

SAFETY DATA SHEET

Date of issue : JAN 5, 2015
Revision date : JAN 2, 2017

Version 02

| | |
|--------------|-----------------------------|
| PRODUCT | DISODIUM 5'- INOSINATE(IMP) |
| CAS NO. | 4691-65-0 |
| MANUFACTURER | DAESANG Corporation |

1. IDENTIFICATION OF THE SUBSTANCE AND OF THE COMPANY UNDERTAKING

| | | |
|--------------------------|--|--|
| Product identifier | Product name CAS number EC number Index number Registration number | Disodium 5'-Inosinate(IMP) 4691-65-0 225-146-4 Not applicable Not applicable |
| Relevant identified uses | Applications | Food Additive, Flavour Enhancer |
| Details of the supplier | Names Address Tel/Fax Contact email | Daesang Corporation 26, Cheonho-daero, Dongdaemun-gu, Seoul, South Korea Tel: +82 2 2657 5371 & Fax: +82 2 2657 5333 bio@daesang.com |
| Emergency telephone no. | Telephone | +1 201 488 4010 for USA & Canada +31 20 640 6080 for Europe +82 2 2657 5371 for the rest countries |

2. HAZARDS IDENTIFICATION

| | | |
|---------------------------------|---|---|
| Classification of the substance | Physical hazards Health hazards Environmental hazards | Not applicable Not applicable Not applicable |
| Label elements | | Not applicable |
| Potential effects | | May cause eye and skin irritation It will increase the biological oxygen demand (BOD) of water |

3. COMPOSITION INFORMATION ON INGREDIENTS

| | | |
|--|---|---|
| Substance | Name of substance CAS number EC number Index number Concentration | Disodium 5'-Inosinate(IMP) 4691-65-0 225-146-4 - 100% |
| 4. FIRST AID MEASURES | | |
| Description of first aid measures | After eye contact | Flush eyes with water as a precaution |
| | After skin contact | Wash off with soap and plenty of water |
| | After inhalation | If breathed in, move person into fresh air. If not breathing give artificial respiration. |
| | After ingestion | Never give anything by mouth to an unconscious person. Rinse mouth with water. |
| Most important symptoms and effects, both acute and delayed | | Not determined |
| Indication of any immediate medical attention and special treatment needed | | Not determined |
| 5. FIRE FIGHTING MEASURES | | |
| Extinguishing media | | Non-flammable |
| Special hazards arising from the substance or mixture | | Nothing reported |
| Advice for firefighters | | No special requirements |
| 6. ACCIDENTAL RELEASE MEASURES | | |
| Personal precautions, protective equipment and emergency procedures | | Special action not required. Not a spill hazard. |
| Environmental precautions | | None |
| Methods and material for containment and cleaning up | | Sweep up and shovel. Keep in suitable, closed containers for disposal. |
| Reference to other sections | | See precautions in section 7 and 8 |
| 7. HANDLING AND STORAGE | | |
| Precautions for safe handling | | Avoid dust formation. Avoid eye contact. |

| | | |
|--|---|--|
| Conditions for safe storage, including any incompatibilities | Close containers properly and store under normal conditions of temperature and humidity. Storage in dry cool place. | |
| Specific end use(s) | Not applicable | |
| 8. EXPOSURE CONTROLS / PERSONAL PROTECTION | | |
| Control parameters | Not determined | |
| Exposure controls | <u>Respiratory protection</u> : Not required. Use approved nuisance mask if needed. <u>Hand protection</u> : None <u>Eye protection</u> : None <u>Body protection</u> : None <u>Hygiene measures</u> : None | |
| 9. PHYSICAL AND CHEMICAL PROPERTIES | | |
| Information of basic physical and chemical properties | Physical state | Transparent or white crystals or crystalline powder. |
| | Colour | Transparent or White |
| | Odour | Odourless |
| | Odour threshold | Not determined |
| | pH | 7.0 – 8.5 |
| | Melting point | 175 °C |
| | Boiling point | Not applicable |
| | Flash point | Not flammable |
| | Evaporation rate | None |
| | Flammability | Not flammable |
| | Auto flammability | Not determined |
| | Upper/lower flammability or explosive limits | Not flammable |
| | Explosive properties | Not determined |
| | Oxidising properties | Not determined |
| | Vapour pressure | Not applicable |
| | % volatile by volume | Not determined |
| | Vapour density | Not applicable |
| | Relative density | Not determined |
| | Solubility in water | Soluble in water |
| | Other solvents | Not determined |
| | Partition coefficient (n-octanol/water) | Not applicable |
| | Decomposition temperature | Above 250 °C |
| Viscosity | Not applicable | |
| Specific gravity | 0.84 | |

