DE-ICING

SODIUM GLUCONATE

Sodium Gluconate has seen increasing use as part of a de-icing solution. These solutions are applied to bridges, roads, guardrails and overpasses, not only to melt the ice and snow but to help protect the infrastructure itself. These structures are particularly prone to oxidative corrosion. This occurs because air from the atmosphere will dissolve in the snow and ice. The dissolved oxygen will diffuse into the metal inducing corrosion.

CORROSION INHIBITION

The corrosion can be inhibited by dissolving sodium gluconate in concentrations above 100 ppm. This will generate the formation of a thin protective film on those metal surfaces. This film inhibits the diffusion of the dissolved oxygen to the metal surface lowering the corrosion rate of the metal.

MECHANISM

Corrosion inhibition has been attributed to many of the metal salts of gluconic acid including sodium, potassium, calcium, manganese, cobalt, cadmium and zinc. Tests have been conducted in both fresh and sea water. Rajendran[1] et al proposed the following mechanism of corrosion inhibition by calcium gluconate. When mild steel is immersed in a solution containing 60 ppm Cl- and 200 ppm calcium gluconate, the calcium gluconate diffuses from the bulk of the solution to the metal surface.

On the metal surface, an Fe2+ - gluconate complex is formed on the anodic regions and Ca2+ is released

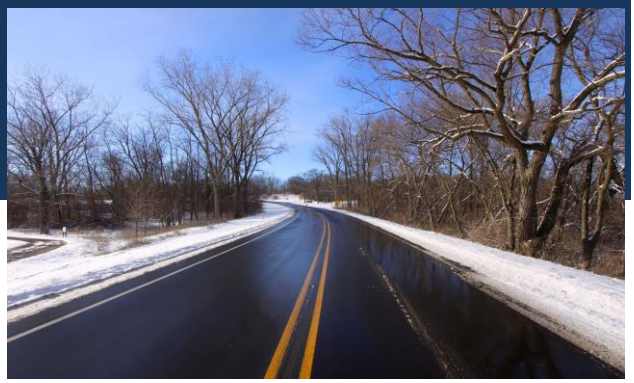
The released Ca2+ forms Ca(OH)2 on the cathodic sites

Ca^{2+} 2OH- ➡ $Ca(OH)_2$

Thus, it is concluded that the protective film consists of Fe^{2+} - gluconate complex and $Ca(OH)_2$. This same general mechanism is probably similar with other metal salts of gluconic acid, including sodium.

DE-ICING

SODIUM GLUCONATE



FORMULATIONS

Many of the formulations are a mixture of gluconate, salt brine and some other ingredients. Individual companies, in consultation with their respective state DOTs determine the final formulation. Recent data suggests that use of gluconate in these solutions, may reduce corrosion on the trucks themselves, thus saving valuable equipment and reducing costs to municipalities.

ENVIRONMENTAL CONCERNS

Gluconates are readily biodegradable making them more environmentally friendly than compounds using EDTA or other chemicals that are of environmental concern

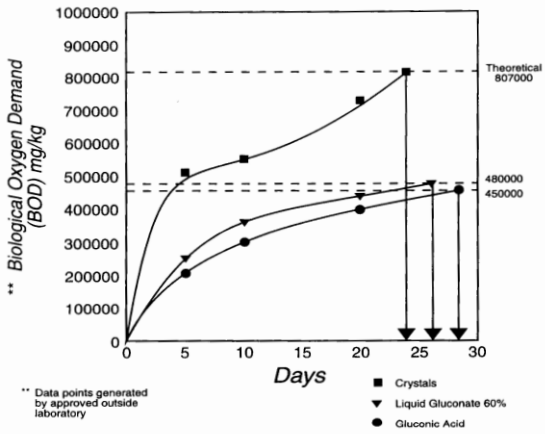
GLUCONATE SOURCE

Because the gluconate anion is the active sequestrant, it does not matter whether the gluconate is introduced as sodium gluconate crystals, liquid gluconate. Each product for does have a different use level based on molecular weight.

SPECIFICATIONS

Sodium gluconate is available is solid or liquid form. Sodium Gluconate FCC comes in both granular and powder form . Liquid Gluconate 60 (LT) and Gluconic Acid 50% are available in drums, totes or bulk.

Biodegradability of Gluconates



Chemical Oxygen Demand

The Chemical Oxygen Demand of sodium gluconate is 0.515 g/g

Total Oxygen Demand

The Total Oxygen Demand of sodium gluconate is 0.973 g/g

REFERENCES

1 S. Rajendran, "Calcium gluconate as corrosion inhibitor for mild steel in low chloride media"; British Corrosion Journal, 1998, Vol. 33 No.4

PMP FERMENTATION PRODUCTS, INC.

900 NE Adams Street ● Peoria, IL 61603 ● (309) 637-0400

To order, call (800) 558-1031 ● Fax: (309) 637-9302

www.pmpinc.com ● make inquiries to: Info@pmpinc.com