

Safety Data Sheet

Prepared in accordance with Commission Regulation (EU) 2020/878



Performance Through Carbon Chemistry

Date of the latest revision: July 20th, 2023

GrapheneBlack™

SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1 Product identifier:	Graphene
Brand/Grades:	GrapheneBlack™ 0X, GrapheneBlack™ 3X
Other means of identification:	Few-layer graphene platelets with predominant thickness of 6-10 layers and predominant lateral dimension of less than 2 micrometers
EC No.:	801-282-5
CAS No:	1034343-98-0
UFI Number:	
REACH Registration No.:	01-2120768618-38-0002
1.2 Relevant identified uses of the substance or mixture and uses advised against:	
Relevant identified uses:	Additive/reinforcing agent for plastics, rubbers, coatings; Anthracite pigment; Additive for concrete, drilling fluids, battery electrodes; Processing aid; Light and UV stabilizer; Conductive agent.
Uses advised against:	FDA Class III medical devices; European class III medical devices; Health Canada class IV Medical Devices; Applications involving permanent implantation into the body; Life-sustaining medical applications.
1.3 Details of the Supplier of the Safety Data Sheet:	
	NanoXplore Inc. 4500 Thimens Blvd., Montreal, QC, Canada, H4R 2P2
Telephone number:	+1-514-935-1377
Email of person responsible for Safety Data Sheets:	info@nanoxplore.ca
1.4 Emergency telephone number:	
Only Representative for REACH Registration:	+1-514-935-1377 Chemservice S.A. Address: 5, an de Laengten 6776 Grevenmacher Luxembourg Tel.: +352 270776-1 Fax: +352 270776-75 luxembourg@chemservice-group.com www.chemservice-group.com Managing Director: Dr. Dieter Drohmann Place of business: Grevenmacher

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Poison Centre contact information: National Poisons Information Service
City Hospital, Birmingham B187QH, United Kingdom
Tel: +44 121 507 4123
E-mail: allistervale@npis.org, sallybradberry@npis.org
Website: www.npis.org

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture:

Classification according to Commission Regulation (EC) No 2020/878 [CLP]: Not classified as hazardous in accordance with CLP

2.2 Label elements:

Labelling according to Commission Regulation (EC) No 2020/878 [CLP]:

Hazard pictograms:	No hazard symbols required
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Supplemental Hazard information (EU): None Known

2.3 Other hazards: This substance/mixture contains no components considered to be an endocrine-disrupting substance at levels of 0.1% or higher.

SECTION 3: Composition/information on ingredients

3.1 Substances:

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Chemical Name	concentration %	CAS #	EC No. REACH Registration No.	Classification (EC) No 1272/2008	M Factor	SCL	Acute Toxicity Estimates	Nanoform material
Graphene	~ 100	1034343-98-0	801-282-5 01-2120768618-38-0002	Not classified by this country.	No data available	No data available	Not determined	Yes*

Name of (Set of) nanoform(s)	*Graphene		
		Value	Unit
Number based particle size distribution	D10 (thickness)	<2	nm
	D10 (lateral; secondary particles)	<10	µm
	D50 (thickness)	<10	nm
	D50 (lateral; secondary particles)	<30	µm
	D90 (thickness)	<20	nm
	D90 (lateral; secondary particles)	<70	µm
Shape and aspect ratio of particles	Nanoplatelet; aspect ratio: 100-1000		NA
Crystallinity	>80%		
Surface functionalization/treatment	Agent (s)	None	
	Process		
Specific surface area	20-300		m ² /g
Additional information			

3.2 Mixtures: Not applicable

For full text of H-statements see Section 16.

SECTION 4: First aid measures

4.1 Description of first aid measures:

Inhalation:	Remove to fresh air. If breathing is difficult, give oxygen. Get medical attention if symptoms persist.
Eye contact:	Flush eyes with plenty of water.
Skin Contact:	Wash off with soap and water.
Ingestion:	Do not induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Seek medical attention if symptoms

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

develop.

To the best of our knowledge, the substance does not cause any immediate/acute effects/symptoms.

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

None Known

SECTION 5: Firefighting measures

5.1 Extinguishing media:

Suitable extinguishing media:

Dry chemical, carbon dioxide, water spray or alcohol resistant foam.

Unsuitable extinguishing media:

None Known

5.2 Special hazards arising from the substance or mixture:

This product has a weak to moderate explosion risk. Conductive items should be bonded and grounded (<10 Ohms to the ground). Avoid "Propagating Brush Discharges" by restricting use of insulating liners and coatings.

Hazardous Combustion Products:

Carbon dioxide, Carbon monoxide

5.3 Advice for firefighters:

Do not enter fire area without proper protection including self-contained breathing apparatus (SCBA) and full protective equipment.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures:

Non-emergency personnel:

Non-emergency personnel should be kept clear of the area

Emergency responders:

Clean up spills immediately using Protective Equipment recommended in Section 8 at a minimum.

6.2 Environmental precautions:

The substance is insoluble in water and is not known to pose any significant environmental hazards. Keep it in suitable, closed containers for disposal. As a matter of good practice, minimize contamination of sewage water, soil, groundwater, drainage systems, or bodies of water.

6.3 Methods and material for containment and cleaning up:

Small spills:

Refer to information provided for large spills

Large spills:

The substance is insoluble in water and is not known to pose any

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significant environmental hazards. In a case of a spill, it would be physically collected for disposal, in accordance with local, provincial and federal laws and regulations. Additionally, the substance is non-volatile, insoluble, and does not readily degrade which facilitates spill management and cleanup in the unlikely event of an accident.

6.4 Reference to other sections:

Containment is described in section 7 and for disposal information refer to section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling:

As with all chemicals, good industrial hygiene practices should be followed when handling this material. Conducting items should be bonded and grounded (<10 Ohms to ground). Avoid "Propagating Brush Discharges" by restricting use of insulating liners and coatings.

7.2 Conditions for safe storage, including any incompatibilities:

Conditions for safe storage:

Keep container closed when not in use. Keep in a dry, cool, and well-ventilated location.

Materials to Avoid/Chemical Incompatibility:

Strong oxidizing agents

7.3 Specific end use(s):

Per Article 14.4 of the REACH Regulation no exposure scenario has been developed as the substance is not hazardous.

SECTION 8: Exposure controls/personal protection

8.1 Control parameters:

Occupational Exposure limit values:

Chemical Name	EU Indicative Occupational Exposure Limits (IOELVs) - TWA	EU Indicative Occupational Exposure Limits (IOELVs) - STELs	EU - Biological Exposure Limits (BLVs)
No exposure limits established			

DNEL: None Known

PNEC: None Known

8.2 Exposure controls:

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Appropriate engineering controls:	Use an exhaust ventilation system and/or process enclosure to minimize airborne dust. If handling results in dust generation, special ventilation may be needed to minimize dust exposure. If heated material generates vapor or fumes, use process enclosures, local exhaust ventilation, or other engineering controls to control exposure.
Individual protection measures, such as personal protective equipment:	
Eye and face protection:	Wear safety glasses or goggles.
Skin Protection:	
Hand protection:	Wear suitable gloves to protect from thermal and irritation hazards.
Other skin protection:	Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices.
Respiratory Protection:	To minimize risk of over exposure to dust, vapour or fumes it is recommended that a local exhaust system is placed above the equipment, and that the working area is properly ventilated. If ventilation is inadequate, use certified respirator that will protect against dust/mist.
Thermal Hazards:	Not applicable
Environmental exposure controls:	Avoid runoff into storm sewers and ditches that lead to waterways.
General hygiene conditions:	Handle in accordance with general industrial hygiene practice.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties:

Appearance:	
Physical state:	Powder
Colour:	Black
Odour and odour threshold:	Odorless
pH:	Not determined
Melting point / freezing point:	

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Melting point:	approximately 4500 °C
Freezing point:	No data available
Initial boiling point and boiling range:	No data available
Flash point:	No data available
Evaporation Rate (water = 1):	No data available
Flammability (solid, gas):	May form combustible dust concentrations in air
Upper/lower flammability or explosive limits:	
Upper flammable or explosive limit, % in air:	Not applicable
Lower flammable or explosive limit, % in air:	Not applicable
Maximum Explosion Pressure-Pmax:	5.8 bar·g
Maximum Rate of Pressure Rise-dP/dt:	151 bar/s
Kst Value:	41 bar·m/s
Vapour pressure:	No data available
Vapor Density (Air=1):	No data available
Density and/or relative density:	2.2 g/cm ³
Solubility(ies):	Insoluble
Biodegradability:	Not readily biodegradable
Partition coefficient: n-octanol/water:	No data available
Auto-ignition temperature:	No data available
Minimum Ignition Energy-MIE:	>2000 mJ
Decomposition temperature:	600°C
Viscosity:	No data available
Kinematic viscosity:	No data available
Particle characteristics:	
Particle size:	No data available
Size distribution:	No data available
Explosive properties:	Not explosive
Oxidizing properties:	Not an oxidizer.
9.2 Other information:	None Known