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| Other information | No other information |
| 10. STABILITY AND REACTIVITY | |
| Reactivity | Not determined |
| Chemical stability | Stable. Decomposes above 250 °C |
| Possibility of hazardous reactions | Hazard polymerization will not occur |
| Conditions to avoid | Not determined |
| Incompatible materials | Nothing reported |
| Hazardous decomposition materials | None |
| 11. TOXICOLOGICAL INFORMATION | |
| Acute toxicity | Generally Recognized As Safe(GRAS) |
| Skin corrosion/irritation | Not determined |
| Serious eye damage/irritation | Not determined |
| Respiratory or skin sensitization | Not determined |
| Germ cell mutagenicity | Not determined |
| Carcinogenicity | Not determined |
| Reproductive toxicity | Not determined |
| STOT-single exposure | Not determined |
| STOT-repeated exposure | Not determined |
| Aspiration hazard | Not determined |
| RTECS No. | NM 7519500 |
| 12. ECOLOGICAL INFORMATION | |
| Toxicity | Not determined |
| Persistence and degradability | Biodegradable |
| Bioaccumulative potential | Not determined |
| Mobility in soil | Not determined |
| Results of PBT and vPvB assessment | Not determined |
| Other adverse effects | According to present knowledge, no unfavourable ecological effects are expected. |
| 13. DISPOSAL CONSIDERATIONS | |
| Waste treatment methods | Recycling/disposal according to national and regional regulations. Dispose of contaminated packaging as unused product. Clean surfaces by wiping or with a broom. Place waste in clean, dry containers for disposal. Do not flush into municipal sewer. |
| List of CER codes | Allocation of the waste code numbers according EC Directive 91/692/EEC must be realized under considerations of existing sector specifics and processes |

14. TRANSPORT INFORMATION

| | |
|--|----------------|
| UN Number | None |
| UN proper shipping name | None |
| Transport hazard classes | None |
| Packing group | None |
| Environmental hazards | None |
| Land transport (ADR/RID) | None |
| Onland waterway craft (ADN/ADNR) | None |
| Marine transport (IMDG) | None |
| Air transport (IATA) | None |
| Special precautions for user | None |
| Transport in bulk according to Annex II of MARPOL 73/78 and the IBC code | Not determined |
| No special requirements for transport according to international regulations. For more information, contact Daesang Europe b.v. | |

15. REGULATORY INFORMATION

| | |
|--|-------------------|
| Safety, health and environmental regulations/legislation specific for the substance or mixture | No data available |
| Chemical safety assessment | Not applicable |

16. OTHER INFORMATION

This information is based on our present knowledge and is provided according to the relevant EC and national regulations. This information is intended as a characterization of the product in order to provide guidance for the relevant safety issues. However, this document does not provide any warranty, expressed or implied, regarding the properties of the product. In no event will Daesang Corp. be responsible for damages of any nature whatsoever resulting from the use of or reliance on information.

SAFETY DATA SHEET

Date of issue : JAN 5, 2015
Revision date : JAN 2, 2017

Version 02

| | |
|--------------|-----------------------------|
| PRODUCT | DISODIUM 5'- GUANYLATE(GMP) |
| CAS NO. | 5550-12-9 |
| MANUFACTURER | DAESANG Corporation |

1. IDENTIFICATION OF THE SUBSTANCE AND OF THE COMPANY UNDERTAKING

| | | |
|--------------------------|--|--|
| Product identifier | Product name CAS number EC number Index number Registration number | Disodium 5'-Guanylate(GMP) 5550-12-9 226-914-1 Not applicable Not applicable |
| Relevant identified uses | Applications | Food Additive, Flavour Enhancer |
| Details of the supplier | Names Address Tel/Fax Contact email | Daesang Corporation 26, Cheonho-daero, Dongdaemun-gu, Seoul, South Korea Tel: +82 2 2657 5371 & Fax: +82 2 2657 5333 bio@daesang.com |
| Emergency telephone no. | Telephone | +1 201 488 4010 for USA & Canada +31 20 640 6080 for Europe +82 2 2657 5371 for the rest countries |

2. HAZARDS IDENTIFICATION

| | | |
|---------------------------------|---|---|
| Classification of the substance | Physical hazards Health hazards Environmental hazards | Not applicable Not applicable Not applicable |
| Label elements | | Not applicable |
| Potential effects | | May cause eye and skin irritation It will increase the biological oxygen demand (BOD) of water |

