



SAFETY DATA SHEET

Trade name: Graphene Suspension

Revised 2023

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


1.1 Product identifier:

Product Name Graphene suspension
 Product Code S-EA60

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 | Skin Corrosion/Irritation | Category 3 |
| | Serious Eye Damage/Eye Irritation | Category 2A |
| | Specific target organ toxicity, single exposure | Category 3 (Narcotic effects) |

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.
 EUH066 Repeated exposure may cause skin dryness or cracking.

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.



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- P233 Keep container tightly closed.
- P240 Ground/bond container and receiving equipment.
- P242 Use only non-sparking tools.
- P243 Take precautionary measures against static discharge.
- P261 Avoid breathing dust/fume/gas/mist/vapours/spray.
- P264 Wash hand thoroughly after handling.
- 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.
 - P313 Get medical advice/attention.
- 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 water, carbon dioxide, dry chemical powder or alcohol resistant foam to extinguish.

Storage

- P402 Store in a dry place.
- P403 Store in a well-ventilated place.
- P404 Store in a closed container.
- P405 Store locked up.



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

3. Composition/information on ingredients

| <u>Chemical name</u> | <u>CAS No.</u> | <u>EC No.</u> | <u>Index No.</u> | <u>Content (wt%)</u> |
|----------------------|----------------|---------------|------------------|----------------------|
| Ethyl acetate | 141-78-6 | 205-500-4 | 607-022-00-5 | 80~95 |
| Graphene | 1034343-98-0 | 801-282-5 | | 5~20 |

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 May cause irritation to skin, eyes and respiratory tract.

Hazards No information about adverse effects due to exposure

4.3 Indication of immediate medical attention and special treatment needed.

Treatment Symptoms may be delayed. Treat symptomatically.

5. Fire-fighting measures

5.1 Extinguishing media

Suitable extinguishing media Water, carbon dioxide, dry chemical powder or alcohol resistant foam.

Unsuitable extinguishing media No data available

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).

Flammable liquid and vapor.

Can be ignited easily and burns vigorously.

Vapors may cause a flash fire or ignite explosively.



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Vapors may travel considerable distance to a source of ignition and flash back.
Prevent buildup of vapors or gases to explosive concentrations.

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.

Water may be ineffective in fighting the fire.

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

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.



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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

| <u>Components</u> | <u>Type</u> | <u>Exposure limit(s)</u> | <u>Source</u> |
|-------------------|-------------|---------------------------------|---|
| Ethyl acetate | TWA | 400 ppm | US. ACGIH Threshold Limit Values (2011) |
| | REL | 400 ppm 1,400 mg/m ³ | US. NIOSH: Pocket Guide to Chemical Hazards (2010) |
| | PEL | 400 ppm 1,400 mg/m ³ | US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006) |
| | TWA | 400 ppm 1,400 mg/m ³ | US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989) |
| | TWA | 400 ppm 1,400 mg/m ³ | US. Tennessee. OELs. Occupational Exposure Limits, Table Z1A (06 2008) |
| | ST ESL | 1,400 µg/m ³ | US. Texas. Effects Screening Levels (Texas Commission on Environmental Quality) (02 2013) |
| | AN ESL | 1,440 µg/m ³ | US. Texas. Effects Screening Levels (Texas Commission on Environmental Quality) (12 2010) |
| | ST ESL | 390 ppb | US. Texas. Effects Screening Levels (Texas Commission on Environmental Quality) (02 2013) |
| | AN ESL | 400 ppb | US. Texas. Effects Screening Levels (Texas Commission on Environmental Quality) (12 2010) |
| | TWA PEL | 400 ppm 1,400 mg/m ³ | US. California Code of Regulations, Title 8, Section |



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5155. Airborne Contaminants (08 2010)

8.3 Personal protective Equipment

General

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 | |
| Color | Gray to black | |
| Odor | Easter-like | |
| Odor threshold | No data available | |
| pH | No data available | |
| Melting point | Ethyl acetate: -83°C; Graphene: >3600°C | |
| Initial boiling point | Ethyl acetate: 77°C | |
| Flash point | Ethyl acetate: -4°C | Closed cup |
| Auto-ignition temperature | Ethyl acetate: 426 °C | |



