



SAFETY DATA SHEET

Trade name: Graphene Suspension

Revised September, 2021 GP 2.0.c

1. Identification of the substance/mixture and of the company/undertaking


1.1 Product identifier:

Product Name Graphene suspension
 Product Code S-MK15

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

Relevant identified uses of the Additive for enhancing physical properties.
 product

1.3 Details of the supplier of the safety data sheet

Manufacturer/ Supplier Enerage Inc. 
 Address No.5, Ligong 3rd Rd., Wujie Township, Yilan County 26841, Taiwan, R.O.C.
 Phone number 886-3-990-2100
 Fax 886-3-990-2500

1.4 Emergency phone number 886-3-990-2100

2. Hazards identification

GHS classification and label elements of the product

2.1 Classification of the substance or mixture

Physical and Chemical hazards	Flammable liquids	Category 2
Health hazards	Serious Eye Damage/Eye Irritation	Category 2
	Specific target organ toxicity, single exposure, central nervous system	Category 3

2.2 Label elements



Signal word Danger
 Hazard statements H225 Highly flammable liquid and vapor.
 H319 Causes serious eye irritation.
 H336 May cause drowsiness or dizziness.

Precautionary statements

Prevention

P102 Keep out of reach of children
 P201 Obtain special instructions before use
 P202 Do not handle until all safety precautions have been read and understood
 P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking
 P211 Do not spray on an open flame or other ignition source.
 P233 Keep container tightly closed.



SAFETY DATA SHEET

Trade name: Graphene Suspension

Revised September, 2021 GP 2.0.c

- P240 Ground/bond container and receiving equipment.
- P241 Use explosion-proof electrical/ventilating/lighting/.../equipment
- P242 Use only non-sparking tools.
- P243 Take precautionary measures against static discharge.
- P261 Avoid breathing dust/fume/gas/mist/vapours/spray.
- P270 Do no eat, drink or smoke when using this product
- P271 Use only outdoors or in a well-ventilated area.
- P272 Contaminated work clothing should not be allowed out of the workplace.
- P273 Avoid release to the environment.
- P280 Wear protective gloves/protective clothing/eye protection/face protection
- P281 Use personal protective equipment as required.
- P284 Wear respiratory protection
- P285 In case of inadequate ventilation wear respiratory protection

Response

P301 IF SWALLOWED

P330 Rinse mouth.

P331 Do NOT induce vomiting.

P313 Get medical advice/attention

P303 IF ON SKIN (or hair)

P351 Rinse cautiously with water for several minutes.

P352 Wash with plenty of soap and water.

P353 Rinse skin with water/shower.

P304 IF INHALED

P314 Call a POISON CENTER/doctor if you feel unwell.

P340 Remove victim to fresh air and keep at rest in a position comfortable for breathing.

P305 IF IN EYES

P338 Remove contact lenses, if present and easy to do. Continue rinsing.

P351 Rinse cautiously with water for several minutes.

P337 If eye irritation persists

P313 Get medical advice/attention.

P370 In case of fire

P374 Fight fire with normal precautions from a reasonable distance.

P376 Stop leak if safe to do so.

P378 Use dry chemical powder or dry sand to extinguish.

Supplemental Hazard information (EU)

EUH066 Repeated exposure may cause skin dryness or cracking.

Storage

P402 Store in a dry place.

P403 Store in a well-ventilated place.

P404 Store in a closed container.

P405 Store locked up.



SAFETY DATA SHEET

Trade name: Graphene Suspension

Revised September, 2021 GP 2.0.c

Disposal P501 Dispose of contents/ container to an approved waste disposal plant.

2.3 Other hazards This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

3. Composition/information on ingredients

<u>Chemical name</u>	<u>CAS No.</u>	<u>Content (wt%)</u>
Methyl Ethyl Ketone (MEK)	78-93-3	70~95 wt%
Graphene	1034343-98-0	5~30 wt%

4. First-aid measures

4.1 Descriptions of first-aid measures

General measures In the case of prolonged irritation or other adverse effects, contact a doctor.