3. COMPOSITION INFORMATION ON INGREDIENTS

| | | |
|--|---|---|
| Substance | Name of substance CAS number EC number Index number Concentration | Disodium 5'-Guanylate(GMP) 5550-12-9 226-914-1 - 100% |
| 4. FIRST AID MEASURES | | |
| Description of first aid measures | After eye contact | Flush eyes with water as a precaution |
| | After skin contact | Wash off with soap and plenty of water |
| | After inhalation | If breathed in, move person into fresh air. If not breathing give artificial respiration. |
| | After ingestion | Never give anything by mouth to an unconscious person. Rinse mouth with water. |
| Most important symptoms and effects, both acute and delayed | | Not determined |
| Indication of any immediate medical attention and special treatment needed | | Not determined |
| 5. FIRE FIGHTING MEASURES | | |
| Extinguishing media | | Non-flammable |
| Special hazards arising from the substance or mixture | | Nothing reported |
| Advice for firefighters | | No special requirements |
| 6. ACCIDENTAL RELEASE MEASURES | | |
| Personal precautions, protective equipment and emergency procedures | | Special action not required. Not a spill hazard. |
| Environmental precautions | | None |
| Methods and material for containment and cleaning up | | Sweep up and shovel. Keep in suitable, closed containers for disposal. |
| Reference to other sections | | See precautions in section 7 and 8 |
| 7. HANDLING AND STORAGE | | |
| Precautions for safe handling | | Avoid dust formation. Avoid eye contact. |

| | | |
|--|---|--|
| Conditions for safe storage, including any incompatibilities | Close containers properly and store under normal conditions of temperature and humidity. Storage in dry cool place. | |
| Specific end use(s) | Not applicable | |
| 8. EXPOSURE CONTROLS / PERSONAL PROTECTION | | |
| Control parameters | Not determined | |
| Exposure controls | <u>Respiratory protection</u> : Not required. Use approved nuisance mask if needed. <u>Hand protection</u> : None <u>Eye protection</u> : None <u>Body protection</u> : None <u>Hygiene measures</u> : None | |
| 9. PHYSICAL AND CHEMICAL PROPERTIES | | |
| Information of basic physical and chemical properties | Physical state | Transparent or white crystals or crystalline powder. |
| | Colour | Transparent or White |
| | Odour | Odourless |
| | Odour threshold | Not determined |
| | pH | 7.0 – 8.5 |
| | Melting point | 300 °C |
| | Boiling point | Not applicable |
| | Flash point | Not flammable |
| | Evaporation rate | None |
| | Flammability | Not flammable |
| | Auto flammability | Not determined |
| | Upper/lower flammability or explosive limits | Not flammable |
| | Explosive properties | Not determined |
| | Oxidising properties | Not determined |
| | Vapour pressure | Not applicable |
| | % volatile by volume | Not determined |
| | Vapour density | Not applicable |
| | Relative density | Not determined |
| | Solubility in water | Soluble in water |
| | Other solvents | Not determined |
| | Partition coefficient (n-octanol/water) | Not applicable |
| | Decomposition temperature | Above 250 °C |
| | Viscosity | Not applicable |
| | Specific gravity | 0.79 |

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|--------------------------------------|--|
| Other information | No other information |
| 10. STABILITY AND REACTIVITY | |
| Reactivity | Not determined |
| Chemical stability | Stable. Decomposes above 250 °C |
| Possibility of hazardous reactions | Hazard polymerization will not occur |
| Conditions to avoid | Not determined |
| Incompatible materials | Nothing reported |
| Hazardous decomposition materials | None |
| 11. TOXICOLOGICAL INFORMATION | |
| Acute toxicity | Generally Recognized As Safe(GRAS) |
| Skin corrosion/irritation | Not determined |
| Serious eye damage/irritation | Not determined |
| Respiratory or skin sensitization | Not determined |
| Germ cell mutagenicity | Not determined |
| Carcinogenicity | Not determined |
| Reproductive toxicity | Not determined |
| STOT-single exposure | Not determined |
| STOT-repeated exposure | Not determined |
| Aspiration hazard | Not determined |
| RTECS No. | MF 9290000 |
| 12. ECOLOGICAL INFORMATION | |
| Toxicity | Not determined |
| Persistence and degradability | Biodegradable |
| Bioaccumulative potential | Not determined |
| Mobility in soil | Not determined |
| Results of PBT and vPvB assessment | Not determined |
| Other adverse effects | According to present knowledge, no unfavourable ecological effects are expected. |
| 13. DISPOSAL CONSIDERATIONS | |
| Waste treatment methods | Recycling/disposal according to national and regional regulations. Dispose of contaminated packaging as unused product. Clean surfaces by wiping or with a broom. Place waste in clean, dry containers for disposal. Do not flush into municipal sewer. |
| List of CER codes | Allocation of the waste code numbers according EC Directive 91/692/EEC must be realized under considerations of existing sector specifics and processes |