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| | |
|--|---|
| | Graphene: dispersed dust cloud: >600°C |
| Flammability (solid, gas) | Ethyl acetate: Class IB Flammable Liquid |
| Flammable limit | 2~11.5 %(V) |
| Evaporation rate | 4.1 6 (butyl acetate=1) |
| Vapor density | 1.2 |
| Vapor pressure | 98 hPa @ 20 °C; 12.43 hPa @ 25 °C |
| Decomposition temperature | No data available |
| Density | 0.9~1.0 g/cm ³ @20°C |
| Solubility in water | Ethyl acetate: 60-80 g/l; Graphene: Insoluble |
| Solubility (other) | No data available |
| Partition coefficient (n-Octanol/water) | 0.73 |

10. Stability and Reactivity

| | |
|---|--|
| 10.1 Reactivity | Stable under recommended storage conditions. |
| 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, Alkali metals, Strong acids, Nitrates. |
| 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 | May cause irritation to the respiratory system. May cause drowsiness or dizziness. |
| Ingestion | Irritating. May cause nausea, stomach pain and vomiting. |
| Skin contact | Causes mild skin irritation. |
| Eye contact | Causes serious eye irritation. |

11.2 Symptoms related to the physical, chemical and toxicological characteristics

| | |
|--------------|--------------------|
| Inhalation | No data available. |
| Ingestion | No data available. |
| Skin contact | No data available. |
| Eye contact | No data available. |

11.3 Information on toxicological effects

| | |
|----------------|-------------------------------|
| Acute toxicity | |
| Dermal | LD 50, Rabbit: > 20,000 mg/kg |



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| | |
|-----------------------------------|--|
| Oral | LD 50, Rat: 5.6 g/kg |
| Inhalation | LD 50, Rat, 4 h: 4,000 ppm |
| Skin Corrosion/Irritation | Causes mild skin irritation. |
| Serious Eye Damage/Eye Irritation | Causes serious eye irritation. |
| Respiratory or skin sensitization | Not a skin sensitizer. |
| Germ cell mutagenicity | |
| in vitro | Ames test, Salmonella typhimurium; with and without metabolic activation: Did not show mutagenic effects (literature value) |
| in vivo | No mutagenic components identified. |
| Carcinogenicity | This substance has no evidence of carcinogenic properties. |
| Reproductive toxicity | No components toxic to reproduction |
| Specific target organ toxicity | |
| Single exposure | The substance or mixture is classified as specific target organ toxicant, single exposure, category 3 with narcotic effects. |
| Repeated exposure | No data available. |
| Aspiration hazard | No data available. |
| Other effects | No data available. |

12. Ecological Information

12.1 Ecotoxicity

| | |
|-----------------------|---|
| Specific substance(s) | Ethyl acetate |
| Fish | LC 50, Pimephales promelas, 96 h: 230 mg/l LC 50, Oncorhynchus mykiss, 96 h: 230 - 500 mg/l EC 50, Pimephales promelas, 96 h: 220 mg/l LC 50, Heteropneustes fossilis, 96 h: 212.5 mg/l LOAEL, Pimephales promelas, 96 h: 19.4 mg/l |
| Aquatic invertebrates | EC 50, Brine shrimp (Artemia salina), 24 h: 306.9 - 389.9 mg/l LC 50, Water flea (Daphnia magna), 48 h: 560 - 819 mg/l LC 50, Hydra (Hydra oligactis), 48 h: 1,350 mg/l LC 50, Water flea (Daphnia cucullata), 48 h: 154 - 175 mg/l EC 50, Water flea (Daphnia magna), 48 h: 610 - 799 mg/l |
| Algae | EC50, Desmodesmus subspicatus (green algae), 72h: >100 mg/l |

12.2 Persistence and degradability

| | |
|----------------|--|
| Biodegradation | Expected to be readily biodegradable. |
| BOD/ThBOD | OECD Test Guideline 301B (28 d): > 60 % (literature value) |



