



# SAFETY DATA SHEET

## Trade name: Graphene Resin Additive

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 resin additive  
 Product Code                      C-EP08

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

Relevant identified uses of the              Additive in epoxy resin 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

Health hazards	Skin Corrosion/Irritation	Category 3
	Serious Eye Damage/Eye Irritation	Category 2B
	Skin sensitizer	Category 1

#### 2.2 Label elements



Signal word                      Warning

Hazard statements

H316 Cause mild skin irritation.  
 H317 May cause allergic skin reaction.  
 H320 Causes serious eye irritation.  
 H411 Toxic to aquatic life with long lasting effects.

#### 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.
- 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.
  - 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>Content (wt%)</u>
Bisphenol-A epoxy resin (number average molecular weight < 700)	25068-38-6	85~95
Graphene	1034343-98-0	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.
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### 5. Fire-fighting measures

#### 5.1 Extinguishing media

Suitable extinguishing media	Water, carbon dioxide, dry chemical powder or alcohol resistant foam.
Unsuitable extinguishing media	High pressure water jet.

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 (CO<sub>2</sub>).

Prevent buildup of vapors or gases to explosive concentrations.

#### 5.3 Advice for firefighters



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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
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



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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

No data available

### 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.



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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	Mild
Odor threshold	No data available
pH	No data available
Melting point	Resin: -16 °C (@ 1013 hPa); Graphene: >3600°C
Initial boiling point	Resin: No data available
Flash point	Resin: >250°C
Auto-ignition temperature	Resin: No data available; Graphene: dispersed dust cloud: >600°C
Flammability (solid, gas)	Resin: No data available
Flammable limit	No data available
Evaporation rate	No data available
Vapor density	Resin: <1 g/cm <sup>3</sup> (Air = 1)
Vapor pressure	Resin: 4.6x10 <sup>-8</sup> Pa (@ 25 °C)
Decomposition temperature	No data available
Density	1.1~1.2 g/cm <sup>3</sup> @20°C
Solubility in water	Resin: Practically insoluble; Graphene: Insoluble
Solubility (other)	No data available
Partition coefficient (n-Octanol/water)	2.64~3.78

### 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	Avoid static electricity discharge. Avoid temperatures above 300 °C - Potentially violent decomposition can occur above 350 °C.
10.5 Incompatible materials	Strong oxidizing agents, Strong base, Strong acids, Amines.
10.6 Hazardous decomposition	Mainly carbon oxides occur under high temperature/fire conditions.



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products Toxic fumes may be generated.

10.7 Hazardous polymerization Masses of more than one pound (0.5 kg) of product plus an aliphatic amine will cause irreversible polymerization with considerable heat build-up.

### 11. TOXICOLOGICAL INFORMATION

#### 11.1 Information on the likely routes of exposure

Inhalation -  
Ingestion -  
Skin contact -  
Eye contact -

#### 11.2 Symptoms related to the physical, chemical and toxicological characteristics

Inhalation Prolonged inhalation of high concentrations may damage respiratory system.  
Ingestion May cause sensitization or allergic reactions in sensitive individuals.  
May cause irritation.  
Skin contact Causes mild skin irritation.  
Eye contact Causes serious eye irritation.

#### 11.3 Information on toxicological effects

##### Acute toxicity

Dermal LD 50, Rat, >2,000 mg/kg  
Oral LD 50, 10,000~11,400 mg/kg body weight  
Inhalation No data available.

Skin Corrosion/Irritation Causes mild skin irritation.

Serious Eye Damage/Eye Irritation Causes serious eye irritation.

##### Irritation

Respiratory or skin sensitization No data available.

##### Germ cell mutagenicity

in vitro No data available.  
in vivo No data available.

Carcinogenicity No data available.

Reproductive toxicity No data available.

##### Specific target organ toxicity

Single exposure Not classified as a specific target organ toxicant after a single exposure.

Repeated exposure Not classified as a specific target organ toxicant after repeated exposure..

Aspiration hazard No data available.

Other effects No data available.

### 12. Ecological Information



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### 12.1 Ecotoxicity

#### Fish

##### Specific substance(s)

Bisphenol-A epoxy resin LC 50, semi-static, Oncorhynchus mykiss (Rainbow trout), 96 h: 1.3 mg/l

#### Aquatic invertebrates

##### Specific substance(s)

Bisphenol-A epoxy resin EC 50, Daphnia magna, 48 h: 2.1 mg/l  
NOEC, Daphnia magna, 21 days: 0.3 mg/l

#### Algae

##### Specific substance(s)

Bisphenol-A epoxy resin EC 50, static, Algae, 48h: 9.4 mg/l  
NOEC, static, Algae, 72h: 4.2 mg/l

### 12.2 Persistence and degradability

#### Biodegradation

Not readily biodegradable.  
Degradation: 12 % (28 d)  
Rate of hydrolysis: 117 hr @ 25 °C

#### BOD/ThBOD

No data available.

