

# NIAPROOF<sup>®</sup> - MCAA

## Monochloroacetic ACID

$C_2H_3ClO_2$  MCAA, MCA, Monochloroacetic Acid, Chloroacetic Acid

Monochloroacetic acid, also referred to as MCAA, is used as a versatile intermediate in the production of chemicals such as:

|   |   |
|---|---|
| carboxymethyl cellulose                 | 2-methyl-4-Chlorophenoxy acetic acid (MCPA) |
| 2,4-dichloro phenoxy acetic acid (2,4D) | synthetic caffeine                          |
| ethylchloroacetate                      | sarcosine                                   |
| glycine                                 | thioglycolic acid                           |

MCAA is a strong organic acid which attacks many common metals. It causes severe irritation and inflammation upon contact with skin, eyes or the respiratory tract. Skin burns, especially when caused by contact with molten acid, result in painful wounds that are very slow to heal and have proven to be fatal in cases where more than 10% of body surface is affected.

MCAA is absorbed by the body from all routes of exposure and can cause systemic toxicity including cardiac damage.

At room temperature, pure monochloroacetic acid (MCAA) is a colorless, deliquescent crystalline mass. It is very soluble in water, freely soluble in methanol, ethanol, isopropanol, diethyl ether and acetone. It is sparingly soluble in hydrocarbons and chlorinated hydrocarbons.

Molecular Weight: 94.5

Molecular Structure:  $ClCH_2COOH$

### TYPICAL PROPERTIES (physical properties of 80% water solution)

|                              |                           |
|------------------------------|---------------------------|
| Boiling range @ 760mm        | 116 °C                    |
| Melting Point Range          | 16-18 °C                  |
| Beginning of Crystallization | 13 °C                     |
| Density @ 20°C               | 1.34 g/cm (11.2 lb/gal)   |
| Color                        | Colorless to light yellow |
| Flash point                  | None                      |
| Burning point                | Not Applicable            |
| Viscosity (dynamic)          | 5.64 centipoise (20°C)    |

### PRODUCT SPECIFICATIONS

| SPECIFICATION          | CONTROL LIMITS |
|------------------------|----------------|
| Monochloroacetic acid  | 99.0% min.     |
| Dichloroacetic acid    | 0.5% max.      |
| Acetic acid            | 0.2% max.      |
| Sulfuric acid          | None           |
| Lead                   | 1.0ppm max     |
| Iron                   | 5.0ppm max     |
| Concentration of sol'n | 79-81%         |



**NIACET CORPORATION**

400 47th St.

Niagara Falls, NY 14304

TEL: 800-828-1207 •

716-285-1474

FAX: 716-285-1497

# Applications

The main field of application of monochloroacetic acid is the manufacture of carboxymethylcellulose. This product has many uses, for instance in the manufacture of adhesives, detergents, finishing agents for the textile, leather and paper industries and drilling muds for deep geological drilling.

Monochloroacetic acid is also an important intermediate for the manufacture of pesticides such as 2,4-dichlorophenoxyacetic acid (2,4-D), 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) and 2-methyl-4-chlorophenoxyacetic acid (MCPA).

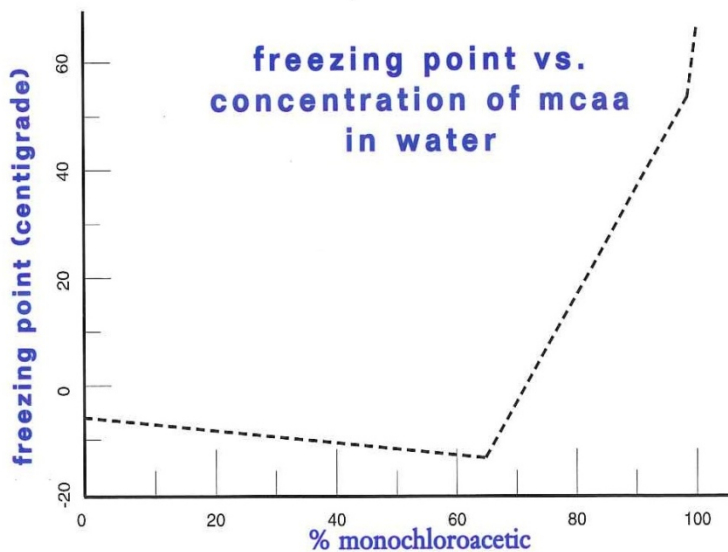
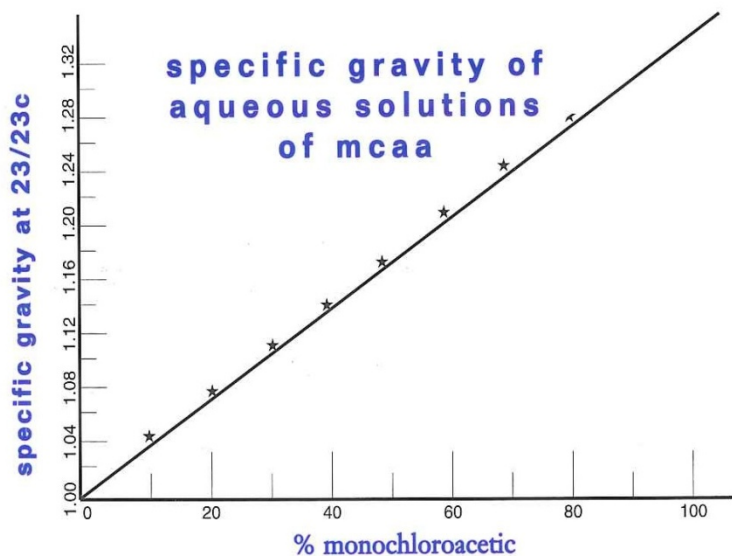
Thioglycolic acid, an important derivative of monochloroacetate, is used for the manufacture of stabilizers for polyvinyl chloride and of permanent hair waving preparations.

