



GRAFRINT3D

Material Safety Data Sheet

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product Identifiers

Product name: graphene ink for extrusion printing

Manufacturer: GRAFRINT3D Inc.

Address: 945 Princess St., Kingston, ON. K7L 0E9

Brand: MP-LEX

Telephone: 1 613 900 4619

1.2 Emergency Contact Number

Emergency phone number: +1-703-527-3887 (CHEMTREC)

SECTION 2. HAZARDS IDENTIFICATION

2.1 Classification of the Substance or Mixture

GHS Classification in accordance with Hazardous Products Regulations (HPR) (SOR/2015/17)

Flammable liquids (Category 2), H225 Eye irritation (Category 2A), H319

2.2 GHS Label Elements, Including Precautionary Statements

Signal word: Warning **Hazard statement(s):** H315 Causes skin irritation. H319 Causes serious eye irritation. H336 May cause drowsiness or dizziness. H351 Suspected of causing cancer. H402 Harmful to aquatic life.

Precautionary statement(s): P201 Obtain special instructions before use. P202 Do not handle until all safety precautions have been read and understood. P261 Avoid breathing dust/fume/gas/mist/vapours/spray. P233 Keep container tightly closed. P264 Wash skin thoroughly after handling. P271 Use only outdoors or in a well-ventilated area. P273 Avoid release to the environment. P280 Wear protective gloves/protective clothing/eye protection/face protection P302 + P352 IF ON SKIN: Wash with plenty of water. P304 + P340 + P312 IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTRE/doctor if you feel unwell. P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P308 + P313 IF exposed or concerned: Get medical advice/attention. P337 + P313 If eye irritation persists, get medical advice/attention. P362 + P364 Take off contaminated clothing and wash it before reuse. P403 + P233 Store in a well-ventilated place. Keep container tightly closed. P405 Store locked up. P501 Dispose of contents/container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS: None

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Mixtures

Synonyms: graphene ink, conductive ink

Component	CAS#	%(w/w)
Dichloromethane	75-09-2	40-80
Dibutyl phthalate	84-74-2	1.0-5.5
2-butoxyethanol	111-76-2	2.0-9.5
Poly(lactic-co-glycolic) acid	30846-39-0	4.2-8.5
Graphene	1034343-98-0	3.5-18.0

SECTION 4. FIRST AID MEASURES

4.1 Description of First Aid Measures/General Advice

General Advice: Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled: If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact: Wash off with soap and plenty of water. Consult a physician.

In case of eye contact: Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed: Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most Important Symptoms and Effects, Both Acute and Delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11.

4.3 Indication of Any Immediate Medical Attention and Special Treatment Needed

No data available.

SECTION 5. FIRE FIGHTING MEASURES

5.1 Suitable Extinguish Media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

5.2 Special Hazards Arising from the Substance or Mixture

No data available.

5.3 Advice for Firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further Information

Use water spray to cool unopened containers.



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SECTION 6. ACCIDENTAL RELEASE MEASURES**6.1 Personal Precautions, Protective Equipment and Emergency Procedures**

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. For personal protection see section 8.

6.2 Environmental Precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and Materials for Containment and Cleaning Up

Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

6.4 Reference to Other Sections

For disposal see section 13

SECTION 7. HANDLING AND STORAGE**7.1 Precautions for Safe Handling**

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist. For precautions see section 2.2.

7.2 Conditions for Safe Storage, Including Any Incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Storage class (TRGS 510): 6.1D: Non-combustible, acute toxic Cat.3 / toxic hazardous materials or hazardous materials causing chronic effects

7.3 Specific End Uses

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION**8.1 Control parameters**

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Components	CAS-No	Value	Control parameters	Basis
Dichloromethane	75-09-2	TWA	25 ppm	Canada. British Columbia OEL
Remarks:	IARC '2A' applies to substances deemed probably carcinogenic to humans on the basis of limited evidence of carcinogenicity in humans.			
		TWA	50 ppm 174 mg/m ³	Canada. Alberta, Occupational Health and Safety Code (table 2: OEL)
		TWAEV	50 ppm 174 mg/m ³	Québec. Regulation respecting occupational health and safety, Schedule 1, Part 1: Permissible exposure values for airborne contaminants
Remarks:	A substance to which exposure must be reduced to a minimum in accordance with section 42. Carcinogenic effect suspected in humans.			
		TWA	50 ppm	USA. ACGIH Threshold Limit Values (TLV)
Dibutyl phthalate	84-74-2	TWAEV	5 mg/m ³	Québec. Regulation respecting occupational health and safety, Schedule 1, Part 1: Permissible exposure values for airborne contaminants
		TWA	50 ppm 174 mg/m ³	Canada. Alberta, Occupational Health and Safety Code (table 2: OEL)
		TWA	5 mg/m ³	Canada. British Columbia OEL
Remarks:	Adverse reproductive effect			
		TWA	5 mg/m ³	USA. ACGIH Threshold Limit Values (TLV)
2-butoxyethanol	111-76-2	TWA	20 ppm, 97 mg/m ³	CAD AB/BC/MB/ON/QC OEL

8.2 Exposure Controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Eye/Face Protection: Safety glasses with side shields conforming to EN166. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU). **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. Wash and dry hands. **Body Protection:** Complete suit protecting against chemicals. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace. **Respiratory Protection:** Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multipurpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). **Control of Environmental Exposure:** Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge to the environment must be avoided.