IF ON SKIN (or hair) Wash with soap and water.
If skin irritation occurs, get medical advice/ attention.
Contaminated clothing should be removed and washed thoroughly before re-use.

IF INHALED Remove from exposure to fresh air and call a poison center/ doctor to get medical advice/ attention.
If breathing is difficult, administer oxygen.
If breathing has stopped, begin artificial respiration immediately, and seek medical attention.

IF IN EYES Flush eyes with water for at least 15 minutes.
If easy to do, remove contact lens.
Get medical attention

IF SWALLOWED Rinse mouth with water and consult a physician.
Never give anything to an unconscious person.

4.2 Most important symptoms/ effects, acute and delayed

Symptoms/effects after inhalation Irritation of the nasal mucous membranes. Nausea. Headache.
Exposure to high concentrations Central nervous system depression.
Dizziness. Mental confusion. Narcosis. Disturbances of consciousness.

Symptoms/effects after skin contact Red Skin.
On continuous exposure/contact Dry skin. Cracking of the skin.

Symptoms/effects after eye contact Irritation of the eye tissue.
Inflammation/damage of the eye tissue.

Symptoms/effects after ingestion



SAFETY DATA SHEET

Trade name: Graphene Suspension

Revised September, 2021 GP 2.0.c

After ingestion of high quantities

Symptoms similar to those listed under inhalation.
Risk of aspiration pneumonia.

Chronic symptoms

On continuous/repeated exposure/contact

Dry skin. Itching. Skin rash/inflammation.

4.3 Indication of immediate medical attention and special treatment needed.

Treatment

No additional information available

5. Fire-fighting measures

5.1 Extinguishing media

Suitable extinguishing media

Carbon dioxide, dry chemical powder or alcohol resistant foam.

Unsuitable extinguishing media

Do NOT use heavy water stream.

5.2 Specific 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).

Vapors may form explosive mixtures with air.

May be ignited by sparks.

Flash back possible over considerable distance.

Peroxidation resulting in increased fire or explosion risk

Reacts violently with (strong) oxidizers: (increased) risk of fire/explosion

Violent to explosive reaction with many compounds e.g.: with (some) halogens compounds, alcohols and with (some) acids/bases.

5.3 Advice for firefighters

Special protective equipment and precautions for fire-fighters

Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA.

Specific fire-fighting measures

Cool containers exposed to flames with water until well after the fire is out.

In case of fire and/or explosion do not breathe fumes.

Keep away from any heat source or electronic circuits.

6. Accidental release measures

6.1 Personnel precautions, protective equipment and emergency procedures

Evacuate personnel to safe areas.

Remove all sources of ignition if safe to do.

Should wear suitable protective equipment to prevent inhalation or skin contact.

Should beware of the risk of slippage due to the material's low coefficient of friction.

Keep upwind.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so.

Do not contaminate water sources or sewer.

Avoid discharge into drains, water courses or onto the ground



SAFETY DATA SHEET

Trade name: Graphene Suspension

Revised September, 2021 GP 2.0.c

6.3 Methods and materials for containment and cleaning up
Collect spillage with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations.

Do not discharge into storm or sanitary sewers or groundwater.

7. Handling and storage

7.1 Precautions for safe handling

Preventive measures

(Exposure Control for handling personnel)

Do not breathe dust/fume/gas/mist/vapors/spray.

Avoid breathing dust/fume/gas/mist/vapors/spray.

(Protective measures against fire and explosion)

Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

Ground/bond container and receiving equipment.

Use explosion-proof electrical/ventilating/lighting equipment.

Use only non-sparking tools.

Take precautionary measures against static discharge.

Safety Measures/Incompatibility

Obtain special instructions before use.

Do not handle until all safety precautions have been read and understood.

Use only outdoors or in a well-ventilated area.

Wear protective gloves and face protection.

Use personal protective equipment as required.

Remove contaminated clothing and wash the skin thoroughly with soap and water after work.

7.2 Conditions for safe storage, including any incompatibilities

Recommendation for storage

Store in a well-ventilated place and keep cool.