Monochloroacetic acid has further uses as a raw material for chemical synthesis, as in the manufacture of pharmaceutical preparations (caffeine, vitamins, barbiturates), textile auxiliaries, dyestuffs (indigo) and dextrin.

Monochloroacetic acid can be used for a number of further reactions besides those typical of monocarboxylic acids.

For instance, it reacts

- with alcohols to form alkoxyacetic acids;
- with ammonia/amines to form α-amino acids, e.g. aminoacetic acid, phenylglycine;
- with alkali cyanides to form cyanoacetic acid and from this by saponification malonic acid;
- with alkali hydrogen sulphide to form thioglycolic acid
- with phenols to form phenoxyacetic acids
- with aqueous alkalis to form glycolic acid



# Toxicological Properties

## Material Safety

### Data Sheet

Please reference the product Material Safety Data Sheet for detailed information on the safe handling of this product. This information should be thoroughly reviewed prior to the acceptance of product. For a copy of the Material Safety Data Sheet, please contact our sales office at 800-828-1207 or call collect to 716-285-1474.

## General

### Precautions

Direct contact with monochloroacetic acid will cause severe irritation to the skin and eyes. MCAA will cause painful burns that are very slow to heal.

MCAA is rapidly absorbed through the skin and may produce serious systemic effects. MCAA absorption has led to permanent injury and death.

Inhalation of the MCAA vapors will cause discomfort to the respiratory tract. The perception of odor threshold is .04mg of MCAA per cubic meter of air or about 0.01ppm. The level of perception of irritation to the membranes of humans is 5.7 mg/m<sup>3</sup> or about 1.5ppm. The 8- hour time-weighted average (TWA) recommended in the Workplace Environmental Exposure Level (WEEL) Guide of the American Industrial Hygiene Association has been set at a level low enough to insure that no irritation or discomfort occurs. This 8-hour TWA level is 1.16 mg/m<sup>3</sup> or 0.3ppm. The short-term exposure limit (15 minutes) is 3.8 mg/m<sup>3</sup> or 1.0ppm.

## Acute Effects

The initial effects of contact with MCAA are similar to those of strong acids. However, in addition to serious skin burns, rapid absorption through skin is a major concern. There have been reports of deaths occurring when molten MCAA was accidentally spilled over 10% or more of the worker's body area. Laboratory studies confirm this lethal property of MCAA. Wetting 3 – 10% of a rabbit's body surface with MCAA for a period of about one minute, followed by washing with sodium bicarbonate neutralizing solution, resulted in death.

The acute oral toxicity of MCAA has been determined in several species. The oral LD50 values are as follows: rats - 76 mg/kg, mice - 165 mg/kg, guinea pigs - 80 mg/kg. For rats exposed to MCAA by inhalation the LC50 was found to be 180 mg/m<sup>3</sup>. When MCAA was applied to the skin of rabbits, the LD50 was found to be 175 mg/kg. The toxic mechanism of MCAA is not well understood although in vivo studies in rats give some evidence that sulfhydryl groups are affected, thus causing the inhibition of acetate oxidation.

## First Aid

### Eyes

Immediate and continuous irrigation with flowing water for at least 30 minutes is imperative. Prompt medical consultation is essential.

### Skin

Immediate continued and thorough washing in flowing water for 30 minutes is imperative. Call a physician and/or take to a medical facility.

### Clothing

Remove contaminated clothing immediately, preferably under safety shower; and wash before reuse. Destroy contaminated shoes.

### Inhalation

Remove to fresh air if effects occur. Call a physician and/or take to a medical facility

# Storage & Handling

Aqueous solutions are very corrosive to most common metals of construction. Silver, tantalum, glass or ceramic-lined steel and polytetrafluorethylene (PTFE) or PFA coated equipment will withstand hot aqueous MCAA solutions. Titanium is suitable at temperatures below 90 degrees C (194 degrees F). Stainless steel (316L) and rubber (natural or synthetic) lined steel withstand aqueous solutions of MCAA only at temperatures below 40 degrees C (118 degrees F). Polypropylene and polyethylene are acceptable for use within their service temperature ranges.

Very slow hydrolysis accompanied by formation of glycolic acid occurs. In 30 days, the following content of glycolic acid can be expected:

0.01 % if stored at 20 degrees C (68 degrees F)

0.15% if stored at 50 degrees C (122 degrees F)

1.00% if stored at 70 degrees C (158 degrees F)

For detailed information refer to the addendum to the Material Safety Data Sheet - Recommended Safe Handling Practices.



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[www.niacet.com](http://www.niacet.com)

**IMPORTANT**

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