allergic skin reactions when tested in humans.

For respiratory sensitization:
No relevant data found.

Specific Target Organ Systemic Toxicity (Single Exposure)
Evaluation of available data suggests that this material is not an STOT-SE toxicant.

Specific Target Organ Systemic Toxicity (Repeated Exposure)
In rare cases, repeated excessive exposure to propylene glycol may cause central nervous system effects.
For the minor component(s):
In animals, effects have been reported on the following organs:
Liver.
Blood
Testes

Carcinogenicity
For the major component(s): Did not cause cancer in laboratory animals.

Teratogenicity
For the major component(s): Did not cause birth defects or any other fetal effects in laboratory animals. In laboratory animals, boron compounds have caused birth defects only at doses toxic to the mother and have been toxic to the fetus at doses nontoxic to the mother.

Reproductive toxicity
For the major component(s): In animal studies, did not interfere with reproduction. In animal studies, did not interfere with fertility. In animal studies, boron compounds have been shown to interfere with fertility in males, and to a lesser degree in females.

Mutagenicity
For the major component(s): In vitro genetic toxicity studies were negative. Animal genetic toxicity studies were negative.

Aspiration Hazard
Based on physical properties, not likely to be an aspiration hazard.

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicological information appears in this section when such data is available.

12.1 Toxicity

Propylene glycol

Acute toxicity to fish
Material is not classified as dangerous to aquatic organisms (LC50/EC50/IC50/LL50/EL50 greater than 100 mg/L in most sensitive species).

LC50, Oncorhynchus mykiss (rainbow trout), static test, 96 Hour, 40,613 mg/l, OECD Test Guideline 203

Acute toxicity to aquatic invertebrates
LC50, Ceriodaphnia dubia (water flea), static test, 48 Hour, 18,340 mg/l, OECD Test Guideline 202

Acute toxicity to algae/aquatic plants
ErC50, Pseudokirchneriella subcapitata (green algae), 96 Hour, Growth rate inhibition, 19,000 mg/l, OECD Test Guideline 201

Toxicity to bacteria
NOEC, Pseudomonas putida, 18 Hour, > 20,000 mg/l

Chronic toxicity to aquatic invertebrates
NOEC, Ceriodaphnia dubia (water flea), semi-static test, 7 d, number of offspring, 13,020 mg/l

Sodium benzoate

Acute toxicity to fish
Material is not classified as dangerous to aquatic organisms (LC50/EC50/IC50/LL50/EL50 greater than 100 mg/L in most sensitive species).
LC50, Pimephales promelas (fathead minnow), static test, 96 Hour, > 100 mg/l

Acute toxicity to aquatic invertebrates
EC50, Daphnia magna (Water flea), static test, 96 Hour, > 100 mg/l

Acute toxicity to algae/aquatic plants
ErC50, Pseudokirchneriella subcapitata (green algae), static test, 72 Hour, > 100 mg/l

BORON POTASSIUM OXIDE (B4K2O7), TETRAHYDRATE

Acute toxicity to fish
For this family of materials:
Material is harmful to aquatic organisms (LC50/EC50/IC50 between 10 and 100 mg/L in the most sensitive species).
For this family of materials:
LC50, dab (Limanda limanda), flow-through, 96 Hour, 74 mg/l

Acute toxicity to aquatic invertebrates
For this family of materials:
LC50, Daphnia magna (Water flea), static test, 48 Hour, 173 mg/l, OECD Test Guideline 202 or Equivalent

12.2 Persistence and degradability

Propylene glycol

Biodegradability: Material is readily biodegradable. Passes OECD test(s) for ready biodegradability. Biodegradation may occur under anaerobic conditions (in the absence of oxygen).
10-day Window: Pass
Biodegradation: 81 %
Exposure time: 28 d
Method: OECD Test Guideline 301F or Equivalent
10-day Window: Not applicable

Biodegradation: 96 %
Exposure time: 64 d
Method: OECD Test Guideline 306 or Equivalent

Sodium benzoate

Biodegradability: Material is readily biodegradable. Passes OECD test(s) for ready biodegradability.
10-day Window: Pass
Biodegradation: > 74 %
Exposure time: 28 d
Method: OECD Test Guideline 301B or Equivalent

BORON POTASSIUM OXIDE (B4K2O7), TETRAHYDRATE

Biodegradability: Biodegradation is not applicable.

12.3 Bioaccumulative potential

Propylene glycol

Bioaccumulation: Bioconcentration potential is low (BCF < 100 or Log Pow < 3).
Partition coefficient: n-octanol/water(log Pow): -1.07 Measured
Bioconcentration factor (BCF): 0.09 Estimated.

Sodium benzoate

Bioaccumulation: Bioconcentration potential is low (BCF < 100 or Log Pow < 3).
Partition coefficient: n-octanol/water(log Pow): -2.27 Estimated.

BORON POTASSIUM OXIDE (B4K2O7), TETRAHYDRATE

Bioaccumulation: No relevant data found.

12.4 Mobility in soil

Propylene glycol

Given its very low Henry's constant, volatilization from natural bodies of water or moist soil is not expected to be an important fate process.
Potential for mobility in soil is very high (Koc between 0 and 50).
Partition coefficient(Koc): < 1 Estimated.

Sodium benzoate

No relevant data found.

BORON POTASSIUM OXIDE (B4K2O7), TETRAHYDRATE

No relevant data found.

12.5 Results of PBT and vPvB assessment

Propylene glycol

This substance is not considered to be persistent, bioaccumulating and toxic (PBT). This substance is not considered to be very persistent and very bioaccumulating (vPvB).

Sodium benzoate

This substance has not been assessed for persistence, bioaccumulation and toxicity (PBT).

BORON POTASSIUM OXIDE (B4K2O7), TETRAHYDRATE

This substance has not been assessed for persistence, bioaccumulation and toxicity (PBT).

12.6 Other adverse effects

Propylene glycol

This substance is not in Annex I of Regulation (EC) No 1005/2009 on substances that deplete the ozone layer.

Sodium benzoate

This substance is not in Annex I of Regulation (EC) No 1005/2009 on substances that deplete the ozone layer.

BORON POTASSIUM OXIDE (B4K2O7), TETRAHYDRATE

This substance is not in Annex I of Regulation (EC) No 1005/2009 on substances that deplete the ozone layer.

SECTION 13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

This product, when being disposed of in its unused and uncontaminated state should be treated as a hazardous waste according to EC Directive 2008/98/EC. Any disposal practices must be in compliance with all national and provincial laws and any municipal or local by-laws governing hazardous waste. For used, contaminated and residual materials additional evaluations may be required. Do not dump into any sewers, on the ground, or into any body of water.

The definitive assignment of this material to the appropriate EWC group and thus its proper EWC code will depend on the use that is made of this material. Contact the authorized waste disposal services.

SECTION 14. TRANSPORT INFORMATION

Classification for ROAD and Rail transport (ADR/RID):

14.1	**UN number**	Not applicable
14.2	**Proper shipping name**	Not regulated for transport
14.3	**Class**	Not applicable
14.4	**Packing group**	Not applicable
14.5	**Environmental hazards**	Not considered environmentally hazardous based on available data.
14.6	**Special precautions for user**	No data available.

Classification for SEA transport (IMO-IMDG):

14.1	**UN number**	Not applicable
14.2	**Proper shipping name**	Not regulated for transport
14.3	**Class**	Not applicable
14.4	**Packing group**	Not applicable
14.5	**Environmental hazards**	Not considered as marine pollutant based on available data.

14.6	**Special precautions for user**	No data available.
14.7	**Transport in bulk according to Annex I or II of MARPOL 73/78 and the IBC or IGC Code**	Consult IMO regulations before transporting ocean bulk

Classification for AIR transport (IATA/ICAO):

14.1	**UN number**	Not applicable
14.2	**Proper shipping name**	Not regulated for transport
14.3	**Class**	Not applicable
14.4	**Packing group**	Not applicable
14.5	**Environmental hazards**	Not applicable
14.6	**Special precautions for user**	No data available.

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Transportation classifications may vary by container volume and may be influenced by regional or country variations in regulations. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

SECTION 15. REGULATORY INFORMATION

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

REACh Regulation (EC) No 1907/2006
This product contains only components that have been either pre-registered , are exempt from registration or are not subject to registration according to Regulation (EC) No. 1907/2006 (REACH)., The aforementioned indications of the REACH registration status are provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. It is the buyer´s/user´s responsibility to ensure that his/her understanding of the regulatory status of this product is correct.

Seveso II - Directive 96/82/EC and its amendments:
Listed in Regulation: Directive 96/82/EC does not apply

15.2 Chemical Safety Assessment
Not applicable

SECTION 16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.
H319 Causes serious eye irritation.

Classification and procedure used to derive the classification for mixtures according to Regulation (EC) No 1272/2008
This product is not classified as dangerous according to EC criteria.

Revision
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Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Legend

GB EH40	UK. EH40 WEL - Workplace Exposure Limits
TWA	Long-term exposure limit (8-hour TWA reference period)
US WEEL	USA. Workplace Environmental Exposure Levels (WEEL)

Information Source and References
This SDS is prepared by Product Regulatory Services and Hazard Communications Groups from information supplied by internal references within our company.

DOW CHEMICAL COMPANY LIMITED urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer's/user's responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer's/user's duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.