Keep container tightly closed

Store locked up.

Graphene is electrically conductive. Avoid accumulations of graphene in places where these accumulations could cause shorting of electrical switches, circuits or components since any dust can form a potentially explosive mixture in air.

8. Exposure controls/personal protection

8.1 Engineering controls

Provide adequate workplace ventilation. If vapor/dusts are generated through handling, local exhaust ventilation should be employed.

Eye wash facilities and emergency shower must be available when handling this product.

Respiratory protection may be needed for non-routine or emergency situations.

8.2 Exposure controls



SAFETY DATA SHEET

Trade name: Graphene Suspension

Revised September, 2021 GP 2.0.c

<u>Components</u>	<u>Type</u>	<u>Exposure limit(s)</u>	<u>Source</u>
Methyl Ethyl Ketone	TWA	200 ppm	US. ACGIH
	STEL	300 ppm	US. ACGIH
	PEL TWA	590 mg/m ³	US. OSHA
	PEL TWA	200 ppm	US. OSHA

8.3 Personal protective Equipment

General

Ensure good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions.

If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits.

If exposure limits have not been established, maintain airborne levels to an acceptable level.

An eye wash and safety shower must be available in the immediate work area.

Respiratory protection

To minimize risk of over exposure to dust, vapor 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/face protection

Wear suitable safety eyeglasses or chemical protective goggles or other face protection.

Skin and body protection

Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place.

Hand 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.

Hygiene

Do not eat, drink or smoke when using the product.

Wash hands after handling.

Observe good industrial hygiene practices.

9. Physical and Chemical Properties

9.1 Information on basic physical and chemical properties

Appearance	Liquid to paste
Color	Gray to black
Odor	Characteristic
Odor threshold	No data available
pH	No data available



SAFETY DATA SHEET

Trade name: Graphene Suspension

Revised September, 2021 GP 2.0.c

Melting point	Methyl Ethyl Ketone: -86°C; Graphene: >3600°C
Initial boiling point	Methyl Ethyl Ketone: 79.6°C
Flash point	Methyl Ethyl Ketone: -6°C Closed cup
Auto-ignition temperature	Methyl Ethyl Ketone: 404 °C; Graphene: dispersed dust cloud: >600°C
Flammability (solid, gas)	Methyl Ethyl Ketone: Class IB Flammable Liquid
Flammable limit	1.5~11.5 %(V)
Evaporation rate	6 (butyl acetate=1)
Vapor density	2.4
Vapor pressure	121 hPa @ 25 °C
Decomposition temperature	No data available
Density	0.8~1.0 g/cm ³ @20°C
Solubility in water	Methyl Ethyl Ketone: 28 g/100ml; Graphene: Insoluble
Solubility (other)	Methyl Ethyl Ketone: Complete in ethanol Methyl Ethyl Ketone: Complete in ether Methyl Ethyl Ketone: Complete in acetone
Partition coefficient (n-Octanol/water)	Methyl Ethyl Ketone: log Pow: 0.3

10. Stability and Reactivity

10.1 Reactivity	Vapor may form explosive mixture with air.
10.2 Chemical stability	No decomposition if stored and applied as directed.
10.3 Possibility of hazardous reactions	No dangerous reaction known under conditions of normal use.
10.4 Conditions to avoid	Heat, flames and sparks.
10.5 Incompatible materials	Strong oxidizing agents.
10.6 Hazardous decomposition products	Mainly carbon oxides occur under high temperature/fire conditions.

11. TOXICOLOGICAL INFORMATION

11.1 Information on the likely routes of exposure

Inhalation	Causes irritation
Ingestion	Causes irritation
Skin contact	Causes mild skin irritation.
Eye contact	Causes serious eye irritation.

11.2 Symptoms related to the physical, chemical and toxicological characteristics

Inhalation	Irritation of the nasal mucous membranes. Nausea. Headache.
Exposure to high	Irritation of the respiratory tract.



