

Safety Data Sheet

Prepared in accordance with OSHA Hazard Communication Standard 2012 (HCS)



Performance Through Carbon Chemistry

Date of the latest revision: July 3rd, 2020

GrapheneBlack™

1. Identification

Product identifier used on the label:	Graphene
Brand/Grades:	GrapheneBlack™ 0X, GrapheneBlack™ 3X
Other means of identification:	
Other means:	Hydroxy and Carbonyl modified Graphene; Few-layer graphene platelets with predominant thickness of 6-10 layers and predominant lateral dimension of less than 2 micrometers
CAS No.:	1034343-98-0
Recommended use of the chemical and restrictions on use:	
Recommended use:	Additive/reinforcing agent for plastics, rubbers, coatings; Anthracite pigment; Additive for battery electrodes; Processing aid; Light and UV stabilizer; Conductive agent.
Restrictions on use:	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.
Name, address, and telephone number of the chemical manufacturer, importer, or other responsible party:	NanoXplore Inc. 4500 Thimens Blvd., Montreal, QC, Canada, H4R 2P2
Telephone number:	+1-514-935-1377
E-mail address:	info@nanoxplore.ca
Emergency phone number:	+1-514-935-1377

2. Hazard(s) identification

Classification of the chemical in accordance with paragraph (d) of §1910.1200:

GHS Hazard Symbols:	No hazard symbols required
----------------------------	----------------------------

GHS Classification:	Combustible Dust
Signal Word:	Warning

Safety Data Sheet

Prepared in accordance with OSHA Hazard Communication Standard 2012 (HCS)



Performance Through Carbon Chemistry

Date of the latest revision: July 3rd, 2020

GrapheneBlack™

Hazard Statements:	May form combustible dust concentrations in air
Other hazards:	This product has a weak to moderate explosion risk
Hazards not otherwise classified:	None known
% unknown toxicity (Oral):	0 % of the mixture consists of ingredient(s) of unknown toxicity
% unknown toxicity (Dermal):	0 % of the mixture consists of ingredient(s) of unknown toxicity
% unknown toxicity (Inhalation Dust):	0 % of the mixture consists of ingredient(s) of unknown toxicity

3. Composition/information on ingredients

Chemical Name	Common name and synonyms	CAS #	concentration %
Graphene	None known	1034343-98-0	~ 100

4. First-aid measures

Description of necessary measures, subdivided according to the different routes of exposure, i.e., inhalation, skin and eye contact, and ingestion:

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 develop.
Most important symptoms/effects, acute and delayed:	To the best of our knowledge, the substance does not cause any immediate/acute effects/symptoms.
Indication of immediate medical attention and special treatment needed, if necessary:	None known

Safety Data Sheet

Prepared in accordance with OSHA Hazard Communication Standard 2012 (HCS)



Performance Through Carbon Chemistry

Date of the latest revision: July 3rd, 2020

GrapheneBlack™

5. Fire-fighting measures

Suitable (and unsuitable) extinguishing media:

Suitable extinguishing media: Dry chemical, carbon dioxide, water spray or alcohol resistant foam

Unsuitable extinguishing media: None known

Specific hazards arising from the chemical:

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

Special protective equipment and precautions for fire-fighters:

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

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures:

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

Methods and materials for containment and cleaning up:

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.

7. Handling and storage

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.

Conditions for safe storage, including any incompatibilities:

Safe storage conditions:

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

Materials to Avoid/Chemical Incompatibility:

Strong oxidizing agents

Safety Data Sheet

Prepared in accordance with OSHA Hazard Communication Standard 2012 (HCS)



Performance Through Carbon Chemistry

Date of the latest revision: July 3rd, 2020

GrapheneBlack™

8. Exposure controls/personal protection

OSHA permissible exposure limit (PEL), American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV), and any other exposure limit used or recommended by the chemical manufacturer, importer, or employer preparing the safety:

Chemical component	OSHA PEL	OSHA PEL- STEL	NIOSH REL-TWA	NIOSH REL-STEL	ACGIH TLV	ACGIH STEL	IDLH
No data available							

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:

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.