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SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on Basic Physical and Chemical Properties

- a) **Appearance:** *Form:* liquid *Colour:* black
- b) **Odor:** No Data Available
- c) **Odor Threshold:** No Data Available
- d) **pH:** No Data Available
- e) **Melting/Freezing Point:** Melting point/range: -114 °C (-173 °F) - lit.
- f) **Initial Boiling Point & Boiling Range:** 78 °C (172 °F) - lit.
- g) **Flash Point:** 14.0 °C (57.2 °F) - closed cup
- h) **Evaporation Rate:** No Data Available
- i) **Flammability(solid/gas):** No data available
- j) **Upper/Lower Flammability or Explosive Limits:** No Data Available
- k) **Vapour Pressure:** No Data Available
- l) **Vapour Density:** No Data Available
- m) **Relative Density:** 1.4 – 1.5 g/cm³ at 25 °C (77 °F)
- n) **Water Solubility:** Completely soluble
- o) **Partition Coefficient: n-octanol/water:** No Data Available
- p) **Auto-Ignition Temperature:** No Data Available
- q) **Decomposition Temperature:** No Data Available
- r) **Viscosity:** No Data Available
- s) **Explosive Properties :** No Data Available
- t) **Oxidizing Properties :** No Data Available

9.2 Other Safety Information

No Data Available

SECTION 11: TOXICOLOGICAL INFORMATION

11.1 Information on Toxicological Effects

Acute Toxicity: LD50 Oral - Rat - > 2,000 mg/kg

LC50 Inhalation - Rat - 4 h - 60.14 mg/l

LD50 Dermal - Rat - > 2,000 mg/kg

(OECD Test Guideline 402)

Skin Corrosion: Skin - Rabbit

Result: Irritating to skin. -4h (OECD Test Guideline 404)

Serious Eye Damage/Eye Irritation: Eyes - Rabbit

Result: Irritating to eyes (OECD Test Guideline 405)

Respiratory or Skin Sensitisation: Sensitisation test:

Result: negative

Germ Cell Mutagenicity: Chromosome aberration test in vitro

Result: positive. / Ames test - Salmonella typhimurium

Result: positive OECD Test Guideline 474

Mouse - male and female - Bone marrow

11.2 Carcinogenicity

Limited evidence of carcinogenicity in animal studies

Suspected human carcinogens. IARC: 2A - Group 2A: Probably

carcinogenic to humans (Methylene chloride)

11.3 Reproductive Toxicity

Specific target organ toxicity - repeated exposure

11.4 Additional Information

RTECS: PA8050000

Dizziness, Nausea, Vomiting, narcosis, Cough, irritant effects, Unconsciousness, Shortness of breath, respiratory paralysis, somnolence, depressed respiration, CNS disorders, inebriation Risk of corneal clouding.

The following applies to aliphatic halogenated hydrocarbons in general: systemic effect: narcosis, cardiovascular disorders. Toxic effect on liver and kidneys.

Dichloromethane is metabolized in the body producing carbon monoxide which increases and sustains carboxyhemoglobin levels in the blood, reducing the oxygen-carrying capacity of the blood.

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence.

SECTION 10: STABILITY AND REACTIVITY

10.1 Reactivity

No Data Available

10.2 Chemical Stability

Stable under recommended storage conditions.

10.3 Possibility of Hazardous Reactions

Vapours may form explosive mixture with air.

10.4 Conditions to Avoid

Heat, flames and sparks.

10.5 Incompatible Materials

Alkali metals, Oxidizing agents, Peroxides.

10.6 Hazardous Decomposition Products

Hazardous decomposition products formed under fire conditions.

Carbon oxides. Other decomposition products - No data available

In the event of fire: see section 5

SECTION 12: ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish LC50 - Pimephales promelas (fathead minnow) - 193.00

mg/l - 96 h Toxicity to daphnia and other aquatic invertebrates

Toxicity to daphnia and other aquatic invertebrates (static test EC50) -

Daphnia magna (Water flea) - 27 mg/l - 48 h

12.2 Persistence and Degradability

Biodegradability aerobic - Exposure time 28 d

Result: 68 % - Readily biodegradable.

12.3 Bioaccumulative Potential

Does not bioaccumulate.

12.4 Mobility in Soil

No Data Available

12.5 Results of PBT and vPvB Assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted.

12.6 Other Adverse Effects

Harmful to aquatic life. An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Treatment Methods

Product: Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Offer surplus and non-recyclable solutions to a licensed disposal company.**Contaminated packaging:** Dispose of as unused product.

SECTION 14: TRANSPORT INFORMATION

TDG (Canada): UN number: 1593

Class: 6.1 Packing group: III

Proper shipping name: GRAPHENE INK

IMDG: UN number: 1593

Class: 6.1 Packing group: III EMS-No: F-A, S-A

Proper shipping name: GRAPHENE INK

IATA: UN number: 1593

Class: 6.1 Packing group: III

Proper shipping name: GRAPHENE INK

SECTION 15: REGULATORY INFORMATION

This product has been classified in accordance with the hazard criteria of the Hazardous Products Regulations (HPR) and the SDS contains all the information required by the HPR.