



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-PA60

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	H225 Flammable liquids	Category 2
Health hazards	H319 Serious Eye Damage/Eye Irritation	Category 2A
	H336 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.
P233 Keep container tightly closed.



SAFETY DATA SHEET

Trade name: Graphene Suspension

Revised 2023

- 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.
- P264 Wash skin thoroughly after handling.
- P270 Do not 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.
- 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 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.

Disposal

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



SAFETY DATA SHEET

Trade name: Graphene Suspension

Revised 2023

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>
Isopropanol	67-63-0	200-661-7	603-117-00-0	85~95
Isopropyl alcohol				
Graphene	1034343-98-0	801-282-5		5~15

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).

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



SAFETY DATA SHEET

Trade name: Graphene Suspension

Revised 2023

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>
Graphene		No data available	
Isopropanol	TWA	400 ppm, 983 mg/m ³	Standards of Permissible Exposure Limits in Workplace
	STEL	500 ppm, 1228.75 mg/m ³	Standards of Permissible Exposure Limits in Workplace

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.



SAFETY DATA SHEET

Trade name: Graphene Suspension

Revised 2023

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	Alcohol-like
Odor threshold	No data available
pH	No data available
Melting point	Isopropanol: -89.5°C; Graphene: >3600°C
Initial boiling point	Isopropanol: 82°C
Flash point	12°C Closed cup
Auto-ignition temperature	Isopropanol: 425°C; Graphene: dispersed dust cloud: >600°C
Flammability (solid, gas)	No data available
Flammable limit	2~13.4 %(V)
Evaporation rate	No data available
Vapor density	1.0
Vapor pressure	43hPa @ 20°C
Decomposition temperature	No data available
Density	0.8 g/cm ³ @25°C
Solubility in water	Isopropanol: Miscible; Graphene: Insoluble
Solubility (other)	No data available
Partition coefficient (n-Octanol/water)	No data available

10. Stability and Reactivity

10.1 Reactivity Vapor may form explosive mixture with air.

10.2 Chemical stability Reacts with air to form peroxides.
No decomposition under standard ambient (room temperature).

10.3 Possibility of hazardous reactions No dangerous reaction known under conditions of normal use.

10.4 Conditions to avoid Flame, Heat, Spark.

10.5 Incompatible materials Strong oxidizing agents, Alkali metals, Strong acids Acid anhydrides, Halogenated



SAFETY DATA SHEET

Trade name: Graphene Suspension

Revised 2023

10.6 Hazardous decomposition products
compounds.
Mainly carbon oxides occur under high temperature/fire conditions.

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Specific substance(s)	Isopropanol
Acute toxicity	OECD Test Guideline 401, LD50 Oral, Rat, 5,840 mg/kg OECD Test Guideline 401, LD50 Oral, Rat male and female, 4h: 37.5 mg/l OECD Test Guideline 403, LD50 Dermal, Rabbit, 12,8000 mg/kg, RTECS
Skin toxicity	OECD Test Guideline 404, Skin, Rabbit, 4h: No skin irritation
Serious eye damage/eye irritation	OECD Test Guideline 405 (Regulation (EC) No 1272/2008, Annex VI), Eyes, Rabbit, Eye irritation,
Respiratory or skin sensitization	OECD Test Guideline 406, Guinea pig, Result: Negative.
Germ cell mutagenicity	OECD Test Guideline 471, Ames test, <i>S. typhimurium</i> , with and without metabolic activation, Result: Negative OECD Test Guideline 476, In vitro mammalian cell gene mutation test, Chinese hamster ovary cells, with and without metabolic activation, Result: Negative OECD Test Guideline 474, In vivo micronucleus test, Mouse, Bone marrow, Intraperitoneal injection, Result: Negative
Carcinogenicity	This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.
Reproductive toxicity	No data available.
Specific target organ toxicity-single exposure	Inhalation, Oral - May cause drowsiness or dizziness. - Central nervous system Remarks: Classified according to Regulation (EU) 1272/2008, Annex VI (Table 3.1/3.2)
Specific target organ toxicity-repeated exposure	No data available.
Aspiration hazard	No data available.
Specific substance(s)	Graphene
Acute toxicity	OECD Test Guideline 403, LD50 Inhalation, Rat male and female, 4h: 2.000 mg/m ³ OECD Test Guideline 423, LD50 Oral, Rat female, >2.000 mg/kg
Skin toxicity	OECD Test Guideline 404, Skin, Rabbit, No skin irritation
Serious eye damage/eye irritation	OECD Test Guideline 405, Eyes, Rabbit, No eye irritation
Respiratory or skin	OECD Test Guideline 429, Mouse, Did not cause sensitization on laboratory animals



SAFETY DATA SHEET

Trade name: Graphene Suspension

Revised 2023

sensitization

Germ cell mutagenicity No data available. Ames test, *S. typhimurium*, Result: negative

Carcinogenicity No data available.

IARC: 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.

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.

11.2 Additional Information

Specific substance(s) Graphene

Repeated dose toxicity NOAEL (no observed adverse effect level), Feed, Rat male, 813/mg/kg

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

BOD/ThBOD No data available.

12. Ecological Information

12.1 Ecotoxicity

Specific substance(s) Graphene

Fish OECD Test Guideline 203, Flow-through test, LC 50, *Pimephales promelas* (fathead minnow), 96 h: 9,640 mg/l

Aquatic invertebrates EC 50, *Daphnia magna* (Water flea), 48 h: 13,299 mg/l, IUCLID

Algae IC50, *Desmodesmus subspicatus* (green algae), 72h: >1,000 mg/l, IUCLID

Bacteria EC5, *Pseudomonas putida*, 16h: 1,050 mg/l, Lit.

Specific substance(s) Graphene

Fish OECD Test Guideline 203, Semi-static test, LC 50, *Danio rerio* (zebra fish), 96 h: >100 mg/l

Aquatic invertebrates OECD Test Guideline 202, Static test, EC 50, *Daphnia magna* (Water flea), 48 h: >100 mg/l

Algae OECD Test Guideline 201, Static test, EC50, *Pseudokirchneriella subcapitata*, 72h: >100 mg/l

12.2 Persistence and degradability

Biodegradability (Directive 67/548/EEC, Annex V, C.6), Aerobic, Exposure 5d, Result: 53% Readily biodegradable.

Theoretical oxygen demand 2,400 mg/g, Lit.



SAFETY DATA SHEET

Trade name: Graphene Suspension

Revised 2023

BOD/ThBOD	49%, IUCLID
12.3 Bioaccumulative potential	
Bioaccumulation	No data available.
Bioconcentration factor (BCF)	No data available.
Partition coefficient n-octanol/water	No data available.
12.4 Mobility in soil	The product is water soluble and may spread in water systems.
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	No data available.
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 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	1219.
UN proper shipping name	ISOPROPANOL
Transport hazard class(es)	
Class	3
Label(s)	No data available.
Packing group	II
Marine pollutant	No
Special precaution for user	No data available.

IATA (International Air Transport Association)

UN number	1219
-----------	------



SAFETY DATA SHEET

Trade name: Graphene Suspension

Revised 2023

UN proper shipping name	Isopropanol	
Transport hazard class(es)		
Class	3	3
Label(s)	No data available.	3
Packing group	II	
Marine pollutant	No	
Special precaution for user	No data available.	

IMDG (International Maritime Dangerous Goods)

UN number	1219
UN proper shipping name	ISOPROPANOL.
Transport hazard class(es)	
Class	3
Label(s)	No data available.
EmS No.	No data available.
Packing group	II
Marine pollutant	No
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

Remarks No data available.

15. Regulatory Information

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

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

Rules on Road Traffic Safety

Standards of Permissible Exposure Limits in Workplace

Rules on the Prevention of Poisoning from Organic Solvents.

Establishment Standards and Safety Control



SAFETY DATA SHEET

Trade name: Graphene Suspension

Revised 2023

Regulations for Manufacturing, Storing, Processing Public Hazardous Substances and Flammable Pressurized Gases Places

15.2 Chemical Safety Assessment

For this product a chemical safety assessment was not carried out.

International Regulations

Inventory status

Australia	Inventory of Chemical Substances (AICS)	All Ingredients are listed.
Japan	The inventory of existing and new chemical substances (ENCS)	All Ingredients are listed.
Japan	List of Existing and New Chemical Substances (CSCL-ENCS)	All Ingredients are listed.
EU	European Inventory of Existing Commercial Chemical Substances (EINECS)	All Ingredients are listed.
EU	REACH Reg.	All Ingredients are listed.
Canada	Domestic Substances List (DSL) Inventory	All Ingredients are listed.
Philippines	Inventory of Chemicals/ Chemical Substances (PICCS)	All Ingredients are listed.
Korea	Existing Chemicals Inventory (KECI)	All Ingredients are listed.
China	Inventory of Existing Chemical Substances (IECSC)	All Ingredients are listed.
Mexico	National Inventory of Chemical Substances of Mexico (INSQ)	All Ingredients are listed.
New Zealand	Inventory of Chemical Substances	All Ingredients are listed.
Taiwan	National Existing Chemical Inventory (NECI)	All Ingredients are listed.

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.
H336	May cause drowsiness or dizziness.

Hazard Ratings

	<u>Health</u>	<u>Flammability</u>	<u>Physical Hazard/ Instability</u>
HMIS	1	3	0
NFPA	1	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



SAFETY DATA SHEET
Trade name: Graphene Suspension
Revised 2023

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