SAFETY DATA SHEET

Citric acid anhydrous

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

1.1 Product identifier

<table>
<thead>
<tr>
<th>Trade name</th>
<th>Citric acid anhydrous</th>
</tr>
</thead>
<tbody>
<tr>
<td>Substance name</td>
<td>Citric acid anhydrous</td>
</tr>
<tr>
<td>Molecular formula</td>
<td>C6-H8-O7</td>
</tr>
<tr>
<td>Chemical identity</td>
<td>2-hydroxypropane-1,2,3-tricarboxylic acid anhydrous</td>
</tr>
<tr>
<td>CAS-No.</td>
<td>77-92-9</td>
</tr>
<tr>
<td>EC-No.</td>
<td>201-069-1</td>
</tr>
</tbody>
</table>

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

Use of the Substance/Mixture: Food/ feedstuff additives, Cosmetic additive, Medical aids, Industrial use

1.3 Details of the supplier of the safety data sheet

Distributor: Duda Energy LLC
1112 Brooks St.
Decatur, AL 35601

Telephone: 256.340.4866
Telefax: 866.568.3412

1.4 Emergency telephone number

Telephone: 800.255.3924 Chemtel

2. Hazards identification

2.1 Classification of the substance or mixture

Classification (REGULATION (EC) No 1272/2008)
Eye irritation, Category 2
H319: Causes serious eye irritation.

Classification (67/548/EEC, 1999/45/EC)
Irritant
R36: Irritating to eyes.
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2.2 Label elements

Labelling (REGULATION (EC) No 1272/2008)

Hazard pictograms :

Signal word : Warning

Hazard statements : H319  Causes serious eye irritation.

Precautionary statements :

Prevention: P264  Wash skin thoroughly after handling.
P280  Wear protective gloves/ eye protection/ face protection.

Response: P305 + P351 + P338  IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P337 + P313  If eye irritation persists: Get medical advice/ attention.

2.3 Other hazards

3. Composition/information on ingredients

3.1 Substances

<table>
<thead>
<tr>
<th>Substance name</th>
<th>CAS-No.</th>
<th>Concentration [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Citric acid anhydrous</td>
<td>77-92-9</td>
<td>100</td>
</tr>
</tbody>
</table>

3.2 Mixtures

4. First aid measures

4.1 Description of first aid measures

General advice : Get medical advice/ attention if you feel unwell. Show this safety data sheet to the doctor in attendance.

If inhaled : If breathed in, move person into fresh air.

In case of skin contact : Immediately flush skin with large amounts of water.

In case of eye contact : Remove contact lenses. Rinse immediately with plenty of water, also under the eyelids.

If swallowed : Drink plenty of water. If swallowed, DO NOT induce vomiting.
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4.2 Most important symptoms and effects, both acute and delayed
   Symptoms : No information available.

4.3 Indication of any immediate medical attention and special treatment needed
   Treatment : No information available.

5. Firefighting measures

5.1 Extinguishing media
   Suitable extinguishing media : Water spray
                                : Dry powder
                                : Foam
                                : Carbon dioxide (CO2)

5.2 Special hazards arising from the substance or mixture
   Specific hazards during firefighting : Do not use a solid water stream as it may scatter and spread fire.
                                        : Hazardous decomposition products formed under fire conditions.
                                        : Exposure to decomposition products may be a hazard to health.

5.3 Advice for firefighters
   Special protective equipment for firefighters : Wear self contained breathing apparatus for fire fighting if necessary.
                                                   : Use personal protective equipment.
   Further information : Standard procedure for chemical fires.
                         : Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.
                         : In the event of fire and/or explosion do not breathe fumes.

6. Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
   Personal precautions : Avoid dust formation.
                         : Avoid breathing dust.
                         : Ensure adequate ventilation, especially in confined areas.

6.2 Environmental precautions
   Environmental precautions : Prevent further leakage or spillage if safe to do so.
                              : No special environmental precautions required.

6.3 Methods and materials for containment and cleaning up
   Methods for cleaning up : Use mechanical handling equipment.
                            : Keep in suitable, closed containers for disposal.
                            : Clean contaminated surface thoroughly.
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6.4 Reference to other sections

No conditions to be specially mentioned.

7. Handling and storage

7.1 Precautions for safe handling

Advice on safe handling: Avoid creating dust. Do not breathe dust. Avoid contact with skin and eyes.

Advice on protection against fire and explosion: Normal measures for preventive fire protection.

Dust explosion class: St1

7.2 Conditions for safe storage, including any incompatibilities

Requirements for storage areas and containers: Keep in an area equipped with acid resistant flooring. Keep container tightly closed in a dry and well-ventilated place.

Further information on storage conditions: Do not store at temperatures above 30 °C / 86 °F.

Advice on common storage: Incompatible with strong bases and oxidizing agents.

Other data: No decomposition if stored and applied as directed.

7.3 Specific end uses

8. Exposure controls/personal protection

8.1 Control parameters

Contains no substances with occupational exposure limit values.

PNEC: Water
Value: 440 mg/l

PNEC: Fresh water sediment
Value: 34,6 mg/kg

PNEC: Marine sediment
Value: 3,46 mg/kg

PNEC: Soil
Value: 33,1 mg/kg

8.2 Exposure controls

Engineering measures
Provide adequate ventilation.
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Personal protective equipment
Respiratory protection: In the case of dust or aerosol formation use respirator with an approved filter. Half mask with a particle filter P2 (EN 143).

Hand protection: Choose gloves to protect hands against chemicals depending on the concentration and quantity of the hazardous substance and specific to place of work.
For special applications, we recommend clarifying the resistance to chemicals of the aforementioned protective gloves with the glove manufacturer.

Eye protection: Safety glasses

Skin and body protection: Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures: Handle in accordance with good industrial hygiene and safety practice.
General industrial hygiene practice.
Do not breathe dust.
Avoid contact with skin,eyes and clothing.

Environmental exposure controls
General advice: Prevent further leakage or spillage if safe to do so.
No special environmental precautions required.

9. Physical and chemical properties
9.1 Information on basic physical and chemical properties

Appearance: crystalline
Colour: white
Odour: odourless
Flash point: not applicable
Flammability (solid, gas): does not ignite
Oxidizing properties: No oxidising effect.
Molecular Weight: 192.13 g/mol
pH: 1.8
at 5 %
25 °C
Melting point/range: ca. 153 °C
Density: 1.665 g/cm3
at 20 °C
# SAFETY DATA SHEET

## Citric acid anhydrous

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water solubility</td>
<td>ca. 800 g/l at 20 °C</td>
</tr>
<tr>
<td>Partition coefficient: n-octanol/water</td>
<td>log Pow: -1.72</td>
</tr>
<tr>
<td></td>
<td>log Pow: -1.8 to -0.2</td>
</tr>
<tr>
<td>Calculation</td>
<td></td>
</tr>
</tbody>
</table>

## 9.2 Other information

## 10. Stability and reactivity

### 10.1 Reactivity

No decomposition if stored and applied as directed.

### 10.2 Chemical stability

Stable under normal conditions.

### 10.3 Possibility of hazardous reactions

Hazardous reactions: None known.

### 10.4 Conditions to avoid

Conditions to avoid: Avoid dust formation.

### 10.5 Incompatible materials

Materials to avoid: Strong bases, oxidizing agents.

### 10.6 Hazardous decomposition products

Hazardous decomposition products: Build-up of dangerous/toxic fumes possible in cases of fire/high temperature.

## 11. Toxicological information

### 11.1 Information on toxicological effects

#### Acute toxicity

<table>
<thead>
<tr>
<th>Toxicity</th>
<th>Value</th>
<th>Species</th>
<th>Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute oral toxicity Citric acid anhydrous</td>
<td>LD50 Oral: 5.400 mg/kg</td>
<td>mouse</td>
<td>OECD Test Guideline 401</td>
</tr>
<tr>
<td></td>
<td>LD50 Oral: 11.700 mg/kg</td>
<td>rat</td>
<td>OECD Test Guideline 401</td>
</tr>
</tbody>
</table>
## SAFETY DATA SHEET

### Citric acid anhydrous

**Acute dermal toxicity**
- **Citric acid anhydrous**
  - **LD₅₀ Dermal:** > 2,000 mg/kg
  - **Species:** rat

**Acute toxicity (other routes of administration)**
- **Citric acid anhydrous**
  - **LD₅₀:** 725 mg/kg
    - **Application Route:** i.p.
    - **Species:** rat
  - **LD₅₀:** 940 mg/kg
    - **Application Route:** i.p.
    - **Species:** mouse

**Skin corrosion/irritation**

**Skin irritation**
- **Citric acid anhydrous**
  - **Species:** rabbit
  - **Result:** No skin irritation
  - May cause skin irritation in susceptible persons.