Eye protection:

Wear safety glasses or goggles.

Skin protection:

Wear appropriate protective clothing and gloves to minimize skin contact.

Gloves:

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.

General hygiene conditions:

Handle in accordance with general industrial hygiene practice.

Safety Data Sheet

Prepared in accordance with OSHA Hazard Communication Standard 2012 (HCS)



Performance Through Carbon Chemistry

Date of the latest revision: July 3rd, 2020

GrapheneBlack™

9. Physical and chemical properties

Appearance (physical state, color etc.):

Physical state: Powder

Color: Black

Odor: Odorless

Odor Threshold: No data available

pH: Not determined

Melting point/freezing point:

Melting Point: approx. 4500 °C

Freezing point: No data available

Initial boiling point and boiling range: No data available

Flash Point: No data available

Evaporation Rate: No data available

Flammability (solid, gas): May form combustible dust concentrations in air

Upper/lower flammability or explosive limits:

Upper flammability or explosive limits: Not applicable

Lower flammability or explosive limits: 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

Vapor pressure: No data available

Vapor density: No data available

Relative density: 2.2 g/cm³

Solubility(ies): Insoluble

Biodegradability: Not readily biodegradable

Partition coefficient: n-octanol/water: No data available

Auto-ignition temperature: No data available

Safety Data Sheet

Prepared in accordance with OSHA Hazard Communication Standard 2012 (HCS)



Performance Through Carbon Chemistry

Date of the latest revision: July 3rd, 2020

GrapheneBlack™

Minimum Ignition Energy-MIE:	>2000 mJ
Decomposition temperature:	600 °C
Viscosity:	No data available

10. Stability and reactivity

Reactivity:	No data available
Chemical stability:	Stable under normal conditions
Possibility of hazardous reactions:	None expected under standard conditions of storage
Conditions to avoid (e.g., static discharge, shock, or vibration):	No data available
Incompatible materials:	Strong oxidizing agents
Hazardous decomposition products:	Carbon dioxide, Carbon monoxide

11. Toxicological information

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

Information on the likely routes of exposure (inhalation, ingestion, skin and eye contact): 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
Erythema or Edema Observations = None
Body Weights = No substance-related changes in body weight

Safety Data Sheet

Prepared in accordance with OSHA Hazard Communication Standard 2012 (HCS)



Performance Through Carbon Chemistry

Date of the latest revision: July 3rd, 2020

GrapheneBlack™

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 (*Jiangsu provincial center for TSE, 2015*)

Repeated Dose Mammalian Toxicity:

Inhalation:

Rat/Sprague-Dawley: No observed effect (OECD 412 (*Kim et al. ,2016*)):
NOAEC (No Observed Adverse Effect Concentration): > 1.88 mg/m³
Assessment: No adverse toxicological effects at highest respirable dose

Target Organs Potentially Affected by Exposure:

None known

Chemical Interactions That Change Toxicity:

No chemical interaction known to affect toxicity

Symptoms related to the physical, chemical and toxicological characteristics:

The New Substance (NS) program of the Environment and Climate Change Canada (ECCC) did not identify any suspicion that the substance is toxic.

Safety Data Sheet

Prepared in accordance with OSHA Hazard Communication Standard 2012 (HCS)



Performance Through Carbon Chemistry

Date of the latest revision: July 3rd, 2020

GrapheneBlack™

Delayed and immediate effects and also chronic effects from short- and long-term exposure:

Immediate effects from short term exposure:

Ingestion Toxicity:	May be harmful if swallowed
Skin Contact:	No skin irritation or skin sensitization was observed in animal studies (OECD 404 and 406).
Inhalation Toxicity:	No adverse effect has been observed in lung at maximum achievable aerosol concentration (OECD 436).
Eye Contact:	May cause eye irritation
Chronic effects:	None known
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.