14. TRANSPORT INFORMATION

| | |
|--|----------------|
| UN Number | None |
| UN proper shipping name | None |
| Transport hazard classes | None |
| Packing group | None |
| Environmental hazards | None |
| Land transport (ADR/RID) | None |
| Onland waterway craft (ADN/ADNR) | None |
| Marine transport (IMDG) | None |
| Air transport (IATA) | None |
| Special precautions for user | None |
| Transport in bulk according to Annex II of MARPOL 73/78 and the IBC code | Not determined |

No special requirements for transport according to international regulations.
For more information, contact Daesang Europe b.v.

15. REGULATORY INFORMATION

| | |
|--|-------------------|
| Safety, health and environmental regulations/legislation specific for the substance or mixture | No data available |
| Chemical safety assessment | Not applicable |

16. OTHER INFORMATION

This information is based on our present knowledge and is provided according to the relevant EC and national regulations. This information is intended as a characterization of the product in order to provide guidance for the relevant safety issues. However, this document does not provide any warranty, expressed or implied, regarding the properties of the product. In no event will Daesang Corp. be responsible for damages of any nature whatsoever resulting from the use of or reliance on information.

SAFETY DATA SHEET

Date of issue : JAN 5, 2015
Revision date : JAN 2, 2017

Version 02

| | |
|--------------|--|
| PRODUCT | DISODIUM 5'- RIBONUCLEOTIDE(I+G) |
| CAS NO. | A mixture of 4691-65-0(IMP) & 5550-12-9(GMP) |
| MANUFACTURER | DAESANG Corporation |

1. IDENTIFICATION OF THE SUBSTANCE AND OF THE COMPANY UNDERTAKING

| | | |
|--------------------------|--|--|
| Product identifier | Product name CAS number EC number Index number Registration number | Disodium 5'-Ribonucleotide(I+G) Not applicable Not applicable Not applicable Not applicable |
| Relevant identified uses | Applications | Food Additive, Flavour Enhancer |
| Details of the supplier | Names Address Tel/Fax Contact email | Daesang Corporation 26, Cheonho-daero, Dongdaemun-gu, Seoul, South Korea Tel: +82 2 2657 5371 & Fax: +82 2 2657 5333 bio@daesang.com |
| Emergency telephone no. | Telephone | +1 201 488 4010 for USA & Canada +31 20 640 6080 for Europe +82 2 2657 5371 for the rest countries |

2. HAZARDS IDENTIFICATION

| | | |
|---------------------------------|---|---|
| Classification of the substance | Physical hazards Health hazards Environmental hazards | Not applicable Not applicable Not applicable |
| Label elements | | Not applicable |
| Potential effects | | May cause eye and skin irritation It will increase the biological oxygen demand (BOD) of water |

3. COMPOSITION INFORMATION ON INGREDIENTS

| | | |
|--|---|--|
| Substance | Name of substance CAS number EC number Index number Concentration | Disodium 5'-Ribonucleotide(I+G) Not applicable Not applicable Not applicable 50% Disodium 5'-Inosinate and 50% Disodium 5'-Guanylate |
| 4. FIRST AID MEASURES | | |
| Description of first aid measures | After eye contact | Flush eyes with water as a precaution |
| | After skin contact | Wash off with soap and plenty of water |
| | After inhalation | If breathed in, move person into fresh air. If not breathing give artificial respiration. |
| | After ingestion | Never give anything by mouth to an unconscious person. Rinse mouth with water. |
| Most important symptoms and effects, both acute and delayed | | Not determined |
| Indication of any immediate medical attention and special treatment needed | | Not determined |
| 5. FIRE FIGHTING MEASURES | | |
| Extinguishing media | | Non-flammable |
| Special hazards arising from the substance or mixture | | Nothing reported |
| Advice for firefighters | | No special requirements |
| 6. ACCIDENTAL RELEASE MEASURES | | |
| Personal precautions, protective equipment and emergency procedures | | Special action not required. Not a spill hazard. |
| Environmental precautions | | None |
| Methods and material for containment and cleaning up | | Sweep up and shovel. Keep in suitable, closed containers for disposal. |
| Reference to other sections | | See precautions in section 7 and 8 |
| 7. HANDLING AND STORAGE | | |
| Precautions for safe handling | | Avoid dust formation. Avoid eye contact. |

