SODIUM GLUCONATE

Product: Sodium gluconate
Molecular Formula: C₆H₁₁N₂O₇
CAS Number: 527-07-1
EINECS Number: 208-407-7
E Number: E576

Sodium gluconate is the sodium salt of gluconic acid, produced by fermentation of Corn starch. It’s white to tan, granular to fine, crystalline powder, very soluble in water. The outstanding property of its excellent chelating powder in alkaline and concentrated alkaline solutions forms stable chelates with calcium, iron, copper, aluminium and other heavy metals. It is also a highly set retarder /water reducer and a good plasticizer of concrete, mortar and gypsum as well as used as industrial metal and glass cleaner for water treatment & detergent industries and textile industries etc.

Technical Specification

<table>
<thead>
<tr>
<th>Property</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>white or yellowish crystalline powder</td>
</tr>
<tr>
<td>Identification</td>
<td>Meet the requirements</td>
</tr>
<tr>
<td>Purity, %</td>
<td>99.0%MIN</td>
</tr>
<tr>
<td>Loss on drying, %</td>
<td>0.30Max</td>
</tr>
<tr>
<td>Reducing substances, %</td>
<td>0.70Max</td>
</tr>
<tr>
<td>Heavy metals, ug/g</td>
<td>10 Max</td>
</tr>
<tr>
<td>As, ug/g</td>
<td>2Max</td>
</tr>
<tr>
<td>Sulfate, %</td>
<td>0.05 Max</td>
</tr>
<tr>
<td>Chloride, %</td>
<td>0.07 Max</td>
</tr>
<tr>
<td>Lead, ug/g</td>
<td>1 Max</td>
</tr>
<tr>
<td>pH</td>
<td>6.2-7.8</td>
</tr>
</tbody>
</table>

Packing: In 25kg PP bags on pallets
20MT in 20'FCL
USES & APPLICATIONS

Sodium Gluconate is widely used in the concrete industry in several applications, one of the reasons Gluconates finds favor than other materials is its uniform quality and consistence performance.

The advantages of gluconate include:

- Reducing water without sacrificing workability and strength.
- Retarding setting time and improving workability without increasing water.
- In concreting higher than 90°C, or addition which will aid in difficult conditions, such as long haulage times, hot summer days or tropical weather operations and placement of concrete in large areas.
- Improved resistance to freeze-thawing.
- Decreased bleeding, segregation, dry shrinkage and cracking.

Water Reducer

As a water reducer, Sodium Gluconate allows better workability of the concrete mix and provides increased slump. By careful modification of the water-cement ratio and the addition of sodium gluconate adjustments can be made to increase strength of the structure or actually reduce the cement content while maintaining the original strength. Retarding besides its wetting agent function, sodium gluconate is a good retarder. Retarding admixtures are used in hot-weather concreting operations when delays in transport and handling between mixing and placing may result in
early setting and loss of workability. The construction of large structural units and dams the manufacture of exposed aggregate panels, retarders has also been used to maintain concrete returned from the ready-mix concrete trucks. The exact retarding effect is dependent on temperature, water, cement ration, cement type, etc.

The table below shows a specific example of how the retardation of the set depends on the added amount of sodium gluconate.

Ratio of Sodium Gluconate determines setting time of cement.

<table>
<thead>
<tr>
<th>% of Sodium Gluconate Added Based on Weight of Cement</th>
<th>Time (hours) to Beginning or End of Setting, Compared with a Control series Portland Cement 275</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.05</td>
<td>.4</td>
</tr>
<tr>
<td>0.10</td>
<td>1.1</td>
</tr>
<tr>
<td>0.15</td>
<td>3.4</td>
</tr>
<tr>
<td>0.20</td>
<td>6.9</td>
</tr>
<tr>
<td>0.30</td>
<td>16.5</td>
</tr>
</tbody>
</table>

**Corrosion Inhibition**

Sodium gluconate is an excellent chelator and as such, provides a degree of protection against corrosion of the rebar used in concrete. In addition to concrete, the inclusion gluconates can modify the physical characteristics of mortar, grout, and various masonry products.

**Bottle Washing**

Sodium Gluconate is widely used in industrial cleaning formulations across several applications. Gluconate in an alkaline solution is used to clean glass bottles used in food and beverage industry. Sodium Gluconate is used because of its excellent chelating properties. This makes it desirable in areas where hard water is an issue. As a sequestrant in a caustic bottle washing, gluconate has been found to:

- Prevent precipitation of the hardness constituents of water (calcium & Magnesium) that cause bottle haze.
- Eliminate the rust spots on bottle neck.
- Increase the efficiency of aluminum label removal
- Provide free rinsing reducing caustic carry-over
- Lower maintenance cost
The table shows usage based on water hardness and product used.