Safety Data Sheet

Prepared in accordance with OSHA Hazard Communication Standard 2012 (HCS)



Performance Through Carbon Chemistry

Date of the latest revision: July 3rd, 2020

GrapheneBlack™

***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 polychromatic erythrocytes or DNA damage in the lung.

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

Carcinogenicity:

Not a carcinogen according to NTP, IARC, or OSHA.

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.

Synergistic Effects:

No data available

Numerical measures of toxicity (such as acute toxicity estimates):

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

Is the hazardous chemical listed in the National Toxicology Program (NTP) Report on Carcinogens (latest edition) or has been found to be a potential carcinogen in the International Agency for Research on Cancer (IARC) Monographs (latest edition), or by:

Chemical Name	OSHA Carcinogen	IARC Carcinogen	NTP Carcinogen
There are no components that are known or reported to cause cancer			

Safety Data Sheet

Prepared in accordance with OSHA Hazard Communication Standard 2012 (HCS)



Performance Through Carbon Chemistry

Date of the latest revision: July 3rd, 2020

GrapheneBlack™

12. Ecological information

Ecotoxicity (aquatic and terrestrial, where available):

This material is not expected to be harmful.

Ecological Toxicity Data:

Chemical Name	CAS #	Aquatic EC50 Crustacea	Aquatic ERC50 Algae	Aquatic LC50 Fish
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).

Persistence and degradability:

Not soluble in water. Not readily biodegradable.

Bioaccumulative potential:

No data available

Mobility in soil:

Not expected to migrate. Insoluble.

Other adverse effects (such as hazardous to the ozone layer):

None known

13. Disposal considerations

Description of waste residues and information on their safe handling and methods of disposal, including the disposal of any contaminated packaging:

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.

14. Transport information

Carriage of dangerous goods by road (DOT), rail or inland waterways:

UN number:

No data available

UN Proper shipping name:

Not applicable

Safety Data Sheet

Prepared in accordance with OSHA Hazard Communication Standard 2012 (HCS)



Performance Through Carbon Chemistry

Date of the latest revision: July 3rd, 2020

GrapheneBlack™

Transport hazard class(es): Not applicable
Packing group, if applicable: Not applicable
DOT Basic description: No data available

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

UN number: No data available
UN Proper shipping name: Not applicable
Transport hazard class(es): Not applicable
Packing group, if applicable: Not applicable

International carriage of dangerous goods by air (IATA):

UN number: No data available
UN Proper shipping name: Not applicable
Transport hazard class(es): Not applicable
Packing group, if applicable: Not applicable

Environmental hazards (e.g., Marine pollutant (Yes/No)): No

Transport in bulk (according to Annex II of MARPOL 73/78 and the IBC Code): Not a marine pollutant

Special precautions which a user needs to be aware of or needs to comply with in connection with transport or conveyance either within or outside their premises: Consult IMO regulations before transporting in bulk by ocean

15. Regulatory information

Safety, health and environmental regulations specific for the product in question:

TSCA Status: This chemical is currently not listed on the inventory list of TSCA. For research and development only.

Safety Data Sheet

Prepared in accordance with OSHA Hazard Communication Standard 2012 (HCS)



Performance Through Carbon Chemistry

Date of the latest revision: July 3rd, 2020

GrapheneBlack™

Regulated Components:

Chemical Name	CAS #	CERCLA	Sara EHS	Sara 313	U.S. HAP
No data available					

Chemical Name	CAS #	California Prop 65 - Cancer	California Prop 65 - Dev. Toxicity	California Prop 65 - Reprod fem	California Prop 65 - Reprod male
No data available					

Chemical Name	CAS #	Massachusetts RTK List	New Jersey RTK List	Pennsylvania RTK List	Minnesota Hazardous Substance List
No data available					

16. Other information, including date of preparation or last revision

SDS Prepared by:

Revision Date: July 3rd, 2020

Revision Number: 1

Reason for revision:

Disclaimer:

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. 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.