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SECTION 10: Stability and reactivity

10.1 Reactivity:	No data available
10.2 Chemical stability:	Stable under normal conditions.
10.3 Possibility of hazardous reactions:	None expected under standard conditions of storage
10.4 Conditions to avoid:	No data available
10.5 Incompatible materials:	Strong oxidizing agents
10.6 Hazardous decomposition products:	Carbon dioxide, Carbon monoxide

SECTION 11: Toxicological information

11.1 Information on toxicological effects:

Acute toxicity:

Chemical Name	ORAL LD50	DERMAL LD50	INHALATION LC50
Graphene	Oral LD50 > 5000 mg/ kg	N/A- No dermal sensitization/irritation observed (OECD 406 and 404)	N/A- No mortality observed (OECD 436)

Based on available data, the classification criteria are not met.

Description of the various toxicological (health) effects and the available data used to identify those effects:

Information on the likely routes of exposure: Inhalation, Dermal, Oral

Inhalation:

Female/Male Rat: Well tolerated (OECD 436):

Mortality = 0

Clinical Observation = No substance-related clinical signs

NOAEL (No-Observed-Adverse-Effect-Level) = 1.99 mg/L

Body Weights = No substance-related changes in body weight

Skin irritation:

Albino Rabbits: No skin irritation (Score 0 according to OECD 404):

Mortality = 0

Clinical observations = No substance-related clinical signs

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	Erythema or Edema Observations = None
	Body Weights = No substance-related changes in body weight
	Assessment: Not irritating to skin
Dermal sensitization:	Guinea Pigs: No dermal sensitization (Score 0 according to OECD 406): Mortality = 0 Clinical observations = No substance-related clinical signs Body Weights = No substance-related changes in body weight Assessment: Not sensitizing to skin
Oral:	Female/Male Mouse: LD50 > 5000 mg/kg (<i>Jiangsu provincial center for TSE, 2015</i>)
Repeated Dose Mammalian Toxicity:	
Inhalation:	Rat/Sprague-Dawley: No observed effect (OECD 412 (<i>Kim et al. ,2016</i>)): NOAEC (No Observed Adverse Effect Concentration): > 1.88 mg/m ³ Assessment: No adverse toxicological effects at highest respirable dose
Target Organs Potentially Affected by Exposure:	None known
Delayed and immediate effects and also chronic effects from short- and long-term exposure:	
Immediate effects from short term exposure:	
Inhalation Toxicity:	No adverse effect has been observed in lung at maximum achievable aerosol concentration (OECD 436).
Skin Contact:	No skin irritation or skin sensitization was observed in animal studies (OECD 404 and 406).
Eye Contact:	May cause eye irritation.
Ingestion Toxicity:	May be harmful if swallowed.

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Delayed and chronic effects from long term exposure:

Chronic effects: None known

Carcinogenicity: The substance is not known to cause cancer.

Reproductive and Developmental Toxicity: No data available to indicate product or any components present at greater than 0.1% may cause birth defects.

Teratogenicity: No data available

Mutagenicity: No data available to indicate product or any components present at greater than 0.1% is mutagenic or genotoxic.

***In Vitro* Test for Gene Mutations:** Chinese Hamster, cell type V79 HPRT: Not mutagenic (OECD 476, (*Envoi*, 2018))

***In Vitro* Mammalian Test for Chromosomal Aberrations:** Human Peripheral Blood Lymphocytes: No evidence of genotoxic activity (OECD 473):

Cytotoxicity: No cytotoxicity has been observed up to 2000 µg/mL of the substance concentration

Incidental observations: No substantial increases in the incidence of chromatid or chromosome gaps, or polyploidy /endoreduplication/ premature centromere division

Assessment: No evidence of genotoxic activity *in vitro* test for induction of chromosome damage was observed.

***In Vivo* Mammalian Test for Chromosomal Aberration OR Gene Mutations:** Rats: No induction of the formation of micronuclei in polychromatic erythrocytes in the micronucleus test or DNA damage in the lung in the *in vivo* comet assay (OECD 474 and 489):

Mortality = 0

Clinical observations = No substance-related clinical signs

Assessment: No evidence of inducing the formation of micronuclei in

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polychromatic erythrocytes or DNA damage in the lung

STOT-single exposure: Based on available data, the classification criteria are not met.
STOT-repeated exposure: Based on available data, the classification criteria are not met.
Aspiration hazard: Based on available data, the classification criteria are not met.
Endocrine disrupting properties: None of the components is known to cause endocrine disrupting properties.
Synergistic Effects: No data available