SAFETY DATA SHEET

Trade name: Graphene Suspension

Revised September, 2021 GP 2.0.c

concentrations	Central nervous system depression. Dizziness. Mental confusion. Narcosis. Disturbances of consciousness
Ingestion	
After ingestion of high quantities	Symptoms similar to those listed under inhalation. Risk of aspiration pneumonia.
Skin contact	Red skin.
On continuous exposure/contact	Dry skin. Cracking of the skin.
Eye contact	Irritation of the eye tissue. Inflammation/damage of the eye tissue.
Chronic symptoms	
On continuous/repeated exposure/contact	Dry skin. Itching. Skin rash/inflammation.
11.3 Information on toxicological effects	
Acute toxicity	
Dermal	LD 50, Rabbit: 6,480 mg/kg
Oral	LD 50, Rat: 2,737 mg/kg
Inhalation	LC 50, Mouse: 4 h: 32,000 mg/m ³
Skin Corrosion/Irritation	OECD Test Guideline 404, Rabbit: No skin irritation.
Serious Eye Damage/Eye Irritation	OECD Test Guideline 405, Rabbit: Irritation to eyes.
Respiratory or skin sensitization	No data available.
Germ cell mutagenicity	
in vitro	No data available.
in vivo	No data available.
Carcinogenicity	No components of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
Reproductive toxicity	No data available.
Specific target organ toxicity	
Single exposure	No data available.
Repeated exposure	No data available.
Aspiration hazard	No data available.
Other effects	No data available.

12. Ecological Information

12.1 Ecotoxicity



SAFETY DATA SHEET

Trade name: Graphene Suspension

Revised September, 2021 GP 2.0.c

Fish

Specific substance(s)

Methyl ethyl ketone LC 50, Pimephales promelas, 96 h: 2,993 mg/l

Aquatic invertebrates

Specific substance(s)

Methyl ethyl ketone LC 50, Water flea (Daphnia magna) 48 h: > 520 mg/l

EC 50, Water flea (Daphnia magna), 24 h: 7,060 mg/l

Algae

Specific substance(s)

Methyl ethyl ketone EC50, Pseudokirchneriella subcapitata (green algae), 96h: >100 mg/l

12.2 Persistence and degradability

Biodegradation

Readily biodegradable in water. Biodegradable in the soil. Biodegradable in the soil under anaerobic conditions.

BOD

2.03 g O₂/g

COD

2.31 g O₂/g

ThOD

2.44 g O₂/g

BOD/ThOD (%)

> 0.5 (5 days)

12.3 Bioaccumulative potential

Bioaccumulation

No bioaccumulation is to be expected (log Pow <= 4).

Bioconcentration factor (BCF)

No data available on bioaccumulation.

Partition coefficient

Log Kow: 0.3

n-octanol/water

12.4 Mobility in soil

The product is water soluble and may spread in water systems.

Surface tension

0.024 N/m (20 °C)

Log Koc

Koc,34; Calculated value

Ecology - soil

Slightly harmful to plants.

12.5 Results of PBT and vPvB assessment

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

12.6 Other adverse effects

The product components are not classified as environmentally hazardous. However, this does not exclude the possibility that large or frequent spills can have a harmful or damaging effect on the environment.

13. Disposal considerations

13.1 Waste Code

No data available.

13.2 Disposal methods

Dispose of only in accordance with local, state, and federal regulations. Do not



SAFETY DATA SHEET

Trade name: Graphene Suspension

Revised September, 2021 GP 2.0.c

contaminate any lakes, streams, ponds, groundwater or soil.

No mixing with other waste.

Leave chemicals in original containers.

13.3 Empty containers

Empty containers retain product residue (liquid and/or vapor) and can be dangerous. DO NOT PRESSURIZE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION; THEY MAY EXPLODE AND CAUSE INJURY OR DEATH. Empty drums should be completely drained, triple-rinsed, properly bunged and promptly returned to a drum reconditioner, or properly disposed.

14. Transport Information

ADR

UN number	UN 1193
Proper shipping name	Methyl Ethyl Ketone
Class	3
Packing group	II, F1

RID

UN number	UN 1193
Proper shipping name	Methyl Ethyl Ketone
Transport hazard class	3
Packing group	II, F1

ADNR

UN number	UN 1193
Proper shipping name	Methyl Ethyl Ketone
Transport hazard class	3
Packing group	II, F1

DOT (U.S. Department of Transportation)

UN number	UN 1193
UN proper shipping name	Methyl Ethyl Ketone
Transport hazard class(es)	
Class	3
Label(s)	3
Packing group	II
Material pollutant	No data available.
Special precaution for user	No data available.

IATA (International Air Transport Association)



SAFETY DATA SHEET

Trade name: Graphene Suspension

Revised September, 2021 GP 2.0.c

UN number	UN 1193	
UN proper shipping name	Methyl Ethyl Ketone	
Transport hazard class(es)		
Class	3	3
Label(s)	3	3
Packing group	II	
Material pollutant	No data available.	
Special precaution for user	No data available.	

IMDG (International Maritime Dangerous Goods)

UN number	UN 1193
UN proper shipping name	Methyl Ethyl Ketone
Transport hazard class(es)	
Class	3
Label(s)	3
EmS No.	F-E, S-D
Packing group	II
Material pollutant	No data available.
Special precaution for user	No data available.

14.1 Environmental hazards

MARPOL Annex III - Prevention of pollution by harmful substances

Marine pollutants (yes/no) no

14.2 Special precautions for user No data available.

14.3 Transport in bulk according to Annex II of MARPOL73/78 and IBC Code

Ship type 3
Pollution category Z

15. Regulatory Information

U.S. Federal Regulations

TSCA Inventory Listing

Components	CAS No.
2-Butanone	78-93-3

SARA 302 Status

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

SARA 311/312 Classification

“Fire hazard”. “Immediate (acute) health hazard”

SARA 313 Chemical



SAFETY DATA SHEET

Trade name: Graphene Suspension

Revised September, 2021 GP 2.0.c

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.

U.S. EPA CERCLA Hazardous Substance (40 CFR 302)

<u>Components</u>	<u>RCRA Waste No.</u>	<u>Reportable Quantity</u>
2-Butanone	U159	5,000LB

International Regulations

WHMIS Classification

Flammable liquids	Category 2
Eye irritation	Category 2A
Specific target organ toxicity-single exposure	Category 3A (Narcotic effects)

European Union

Classification according to Regulation (EU) 1272/2008.

Flammable liquids	Category 2
Eye irritation	Category 2A
Specific target organ toxicity-single exposure	Category 3A (Narcotic effects)

Inventory status

Australia	Inventory of Chemical Substances (AICS)	On or in compliance with the inventory
Japan	Inventory of Existing and New Chemical Substances (ENCS)	On or in compliance with the inventory
Japan	ISHL- Inventory of Chemical Substances	On or in compliance with the inventory
Canada	Domestic Substances List (DSL) Inventory	On or in compliance with the inventory
Philippines	Inventory of Chemicals/ Chemical Substances (PICCS)	On or in compliance with the inventory
Korea	Existing Chemicals Inventory (KECI)	On or in compliance with the inventory
China	Inventory of Existing Chemical Substances (IECSC)	On or in compliance with the inventory
New Zealand	Inventory of Chemical Substances	On or in compliance with the inventory
Taiwan	National Existing Chemical Inventory (NECI)	On or in compliance with the inventory

16. Other Information

Hazard Ratings

	<u>Health</u>	<u>Flammability</u>	<u>Physical Hazard/ Instability</u>
HMIS	2	3	0
NFPA	2	3	0

Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe; RNP - Rating not possible

Date of the latest revision 2021/04/13

DISCLAIMER:



SAFETY DATA SHEET

Trade name: Graphene Suspension

Revised September, 2021 GP 2.0.c

This information 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 representation, guarantee or warranties of any kind are made as to its accuracy, suitability for a particular application etc. It is up to the user/distributor to ensure that the information contained in the material safety data sheet is relevant to the product manufactured or sold as the case may be. Enerage Inc. makes no warranties, expressed or implied, in respect of the adequacy of this document for any particular purpose.



Graphage