SAFETY DATA SHEET

Revision Date 05/2024

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Monolayer graphene film on copper foil

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

Identified uses : Industrial use, research use

1.3 Details of the supplier of the safety data sheet

Company : General Graphene
10239 Cogdill Road
Knoxville TN, 37932

Telephone : +1 865 383-3787

Email : sales@generalgraphenecorp.com

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

Not a hazardous substance or mixture.

2.2 GHS Label elements, including precautionary statements

No label required.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

Graphene is electrically conductive. Care should be taken to avoid putting it in places where it could cause shorting of electrical components.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures

Synonyms : Graphene/Cu

Description: Graphene film on copper foil substrate. Graphene is a thin layer of pure carbon. It is a two-dimensional allotrope of carbon in the structure of a plane of sp^2 bonded atoms. Layers of graphene stacked on each other from graphite, with each layer being .345 nm thick.

Hazardous components

Component		Classification	Concentration
Copper			
CAS-No. EC-No.	7440-50-8 231-159-6		> 99.9 %
Graphene			
CAS-No.	1034343-98-0	Not classified	N/A*

For the full text of the H-Statements mentioned in this Section, see Section 16.

* Please notice that substance properties used for the hazard assessment of the mixture come from graphite (bulk substance, CAS 7782-42-5). The properties of the nanoform are under evaluation and to some extent not known.

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice
Move out of dangerous area.

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

In case of skin contact
Wash off with soap and plenty of water.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water.

4.2 Most important symptoms and effects, both acute and delayed

Inhalation

May cause irritation to respiratory tract/inhalation.

Skin contact

May cause skin irritation.

Eye contact

May cause eye irritation.

Ingestion

No effects recorded

4.3 Indication of any immediate medical attention and special treatment needed

No specific treatment.

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

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

5.2 Special hazards arising from the substance or mixture
In the event of combustion or thermal decomposition, this material may release carbon monoxide (CO) or carbon dioxide (CO2) or other toxic gases.

5.3 Advice for firefighters
Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Avoid breathing vapors, mist or gas. For personal protection see section 8.

6.2 Environmental precautions
No special environmental precautions required.

6.3 Methods and materials for containment and cleaning up
Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed. 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.
Handle and ideally store under inert gas. Moisture sensitive. Air sensitive.

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION 8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Copper	7440-50-8	TWA	1.000000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Irritation Gastrointestinal metal fume fever		
		TWA	0.200000 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Irritation Gastrointestinal metal fume fever		
		TWA	1.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.100000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	1 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Irritation Gastrointestinal metal fume fever		
		TWA	0.2 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
		Irritation Gastrointestinal metal fume fever		
		TWA	1 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.1 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		PEL	0.1 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Hazardous components without workplace control parameters

8.2 Exposure controls

Appropriate Engineering Controls

General industrial hygiene practice.

Personal protective equipment

Eye/face protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin protection
Wear protective gloves.

Body Protection
Full body industrial type work clothing.

Respiratory protection
Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
No special environmental precautions required.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a)	Appearance Form	Transparent film of graphene on copper foil
b)	Odor	No data available
c)	Odor Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing	1,084 °C (1,983 °F) point (copper)
f)	Initial boiling point	No data available
g)	Flash point	No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Vapor pressure	No data available
k)	Vapor density	No data available
l)	Density	2.2 g/cm3 (graphite), 8.96 g/cm3 (copper)
m)	Water solubility	No data available
n)	Partition coefficient:	No data available
o)	Auto-ignition temp	No data available
p)	Decomposition temp	No data available

q)	Viscosity	No data available
r)	Explosive properties	No data available
s)	Oxidizing properties	No data available

9.2 Other safety information No data available

9.3 Other safety information No data available

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

Copper:

Exothermic reaction with:

Ethylene oxide

Fluorine

hydrogen sulphide

halogen-halogen compounds

alkali oxides

nitrides

Salts of hydrazine

Sulfuric acid

Risk of ignition or formation of inflammable gases or vapours with:

Oxidizing agents

Chlorine

Risk of explosion with:

Acetylene

azides

ammonium compounds

iodates

bromopropine

perchlorates

bromates

picrates

chlorates

Peroxides

10.4 Conditions to avoid No data available

10.5 Incompatible materials Strong oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Copper oxides
Other decomposition products - No data available
In the event of fire: see section 5

11.1 Information on toxicological effects

Acute toxicity

Oral: No data available
Inhalation: No data available
Dermal: No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitization

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

IARC:
NTP:
No ingredient of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
No ingredient of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA: No component of this product present at levels greater than or equal to 0.1% is on OSHA's list of regulated carcinogens.

Reproductive toxicity

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

12. ECOLOGICAL INFORMATION

12.1 Toxicity No data available

12.2 Persistence and degradability No data available

12.3 Bioaccumulative potential No data available

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 No data available

13. TRANSPORT INFORMATION

13.1 Waste treatment methods

Product

Waste material must be disposed of in accordance with the national and local regulations. Leave chemicals in original containers. No mixing with other waste. Handle uncleaned containers like the product itself. See www.retrologistik.com for processes regarding the return of chemicals and containers, or contact us there if you have further questions.

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

14. REGULATORY INFORMATION

SARA 302 Components
No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
No SARA Hazards

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

CAS-No. Revision Date

Copper	7440-50-8	1989-08-11

New Jersey Right To Know Components

	CAS-No.	Revision Date
Copper	7440-50-8	1989-08-11
Graphene	1034343-98-0	

California Prop. 65 Components

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

16. OTHER INFORMATION

Further information

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. General Graphene Corporation shall not be held liable for any damage resulting from handling or from contact with the above product.