| | | |
|--|--|---|
| Conditions for safe storage, including any incompatibilities | | Close containers properly and store under normal conditions of temperature and humidity. Storage in dry cool place. |
| Specific end use(s) | | Not applicable |
| 8. EXPOSURE CONTROLS / PERSONAL PROTECTION | | |
| Control parameters | | Not determined |
| Exposure controls | | <u>Respiratory protection</u> : Not required. Use approved nuisance mask if needed. <u>Hand protection</u> : None <u>Eye protection</u> : None <u>Body protection</u> : None <u>Hygiene measures</u> : None |
| 9. PHYSICAL AND CHEMICAL PROPERTIES | | |
| Information of basic physical and chemical properties | Physical state | Transparent or white crystals or crystalline powder. |
| | Colour | Transparent or White |
| | Odour | Odourless |
| | Odour threshold | Not determined |
| | pH | 7.0 – 8.5 |
| | Melting point | Not determined |
| | Boiling point | Not applicable |
| | Flash point | Not flammable |
| | Evaporation rate | None |
| | Flammability | Not flammable |
| | Auto flammability | Not determined |
| | Upper/lower flammability or explosive limits | Not flammable |
| | Explosive properties | Not determined |
| | Oxidising properties | Not determined |
| | Vapour pressure | Not applicable |
| | % volatile by volume | Not determined |
| | Vapour density | Not applicable |
| | Relative density | Not determined |
| | Solubility in water | 60g/100g at 70 °C |
| | Other solvents | Not determined |
| | Partition coefficient (n-octanol/water) | Not applicable |
| | Decomposition temperature | Above 250 °C |
| | Viscosity | Not applicable |
| | Specific gravity | 0.82 |

| | |
|--------------------------------------|--|
| Other information | No other information |
| 10. STABILITY AND REACTIVITY | |
| Reactivity | Not determined |
| Chemical stability | Stable. Decomposes above 250 °C |
| Possibility of hazardous reactions | Hazard polymerization will not occur |
| Conditions to avoid | Not determined |
| Incompatible materials | Nothing reported |
| Hazardous decomposition materials | None |
| 11. TOXICOLOGICAL INFORMATION | |
| Acute toxicity | Generally Recognized As Safe(GRAS) |
| Skin corrosion/irritation | Not determined |
| Serious eye damage/irritation | Not determined |
| Respiratory or skin sensitization | Not determined |
| Germ cell mutagenicity | Not determined |
| Carcinogenicity | Not determined |
| Reproductive toxicity | Not determined |
| STOT-single exposure | Not determined |
| STOT-repeated exposure | Not determined |
| Aspiration hazard | Not determined |
| 12. ECOLOGICAL INFORMATION | |
| Toxicity | Not determined |
| Persistence and degradability | Biodegradable |
| Bioaccumulative potential | Not determined |
| Mobility in soil | Not determined |
| Results of PBT and vPvB assessment | Not determined |
| Other adverse effects | According to present knowledge, no unfavourable ecological effects are expected. |
| 13. DISPOSAL CONSIDERATIONS | |
| Waste treatment methods | Recycling/disposal according to national and regional regulations. Dispose of contaminated packaging as unused product. Clean surfaces by wiping or with a broom. Place waste in clean, dry containers for disposal. Do not flush into municipal sewer. |
| List of CER codes | Allocation of the waste code numbers according EC Directive 91/692/EEC must be realized under considerations of existing sector specifics and processes |
| 14. TRANSPORT INFORMATION | |

| | |
|--|-------------------|
| UN Number | None |
| UN proper shipping name | None |
| Transport hazard classes | None |
| Packing group | None |
| Environmental hazards | None |
| Land transport (ADR/RID) | None |
| Onland waterway craft (ADN/ADNR) | None |
| Marine transport (IMDG) | None |
| Air transport (IATA) | None |
| Special precautions for user | None |
| Transport in bulk according to Annex II of MARPOL 73/78 and the IBC code | Not determined |
| No special requirements for transport according to international regulations. For more information, contact Daesang Europe b.v. | |
| 15. REGULATORY INFORMATION | |
| Safety, health and environmental regulations/legislation specific for the substance or mixture | No data available |
| Chemical safety assessment | Not applicable |
| 16. OTHER INFORMATION | |
| This information is based on our present knowledge and is provided according to the relevant EC and national regulations. This information is intended as a characterization of the product in order to provide guidance for the relevant safety issues. However, this document does not provide any warranty, expressed or implied, regarding the properties of the product. In no event will Daesang Corp. be responsible for damages of any nature whatsoever resulting from the use of or reliance on information. | |