HARCROS

HQuest C-100 (Crystalline Dry Powders)
HQuest B-105 (50% Aqueous Liquids)
HQuest L-50 LA (50% Aqueous Liquids)
Calcium Glucoheptonate (38% Aqueous Liquid)

Sodium Glucoheptonates

Sodium glucoheptonate is a sodium salt of polyhydroxymonocarboxylic acid (2,3,4,5,6,7-hexahydroxy-s-heptonic acid). It is the reaction product of sodium cyanide and dextrose.

Sodium glucoheptonate has many industrial uses as a high performing chelating agent. This high level of performance is due to its efficiency in forming stable chelates with di- and tri-valent metal ions such as Ca+2, