Material Safety Data Sheet
Inosine Monophosphate

Section 1 - Product Identification

Synonyms : Inosine 5'-monophosphate, 5'-inosinic acid, IMP
Molecular Weight : 348.21 g/mol
Chemical Formula : $C_{10}H_{13}N_4O_8P$
Company Identification : Tradeasia International Pte. Limited
Address : 133 Cecil Street # 12-03 Keck Seng Tower, Singapore
Tel: +65-6227 6365
Fax: +65-6225 6286
Email: contact@chemtradeasia.com

Recommended use of the chemical and restrictions on use

The product is used in industrial manufacturing, in particular in :

- Food additives

Section 2 – Composition/Information on Ingredients

The product contains greater than 98 percent (%) inosine monophosphate, $C_{10}H_{13}N_4O_8P$

Chemical Name	EC No/CAS No	Purity, %
Inosine 5'-monophosphate 5'-inosinic acid	131-99-7	min. 98.0

Section 3 – Hazards Identification

3.1 Classification of the substance according to GHS

IMP is not classifiable according to GHS.

3.3. Other hazards which do not result in classification

IMP is a white odourless, powdered substance that is not flammable, combustible, or explosive, and has low acute oral and dermal toxicity.

Potential health effects

Dermal exposure is the most significant route of exposure in occupational and other settings.

Inhalation

Occasional mild irritation effects to respiratory tract may occur from inhalation of IMP dusts.

Eye contact

IMP can be an eye irritant.

Skin contact

IMP may cause irritation to intact skin.

Ingestion

IMP may be harmful if swallowed in large amounts.

Potential ecological effects

There is no known effect on ecology.

Signs and symptoms of exposure

Symptoms of accidental over-exposure to IMP have been associated with dermal exposure or inhalation. These may include skin redness and irritation to respiratory tract.

Section 4 – First-Aid Measures

4.1. Description of first aid mesaures

Skin contact

Immediately wash skin with soap and plenty of water for at least 15 minutes. Remove contaminated clothing. Get medical attention if symptoms persist. Wash clothing before reuse

Eye contact

Use eye wash fountain or fresh water to cleanse eye. If irritation persists for more than 15 minutes, seek medical attention.

Inhalation

If symptoms such as nose or throat irritation are observed, remove to fresh air.

Ingestion

Wash mouth with plenty of fresh water if the person is conscious. If large amounts are swallowed (i.e. more than one teaspoon), contact a doctor or toxicity centre immediately.

Note to physicians

N.A

4.2. Most important symptoms and effects, both acute and delayed

N.A.

4.3. Indication of any immediate medical attention and special treatment needed

N.A.

Section 5 – Fire Fighting Measures

5.1. Suitable Extinguishing media

Any fire extinguishing media may be used on nearby fires.

5.2. Specific hazards arising from the chemical

Burning produces irritant fumes.

5.3. Special protective actions for fire-fighters

Full protective gears, self-constraint breathing apparatus.

Section 6 – Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Avoid dust formation. In case of exposure to prolonged or high level of airborne dust, wear a personal respirator in compliance with national legislation.

6.2. Environmental precautions

IMP is a slightly water-soluble white powder. Prevent product from entering drainage system.

6.3. Methods and material for containment and cleaning up

Land spill

Vacuum, shovel or sweep up IMP and place in containers for disposal in accordance with applicable local regulations. Avoid contamination of water bodies during clean up and disposal. Contain spill with inert material. No personal protective equipment is needed to clean up land spills.

Spillage into water

Where possible, remove any intact containers from the water. Advise local water authority that none of the affected water should be used for irrigation or for the abstraction of potable water until natural dilution returns to its normal environmental background level.

Section 7 – Handling and Storage

7.1. Precautions for safe Handling

To maintain package integrity and to minimise caking of the product, bags should be handled on a first-in first out basis. Good housekeeping and dust prevention procedures should be followed to minimise dust generation and accumulation. Your supplier can advise you on safe handling, please contact the supplier. The product should be kept away from strong reducing agents. Apply above handling advice when mixing with other substances.