**Serious eye damage/eye irritation**

**Eye irritation**
- **Citric acid anhydrous**
  - **Species:** rabbit
  - **Result:** Irritating to eyes.

**Respiratory or skin sensitization**

**Sensitisation**
- **Citric acid anhydrous**
  - **Maximisation Test**
    - **Species:** guinea pig
  - **Result:** Does not cause skin sensitization.
  - **Method:** OECD Test Guideline 406

**Germ cell mutagenicity**

**Assessment**
- **Citric acid anhydrous**
  - In vivo tests did not show mutagenic effects

**Carcinogenicity**

**Assessment**
- **Citric acid anhydrous**
  - Did not show carcinogenic or teratogenic effects in animal experiments.

**Reproductive toxicity**

**Assessment**
- **Citric acid anhydrous**
  - No toxicity to reproduction

**Target Organ Systemic Toxicant - Repeated exposure**
12. Ecological information

12.1 Toxicity

Toxicity to fish
Citric acid anhydrous : LC50: 440 mg/l
Exposure time: 48 h
Species: Leuciscus idus (Golden orfe)
static test
Method: OECD Test Guideline 203

Toxicity to daphnia and other aquatic invertebrates.
Citric acid anhydrous : LC50: 1.535 mg/l
Exposure time: 24 h
Species: Daphnia magna (Water flea)
static test

Toxicity to algae
Citric acid anhydrous : 425 mg/l
Exposure time: 168 h
Species: Scenedesmus quadricauda (Green algae)
static test

Toxicity to bacteria
Citric acid anhydrous : > 10,000 mg/l
Exposure time: 16 h
Species: Pseudomonas putida

12.2 Persistence and degradability

Biodegradability
Citric acid anhydrous : 97 %
Testing period: 28 d
Method: OECD Test Guideline 301B
Readily biodegradable.

100 %
Testing period: 19 d
Method: OECD Test Guideline 301E
Readily biodegradable.

Biochemical Oxygen Demand (BOD)
Citric acid anhydrous : 526 mg/g

Chemical Oxygen Demand (COD)
Citric acid anhydrous : 728 mg/g
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12.3 Bioaccumulative potential

Bioaccumulation
Citric acid anhydrous : The product is miscible in water and readily biodegradable in both water and soil. Accumulation is not expected.

12.4 Mobility in soil

12.5 Results of PBT and vPvB assessment

Citric acid anhydrous : This substance is not considered to be persistent, bioaccumulating nor toxic (PBT).

12.6 Other adverse effects

13. Disposal considerations

13.1 Waste treatment methods

Product : Where possible recycling is preferred to disposal or incineration. Can be landfilled or incinerated, when in compliance with local regulations. Waste codes should be assigned by the user based on the application for which the product was used. According to the European Waste Catalogue, Waste Codes are not product specific, but application specific.

Contaminated packaging : Empty containers should be taken to an approved waste handling site for recycling or disposal. Dispose of as unused product.

14. Transport information

ADR
Not dangerous goods

DOT
Not a Hazardous Material

TDG
Not dangerous goods

IATA
Not dangerous goods

IMDG
Not dangerous goods

RID
Not dangerous goods
SAFETY DATA SHEET

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15. Regulatory information

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

Major Accident Hazard Legislation : 96/82/EC Update: 2003
Directive 96/82/EC does not apply

Notification status

<table>
<thead>
<tr>
<th>CERCLA</th>
<th>Not considered hazardous</th>
</tr>
</thead>
<tbody>
<tr>
<td>SARA Title III</td>
<td>Not considered hazardous</td>
</tr>
<tr>
<td>WHMIS</td>
<td>Class E</td>
</tr>
<tr>
<td>TSCA</td>
<td>On TSCA Inventory</td>
</tr>
<tr>
<td>EINECS</td>
<td>On the inventory, or in compliance with the inventory</td>
</tr>
<tr>
<td>AICS</td>
<td>On the inventory, or in compliance with the inventory</td>
</tr>
<tr>
<td>DSL</td>
<td>All components of this product are on the Canadian DSL list.</td>
</tr>
<tr>
<td>ENCS</td>
<td>On the inventory, or in compliance with the inventory</td>
</tr>
<tr>
<td>KECI</td>
<td>On the inventory, or in compliance with the inventory</td>
</tr>
<tr>
<td>PICCS</td>
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</tr>
<tr>
<td>IECSC</td>
<td>On the inventory, or in compliance with the inventory</td>
</tr>
<tr>
<td>NZIoC</td>
<td>On the inventory, or in compliance with the inventory</td>
</tr>
</tbody>
</table>

15.2 Chemical Safety Assessment

16. Other information

HMIS* Rating Health = 1, Fire = 0, Reactivity = 0
0=minimal, 1=slight, 2=moderate, 3=serious, 4=severe

The information provided in this safety data sheet is correct to the best of Duda Energy LLC's knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text. This safety datasheet only contains information relating to safety and does not replace any product information or product specification. Please note, the content may be changed, corrected, or deleted at any time without notice, and may not always necessarily reflect the most current data. Duda Energy LLC. will assume no responsibility for any trouble or failure caused by the errors in the information provided, nor any damage associated with the usage of the information.