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12.3 Bioaccumulative potential

| | |
|--|--|
| Bioaccumulation | No bioaccumulation is to be expected (log Pow <= 4). |
| Bioconcentration factor (BCF) | No data available on bioaccumulation. |
| Partition coefficient n-octanol/water | Log Kow: 0.73 |

12.4 Mobility in soil

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

12.5 Results of PBT and vPvB assessment

The substance is not PBT / vPvB

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

U112 - Ethyl Acetate - (RQ 5,000 LB).D001 - Ignitability (RQ 100 LB). This product has the RCRA characteristic of ignitability. Re-evaluation of the product may be required by the user at the time of disposal, since the product uses, transformations, mixtures, contamination, and spillage may change the classification.

13.2 Disposal methods

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

DOT (U.S. Department of Transportation)

| | |
|----------------------------|---------------|
| UN number | 1173 |
| UN proper shipping name | Ethyl Acetate |
| Transport hazard class(es) | |
| Class | 3 |
| Label(s) | 3 |
| Packing group | II |
| Material pollutant | No |



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Special precaution for user When shipped in quantities greater than 5,000 lbs, RQ must be added to the shipping description.

IATA (International Air Transport Association)

UN number 1173
 UN proper shipping name Ethyl Acetate
 Transport hazard class(es)

Class 3

Label(s) 3

Packing group II

Material pollutant No

Special precaution for user When shipped in quantities greater than 5,000 lbs, RQ must be added to the shipping description.

IMDG (International Maritime Dangerous Goods)

UN number 1173
 UN proper shipping name Ethyl Acetate
 Transport hazard class(es)

Class 3

Label(s) 3

EmS No. F-E, S-D

Packing group II

Material pollutant No

Special precaution for user When shipped in quantities greater than 5,000 lbs, RQ must be added to the shipping description.

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

Remarks No data available.

15. Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

Regulations on Labelling and Hazard Communication of Hazardous Chemicals

Regulations on Occupational Safety and Health Facilities

Standards for the Storage, Cleanup, Handling and Disposal of Industrial Waste

Establishment Standards and Safety Control Regulations for Manufacturing, Storing, Processing



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Public Hazardous Substances and Flammable Pressurized Gases Places
 Occupational Safety and Health Act
 Regulations on Occupational Safety and Health Facilities
 Waste Disposal Act
 Standards for the Storage, Cleanup, Handling and Disposal of Industrial Waste
 Regulations on Labelling and Hazard Communication of Hazardous Chemicals
 Exposure Assessment and Control Banding of Hazardous Chemicals
 Standards of Permissible Exposure Limits in Workplace
 Establishment Standards and Safety Control
 Regulations for Manufacturing, Storing, Processing
 Public Hazardous Substances and Flammable Pressurized Gases Places

International Regulations

WHMIS classification

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

European Union

Classification according to Regulation (EU) 1272/2008.
 Flammable liquids Category 2
 Eye irritation Category 2
 Specific target organ toxicity -
 single exposure Category 3 (Narcotic effects)

Inventory status

| | | |
|-------------|--|--|
| Australia | Inventory of Chemical Substances (AICS) | On or in compliance with the inventory |
| Japan | The inventory of existing and new chemical substances (ENCS) | On or in compliance with the inventory |
| EU | European Inventory of Existing Commercial Chemical Substances (EINECS) | On or in compliance with the inventory |
| EU | European List of Notified Chemical Substances (ELINCS) | On or in compliance with the inventory |
| EU | No-longer Polymers (NLP) | 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 |
| Mexico | National Inventory of Chemical Substances of Mexico (INSQ) | On or in compliance with the inventory |
| New Zealand | Inventory of Chemical Substances | On or in compliance with the inventory |



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Taiwan

National Existing Chemical Inventory (NECI)

On or in compliance with the inventory

16. Other Information

Full Text of H-Statements referred to under sections 2 and 3

- H225 Highly flammable liquid and vapor.
- H319 Causes serious eye irritation.
- H333 May be harmful if inhaled.
- H336 May cause drowsiness or dizziness.

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 2023/03/08

DISCLAIMER:

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.

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