7.2. Conditions for safe storage, including any incompatibilities

No special handling precautions are required, but dry, indoor storage is recommended. No specific requirements. Provide appropriate ventilation and store bags such as to prevent any accidental damage.

Section 8 – Exposure Controls/Personal Protection

8.1. Control parameters

Occupational exposure limits for dust (total and respirable). are treated by OSHA, Cal OSHA and ACGIH as "Particulate Not Otherwise Classifed" or "Nuisance Dust"

ACGIH/TLV 10 mg/m^3

Cal OSHA/PEL 10 mg/m^3

OSHA/PEL (total dust) 15 mg/m^3

OSHA/PEL (respirable dust) 5 mg/m^3

8.2. Appropriate engineering controls

Maintain air concentrations below occupational exposure standards.

Use local exhaust ventilation to keep airborne concentrations of IMP dust below permissible exposure levels. Wash hands before breaks and at the end of the workday. Remove and wash soiled clothing.

8.3. Individual protection measures, such as personal protective equipment (PPE)

Respiratory protection

In case of prolonged exposure to dust wear a personal respirator in compliance with national legislation (make
reference to the appropriate CEN standard)

Eyes and hands protection

Goggles and gloves are not required for normal industrial exposures, but may be warranted if environment is
excessively dusty.

Section 9 – Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Appearance : white solid crystalline powder
Odour : odourless
Odour threshold : N.A.
pH @ 20° C : 6
Melting point : 149-154° C
Boiling point : N.A
Flash point : Non flammable
Evaporation rate : N.A.
Flammability : N.A.
Upper/lower flammability or explosive limits : Non explosive
Vapour pressure : Negligible @ 20° C
Vapour density : N.A.
Relative density : N.A.
Solubility in water : 3.05 mg/mL
Partition coefficient: n-octanol/water : N.A
Auto-ignition temperature : N.A.
Decomposition temperature : 120° C
Viscosity : N.A.

9.2. Other information

Molecular weight :348.21 g/mol
Specific gravity : 1.81 @ 20° C

Section 10 – Stability and Reactivity

10.1. Reactivity

IMP is a stable product.

10.2. Chemical stability

IMP is a stable product, but when degrades at high pH and high temperature.

10.3. Possibility of hazardous reactions

Reaction with strong oxidizing agents.

10.4. Conditions to avoid:

Exposure to air or moisture for an extended period of time.

10.5. Incompatible materials

Avoid contact with strong oxidizing agents.

10.6. Hazardous decomposition products

Nitrogen oxides, potassium oxides, cyanide and ammonia.

Section 11 – Toxicological Information

11.1. Information on toxicological effect

11.1.1. Substances

Acute toxicity[(1)]

Low acute oral toxicity; LD50 in rats > 16 g/kg of body weight. (Biomedicals, 2006)

Skin corrosion / irritation[(2)]

Low acute dermal toxicity; LD50 in rats is greater than 3900mg/kg of body weight.

Serious eye damage/ irritation

IMP may be an eye irritant.

Respiratory or skin sensitization

IMP is a skin sensitizer.

Germcell mutagenicity

IMP is not mutagenic.

Carcinogenicity

IMP is not carcinegenic

Reproductive toxicity

IMP has no known reproductive toxicity.

STOT-single exposure

N.A.

STOT-repeated exposure

N.A.

Aspiration Hazard

IMP has no aspiration hazard.

Section 12 – Ecological Information

12.1.Toxicity

Inosine monophosphate does not have known toxicity.

Phytotoxicity

IMP has no known phytotoxicity. However, plants can be sensitive to high level of IMP. Care should be taken to minimise the amount of IMP released to the environment.

Algal toxicity

IMP has no known algal toxicity.

Invertebrate toxicity

IMP has no known invertebrate toxicity.

Fish toxicity

IMP has no known fish toxicity.

12.2. Persistence and degradability

IMP is naturally occurring and ubiquitous in the body. It can decompose to nitrogen oxides, potassium oxides and cyanide under high temperature.