SECTION 12: Ecological information

12.1 Toxicity: This material is not expected to be harmful.

Ecological Toxicity Data:

Chemical Name	CAS #	Aquatic EC50 Crustacea	Aquatic ERC50 Algae	Aquatic LC50 Fish	Activated sludge (OECD 209)
Graphene	1034343-98-0	No data available	EC50-96H Chlorella pyrenoidosa green algae, size 10 ⁸ cells/100 mL 62.2 mg/L (Zhao et al, 2017).	LC50 (48h) Daphnia magna > 16 mg/L [STATIC] (Fan et al. 2016).	3h NOEC = 1000 mg/L 3h EC10 > 1000 mg/L 3h EC50 > 1000 mg/L

12.2 Persistence and degradability: Not soluble in water. Not readily biodegradable

12.3 Bioaccumulative potential: No data available

12.4 Mobility in soil: Not expected to migrate. Insoluble.

12.5 Results of PBT and vPvB assessment: Not applicable

12.6 Endocrine disrupting properties: None Known

12.7 Other adverse effects: None Known

12.8 Additional information: No data available

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SECTION 13: Disposal considerations

13.1 Waste treatment methods:

Disposal methods:

It is the responsibility of the generator to determine at the time of disposal whether the product meets the criteria of a hazardous waste per regulations of the area in which the waste is generated and/or disposed of. Waste disposal must be in accordance with appropriate Federal, provincial, and local regulations. This product, if unaltered by use, may be disposed of by treatment at a permitted facility or as advised by your local hazardous waste regulatory authority.

SECTION 14: Transport information

International carriage of dangerous goods by road (ADR), rail or inland waterways:

- | | |
|-----------------------------------|-----------------------------|
| 14.1. UN number: | Not applicable |
| 14.2. UN proper shipping name: | Not Regulated for Transport |
| 14.3. Transport hazard class(es): | Not applicable |
| 14.4. Packing group: | Not applicable |

International carriage of dangerous goods by sea (IMDG/IMO):

- | | |
|-----------------------------------|-----------------------------|
| 14.1. UN number: | Not applicable |
| 14.2. UN proper shipping name: | Not Regulated for Transport |
| 14.3. Transport hazard class(es): | Not applicable |
| 14.4. Packing group: | Not applicable |

International carriage of dangerous goods by air (IATA):

- | | |
|-------------------------------------|---|
| 14.1. UN number: | Not applicable |
| 14.2. UN proper shipping name: | Not Regulated for Transport |
| 14.3. Transport hazard class(es): | Not applicable |
| 14.4. Packing group: | Not applicable |
| 14.5. Environmental hazards: | No |
| 14.6. Special precautions for user: | Consult IMO regulations before transporting in bulk by ocean. |
| 14.7 Transport in bulk according to | Not a marine pollutant. |

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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:

Chemical Name	EINECS	SVHC
Graphene	801-282-5	No

15.2 Chemical Safety Assessment: A Chemical Safety Assessment has been carried out by the supplier.

SECTION 16: Other information

Revision Date: July 20th, 2023

Indication of changes: The information is considered correct, but is not exhaustive and will be used only as guidance, which is based on the current knowledge of the chemical or mixture and is applicable to the precautions of appropriate security for the product.

Abbreviations and acronyms:

- CAS = Chemical Abstract Service
- DNEL= Derivative No Effect Level
- EC= European Community
- EINECS = European Inventory of Existing Chemical Substances
- MSHA = Mine Safety Health Administration
- NIOSH = National Institute of Occupational Safety & Health
- OEL = Occupational Exposure Limit
- PBT= Persistent, Bioaccumulative, Toxic
- PNEC= Predicted No Effect Concentration
- SCOEL= Scientific Committee on Occupational Exposure Limits
- TLV = Threshold Limit Value
- TWA= Time Weighted Average
- vPvB= Very Persistent, Very Bioaccumulative
- Wt.% = Weight Percent

Hazard phrase(s) referenced in section No data available

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3:

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

Classification according to Regulation (EC) Nr. 1272/2008	Classification procedure
No data available	

Disclaimer of Liability:

The information contained in this Safety Data Sheet 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. The information contained in this Safety Data Sheet is to the best of our knowledge and believed to be reliable but no representations, guarantees or warranties of any kind are made as to its accuracy or suitability for a particular application. It is the responsibility of the user/distributor to ensure that the information contained in the Safety Data Sheet is relevant to the product manufactured or sold, as the case may be. NanoXplore Inc. makes no warranties, expressed or implied, in respect of the adequacy of this document for any particular purpose.