Gluconate sequesters calcium and magnesium on a one to one mole basis in 1%-5% caustic solutions. Approximately 100 parts gluconate will sequester 20 parts calcium.

**Corrosion Inhibition**

Sodium gluconate in low concentration is an effective corrosion inhibitor used in recirculating water systems, such as cooling towers & heat exchangers. These systems are composed of pipes, vessels, etc. constructed of copper and carbon steels which are particularly prone to oxidative corrosion. The corrosion can be inhibited by dissolving Sodium Gluconate in concentrations above 100ppm. Mechanism The same general mechanism is probably similar with other metal salts of Gluconic Acid. Gluconate works well in both fresh water and water environments.

**De-Icing**

Corrosion of vehicles, bridge decks and guardrails has often been a problem when sodium chloride is used for de-icing. Sodium Gluconate along with other additives is utilized to minimize this corrosion. Sodium Gluconate is biodegradable and non-toxic, having no pollution problems when disposed of properly.
DETERGENT & CLEANING

Sodium Gluconate is used in cleaning formulations across several applications both in industry & home/personal care. It’s used also because of its excellent chelating properties.

➢ Food Industry
Gluconate may be employed in food equipment cleaners for a variety of food processing industries.
For instance, gluconates provide sequestration of hard water ions in alkaline detergents, which enhance the ability of the cleaner to emulsify or saponify typical food industry soils (i.e. grease, protein, fat).
Since most food processing equipment is constructed of stainless steel, caustic soda may be applied without concern of damaging the metal. Gluconate when added to caustic soda, can successfully aid in the removal of deposits, such as milkstone, beerstone and hard water scale.

➢ Acid cleaning
In solutions where food industry equipment is constructed of non-ferrous metals, such as copper & aluminium, deposits can be removed using a blend of organic acids. Because gluonic acid has a low order of corrosiveness in comparison with other organic acids, it is important in protecting metal when removing milkstone or beerstone.

➢ Dish Washing
Many detergent manufacturers are looking for more environmentally friendly dishwashing compounds.
A granular formulation using Sodium Gluconate, which is based on sodium carbonate & disilicate has been found non-toxic and much more environmentally friendly than phosphates ingredient detergent.
Detergent Function
- Chelator-Binds hard water ions allowing detergent fuction more effectively
- Builder-Binding the hard water ions has the effect of softening the water
- Anti-Reposition agent – Prevent the unwanted ions from being redeposited back onto clothes or dishes.
- Soil remover: Since most soil molecules are bound to fabric by calcium bridges, gluconate can break these bonds, thus removing the soil and preventing it redeposited.

ECONOMIC GREEN INGREDIENT IN MEAT

Economical Stabilization for Succulent Sausages
Sodium Gluconate function as
- Cost saving stabilizer for meat emulsions
- Good bite and mouth feel
- No comprise in colour, taste & safty
- Fits with sodium reduction strategies

Sodium Gluconate for food stabilize meat emulsions in combination with phosphate by increasing water binding and protein solubility. As an economical stabilizer, it allows to reduce costs of emulsion type sausages like frankfurter, wiener and bratwurst without compromising quality and safety.

Stabilization of Emulsion-type Sausages
To avoid fat and gel formation, emulsion-type sausages usually are stabilized by salt & phosphate, sometimes also salts of organic acids, mainly citrates. Like phosphates & citrates, sodium gluconate increase the ionic strength, chelate divalent cations & increase the pH, thus stabilizing sausage meat emulsions.
The below data shows best texture of emulsion-type sausages is obtained with 60% Sodium Gluconate and 40% diphosphate. Colour and taste of the sausages are not affected by the use of Sodium Gluconate but make sausage more safer than using salt and phosphates.

![Gel formation in frankfurter sausages without and with 0.3% stabilizer](chart)

**Recommend Dosage**

Sodium gluconate stabilizes ideally emulsion-type sausages when used together with diphosphate in a ratio 60/40 and a total stabilizer concentration of 0.3%. Infrankfurter and wiener type sausages, this combination provides a texture that is as firm and a bite that is as good as with phosphate alone, but at a significantly lower cost. In bratwurst, the combination even improves the perceived quality as the mouthfeel is less rubbery than with phosphate alone.