12.3. Bioaccumulative potential

Not significantly bioaccumulative.

12.4. Mobility in soil

The product is soluble in water and is leachable through normal soil.

12.5. Other adverse effects

No Data Available

Section 13 – Disposal Considerations

13.1. Disposal methods

Small quantities of IMP can usually be disposed of at landfill sites. No special disposal treatment is required, but local authorities should be consulted about any specific local requirements. Tonnage quantities of product are not recommended to be sent to landfills. Such product should, if possible, be used for an appropriate application.

Section 14 – Transport Information

IMP has no UN Number, and is not regulated under international rail, road, water or air transport regulations.

14.1. UN number : N.A.

14.2. UN proper shipping name : N.A

14.3. Transport of hazard classes : N.A

14.4. Packing group : N.A

14.5. Environmental hazards : N.A.

14.6. Special precautions for user : N.A

14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: N.A.

Section 15 – Regulatory Information

15.1. Safety, health and environmental regulations

It should be noted that IMP are safe under conditions of normal handling and use, besides, they play a beneficial role in human body. CLP classification has been solely based on animal tests where animals were exposed to high doses of IMP over long periods of time. These doses were many times higher than humans are exposed to under conditions of normal handling and use. Consequently, a precautionary decision was taken by the European Commission. Although we will comply with the body of legislation triggered by that decision, we are in process of all possible legal actions.

Clean Air Act (Montreal Protocol)

IMP was not manufactured with and does not contain any Class I or Class II ozone depleting substances.

Chemical inventory listing

U.S. EPA TSCA Inventory	1330-43-4
Canadian DSL	1330-43-4
EINECS	215-540-4
South Korea	1-760
Japanese MITI	(1)-69

Ensure all national/local regulations are observed.

Section 16 : Additional Information

16.1. Mainly changes made to the previous version of this Material Safety Data Sheet (MSDS):

• This MSDS complies with ISO 11014; the requirements of UN-GHS

Revision No	Revision content
05	• This SDS is updated in accordance with the GHS (Rev.6) (2015)-Guidance on the Compilation of Safety data Sheets. • This SDS is updated in line with Eti Maden Corporate identity.

16.2. List of abbreviation and acronyms used in this MSDS

SDS : Safety Data Sheets

Index N° : atomic number of the element most characteristic of the properties of the substance

CAS No : Chemical Abstracts Service number
EC No : EINECS Number : European Inventory of Existing Commercial Substances
GHS : Globally Harmonised System of Classification and Labelling
LD_{50} : Median Lethal Dose
LC_{50} : Lethal Concentration, 50%
N.A. : Not Applicable
OSHA : Occupational Safety & Health Administration
Cal OSHA : The State of California Division of Occupational Safety and Health (DOSH)
PEL : Permissible Exposure Limits
ACGIH : American Conference of Governmental Industrial Hygienists
TLV : Threshold Limit Value
Japanese MITI : Japanese Ministry of International Trade and Industry
EC_{50} : Half maximal effective concentration
UN : United Nations
U.S. EPA TSCA Inventory: Inventory of the chemical substances manufactured or processed in the United States according to Toxic Substances Control Act compiled and published under the autority of the Environmental Protection Agency
Canadian DSL: Canadian Domestic Substances List

16.3. List of relevant hazard statements and precautionary statements used in this MSDS

N.A

16.4. References

1. Biomedicals, M. (2006). *Material Safety Data Sheet.* Solon.

16.5. Disclaimer of Liability

The information in this MSDS was obtained from sources which we believe are reliable. However, the information is provided without any warranty, express or implied, regarding its accuracy, reliability or completeness. The conditions or methods of handling, storage use or disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of the product. It is the user's responsibility to satisfy himself as to the suitableness and completeness of such information for his own particular use.

This MSDS was prepared and is to be used only for this product. If the product is used as a component in another product, this MSDS information may not be applicable.

Material Safety Data Sheet
Guanosine Monophosphate

Section 1 - Product Identification

Synonyms : Guanylic 5'-monophosphate, 5'-guanylic acid, GMP
Molecular Weight : 363.22 g/mol
Chemical Formula : $C_{10}H_{14}N_5O_8P$
Company Identification : Tradeasia International Pte. Limited
Address : 133 Cecil Street # 12-03 Keck Seng Tower, Singapore
Tel: +65-6227 6365
Fax: +65-6225 6286
Email: contact@chemtradeasia.com

Recommended use of the chemical and restrictions on use

The product is used in industrial manufacturing, in particular in :

- Food additives

Section 2 – Composition/Information on Ingredients

The product contains greater than 98 percent (%) guanosine monophosphate, $C_{10}H_{14}N_5O_8P$

Chemical Name	EC No/CAS No	Purity, %
Guanosine 5'-monophosphate 5'-guanylic acid	85-32-5	min. 98.0

Section 3 – Hazards Identification

3.1 Classification of the substance according to GHS

GMP is not classifiable according to GHS.

3.3. Other hazards which do not result in classification

GMP is a white odourless, powdered substance that is not flammable, combustible, or explosive, and has low acute oral and dermal toxicity.

Potential health effects

Dermal exposure is the most significant route of exposure in occupational and other settings.

Inhalation

Occasional mild irritation effects to respiratory tract may occur from inhalation of GMP dusts.

Eye contact

GMP can be an eye irritant.

Skin contact

GMP may cause irritation to intact skin.

Ingestion

GMP may be harmful if swallowed in large amounts.

Potential ecological effects

There is no known effect on ecology.

Signs and symptoms of exposure

Symptoms of accidental over-exposure to GMP have been associated with dermal exposure or inhalation. These may include skin redness and irritation to respiratory tract.

Section 4 – First-Aid Measures

4.1. Description of first aid mesaures

Skin contact

Immediately wash skin with soap and plenty of water for at least 15 minutes. Remove contaminated clothing. Get medical attention if symptoms persist. Wash clothing before reuse

Eye contact

Use eye wash fountain or fresh water to cleanse eye. If irritation persists for more than 15 minutes, seek medical attention.

Inhalation

If symptoms such as nose or throat irritation are observed, remove to fresh air.

Ingestion

Wash mouth with plenty of fresh water if the person is conscious. If large amounts are swallowed (i.e. more than one teaspoon), contact a doctor or toxicity centre immediately.

Note to physicians

N.A

4.2. Most important symptoms and effects, both acute and delayed

N.A.

4.3. Indication of any immediate medical attention and special treatment needed

N.A.

Section 5 – Fire Fighting Measures

5.1. Suitable Extinguishing media

Any fire extinguishing media may be used on nearby fires.

5.2. Specific hazards arising from the chemical

Burning produces irritant fumes.

5.3. Special protective actions for fire-fighters

Full protective gears, self-constraint breathing apparatus.

Section 6 – Accidental Release Measures

6.1. Personal precautions, protective equipment and emergency procedures

Avoid dust formation. In case of exposure to prolonged or high level of airborne dust, wear a personal respirator in compliance with national legislation.

6.2. Environmental precautions

IMP is a slightly water-soluble white powder. Prevent product from entering drainage system.

6.3. Methods and material for containment and cleaning up

Land spill

Vacuum, shovel or sweep up GMP and place in containers for disposal in accordance with applicable local regulations. Avoid contamination of water bodies during clean up and disposal. Contain spill with inert material. No personal protective equipment is needed to clean up land spills.

Spillage into water

Where possible, remove any intact containers from the water. Advise local water authority that none of the affected water should be used for irrigation or for the abstraction of potable water until natural dilution returns to its normal environmental background level.

Section 7 – Handling and Storage

7.1. Precautions for safe Handling

To maintain package integrity and to minimise caking of the product, bags should be handled on a first-in first out basis. Good housekeeping and dust prevention procedures should be followed to minimise dust generation and accumulation. Your supplier can advise you on safe handling, please contact the supplier.
The product should be kept away from strong reducing agents. Apply above handling advice when mixing with other substances.

7.2. Conditions for safe storage, including any incompatibilities

No special handling precautions are required, but dry, indoor storage is recommended. No specific requirements. Provide appropriate ventilation and store bags such as to prevent any accidental damage.

Section 8 – Exposure Controls/Personal Protection

8.1. Control parameters

Occupational exposure limits for dust (total and respirable). are treated by OSHA, Cal OSHA and ACGIH as “Particulate Not Otherwise Classifed” or “Nuisance Dust”

ACGIH/TLV 10 mg/m^3

Cal OSHA/PEL 10 mg/m^3

OSHA/PEL (total dust) 15 mg/m^3

OSHA/PEL (respirable dust) 5 mg/m^3

8.2. Appropriate engineering controls

Maintain air concentrations below occupational exposure standards.

Use local exhaust ventilation to keep airborne concentrations of GMP dust below permissible exposure levels. Wash hands before breaks and at the end of the workday. Remove and wash soiled clothing.

8.3. Individual protection measures, such as personal protective equipment (PPE)

Respiratory protection

In case of prolonged exposure to dust wear a personal respirator in compliance with national legislation (make
reference to the appropriate CEN standard)

Eyes and hands protection

Goggles and gloves are not required for normal industrial exposures, but may be warranted if environment is
excessively dusty.

Section 9 – Physical and Chemical Properties

9.1. Information on basic physical and chemical properties

Appearance : white solid crystalline powder

Odour : odourless

Odour threshold : N.A.

pH @ 20° C : 6

Melting point : 149-154° C

Boiling point : N.A

Flash point : Non flammable

Evaporation rate : N.A.

Flammability : N.A.

Upper/lower flammability or explosive limits : Non explosive

Vapour pressure : Negligible @ 20° C

Vapour density : N.A.

Relative density : N.A.

Solubility in water : 3.05 mg/mL

Partition coefficient: n-octanol/water : N.A

Auto-ignition temperature : N.A.

Decomposition temperature : 120° C

Viscosity : N.A.

9.2. Other information

Molecular weight :348.21 g/mol

Specific gravity : 1.81 @ 20° C

Section 10 – Stability and Reactivity

10.1. Reactivity

IMP is a stable product.

10.2. Chemical stability

IMP is a stable product, but when degrades at high pH and high temperature.

10.3. Possibility of hazardous reactions

Reaction with strong oxidizing agents.

10.4. Conditions to avoid:

Exposure to air or moisture for an extended period of time.

10.5. Incompatible materials

Avoid contact with strong oxidizing agents.

10.6. Hazardous decomposition products

Nitrogen oxides, potassium oxides, cyanide and ammonia.

Section 11 – Toxicological Information

11.1. Information on toxicological effect

11.1.1. Substances

Acute toxicity[(1)]

Low acute oral toxicity; LD50 in rats > 16 g/kg of body weight. (Biomedicals, 2006)

Skin corrosion / irritation

Low acute dermal toxicity; LD50 in rats is greater than 3900mg/kg of body weight.

Serious eye damage/ irritation

GMP may be an eye irritant.

Respiratory or skin sensitization

GMP is a skin sensitizer.

Germcell mutagenicity

GMP is not mutagenic.

Carcinogenicity

GMP is not carcinegenic

Reproductive toxicity

GMP has no known reproductive toxicity.

STOT-single exposure

N.A.

STOT-repeated exposure

N.A.

Aspiration Hazard

GMP has no aspiration hazard.

Section 12 – Ecological Information

12.1.Toxicity

GMP does not have known toxicity.

Phytotoxicity

GMP has no known phytotoxicity. However, plants can be sensitive to high level of IMP. Care should be taken to minimise the amount of IMP released to the environment.

Algal toxicity

GMP has no known algal toxicity.

Invertebrate toxicity

GMP has no known invertebrate toxicity.

Fish toxicity

GMP has no known fish toxicity.

12.2. Persistence and degradability

GMP is naturally occurring and ubiquitous in the body. It can decompose to nitrogen oxides, potassium oxides and cyanide under high temperature.