### 12.3 Bioaccumulative potential

#### Bioaccumulation

No data available.

#### Bioconcentration factor (BCF)

31

#### Partition coefficient

log Kow: 2.64-3.78.

#### n-octanol/water

### 12.4 Mobility in soil

Partition coefficient, soil, organic carbon/water (Koc): 445 at 20 °C

### 12.5 Results of PBT and vPvB assessment

This product does not contain any substances classified as PBT or vPvB.

### 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





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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

#### ADG (The Australian Dangerous Goods) Code

UN number	UN 3082
UN proper shipping name	Bisphenol A Epoxy Resin
Transport hazard class(es)	
Class	C2 Combustible Liquids - Flash Point >93°C, Closed Cup, Not Excluded Flammable
Label(s)	3Z
Packing group	No data available.
Subsidiary Risk	No data available.
EPG	47 Low To Moderate Hazard Substances
Special provision	AU01

#### Safe Transport of Dangerous Goods (NZS 5433)

UN number	UN 3082
UN proper shipping name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (Bisphenol A Epoxy Resin)
Transport hazard class(es)	
Class	9 Miscellaneous Dangerous Goods and Articles
Label(s)	3Z
Packing group	III
Subsidiary Risk	No data available.
EPG	47 Low To Moderate Hazard Substances
Special provision	AU01

#### DOT (U.S. Department of Transportation)

UN number	UN 3082
UN proper shipping name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (Bisphenol A Epoxy Resin)
Transport hazard class(es)	
Class	9 Miscellaneous Dangerous Goods and Articles
Label(s)	3Z
Packing group	III
ERG	171 Substances (Low to Moderate Hazard)



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Special precaution for user No data available.

IATA (International Air Transport Association)

UN number UN 3082

UN proper shipping name ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (Bisphenol A Epoxy Resin)

### Transport hazard class(es)

Class 9 Miscellaneous Dangerous Goods and Articles

Label(s) 3Z

Packing group III

Special precaution for user No data available.

### IMDG (International Maritime Dangerous Goods)

UN number UN 3082

UN proper shipping name ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (Bisphenol A Epoxy Resin)

### Transport hazard class(es)

Class 9 Miscellaneous Dangerous Goods and Articles

Label(s) 3Z

EmS No. F-A; S-F

Packing group III

Marine pollutant Yes

Special precaution for user No data available.

### 14.1 Environmental hazards

MARPOL Annex III - Prevention of pollution by harmful substances

Marine pollutants (yes/no) Yes

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.

### 14.4 Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

## 15. Regulatory Information

Hazard label Xi Irritating

R phrase R36/38 Irritating to eyes and skin.

R43 May cause sensitization by skin contact.

S phrase S26 In case of contact with eyes, rinse immediately with plenty of water and seek



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medical advice.

S28 After contact with skin, wash immediately with plenty of water and soap.

S37/39 Wear suitable gloves and eye/face protection.

Environmental Protection Authority (New Zealand)

Hazardous Substances and New Organisms Amendment Act 2015

Approval code HSR003180

International regulation

Montreal protocol Not applicable

Stockholm convention Not applicable

Rotterdam convention Not applicable

Kyoto protocol Not applicable

Inventory status

USA	The Toxic Substances Control Act (TSCA)	Not on or in compliance with the inventory
Australia	Inventory of Chemical Substances (AICS)	On or in compliance with the inventory
Japan	The inventory of existing and new chemical substances (ENCS)	Not on or in compliance with the inventory
EU	European Inventory of Existing Commercial Chemical Substances (EINECS)	Not on or in compliance with the inventory
EU	European List of Notified Chemical Substances (ELINCS)	Not on or in compliance with the inventory
Canada	Domestic Substances List (DSL) Inventory	Not on or in compliance with the inventory
Philippines	Inventory of Chemicals/ Chemical Substances (PICCS)	Not on or in compliance with the inventory
Korea	Existing Chemicals Inventory (KECI)	Not on or in compliance with the inventory
Mexico	National Inventory of Chemical Substances of Mexico (INSQ)	Not 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)	Not on or in compliance with the inventory

### 16. Other Information

Hazard Ratings

	<u>Health</u>	<u>Flammability</u>	<u>Physical Hazard/ Instability</u>
HMIS	No data available	No data available	No data available
NFPA	No data available	No data available	No data available

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:

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



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# Graphage