12.3. Bioaccumulative potential

Not significantly bioaccumulative.

12.4. Mobility in soil

The product is soluble in water and is leachable through normal soil.

12.5. Other adverse effects

No Data Available

Section 13 – Disposal Considerations

13.1. Disposal methods

Small quantities of GMP can usually be disposed of at landfill sites. No special disposal treatment is required, but local authorities should be consulted about any specific local requirements. Tonnage quantities of

product are not recommended to be sent to landfills. Such product should, if possible, be used for an appropriate application.

Section 14 – Transport Information

GMP has no UN Number, and is not regulated under international rail, road, water or air transport regulations.

14.1. UN number : N.A.

14.2. UN proper shipping name : N.A

14.3. Transport of hazard classes : N.A

14.4. Packing group : N.A

14.5. Environmental hazards : N.A.

14.6. Special precautions for user : N.A

14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code: N.A.

Section 15 – Regulatory Information

15.1. Safety, health and environmental regulations

It should be noted that GMP are safe under conditions of normal handling and use, besides, they play a beneficial role in human body. CLP classification has been solely based on animal tests where animals were exposed to high doses of GMP over long periods of time. These doses were many times higher than humans are exposed to under conditions of normal handling and use. Consequently, a precautionary decision was taken by the European Commission. Although we will comply with the body of legislation triggered by that decision, we are in process of all possible legal actions.

Clean Air Act (Montreal Protocol)

GMP was not manufactured with and does not contain any Class I or Class II ozone depleting substances.

Chemical inventory listing

U.S. EPA TSCA Inventory	1330-43-4
Canadian DSL	1330-43-4
EINECS	215-540-4
South Korea	1-760
Japanese MITI	(1)-69

Ensure all national/local regulations are observed.

Section 16 : Additional Information

16.1. Mainly changes made to the previous version of this Material Safety Data Sheet (MSDS):

• This MSDS complies with ISO 11014; the requirements of UN-GHS

Revision No	Revision content
05	• This SDS is updated in accordance with the GHS (Rev.6) (2015)-Guidance on the Compilation of Safety data Sheets. • This SDS is updated in line with Eti Maden Corporate identity.

16.2. List of abbreviation and acronyms used in this MSDS

SDS : Safety Data Sheets

Index N° : atomic number of the element most characteristic of the properties of the substance

CAS No : Chemical Abstracts Service number

EC No : EINECS Number : European Inventory of Existing Commercial Substances

GHS : Globally Harmonised System of Classification and Labelling

LD_{50} : Median Lethal Dose

LC_{50} : Lethal Concentration, 50%

N.A. : Not Applicable

OSHA : Occupational Safety & Health Administration

Cal OSHA : The State of California Division of Occupational Safety and Health (DOSH)

PEL : Permissible Exposure Limits

ACGIH : American Conference of Governmental Industrial Hygienists

TLV : Threshold Limit Value

Japanese MITI : Japanese Ministry of International Trade and Industry

EC_{50} : Half maximal effective concentration

UN : United Nations

U.S. EPA TSCA Inventory: Inventory of the chemical substances manufactured or processed in the United States according to Toxic Substances Control Act compiled and published under the autority of the Environmental Protection Agency

Canadian DSL: Canadian Domestic Substances List

16.3. List of relevant hazard statements and precautionary statements used in this MSDS

N.A

16.4. References

1. Biomedicals, M. (2006). *Material Safety Data Sheet.* Solon.

16.5. Disclaimer of Liability

The information in this MSDS was obtained from sources which we believe are reliable. However, the information is provided without any warranty, express or implied, regarding its accuracy, reliability or completeness. The conditions or methods of handling, storage use or disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage or expense arising out of or in any way connected with the handling, storage, use or disposal of the product. It is the user's responsibility to satisfy himself as to the suitableness and completeness of such information for his own particular use.

This MSDS was prepared and is to be used only for this product. If the product is used as a component in another product, this MSDS information may not be applicable.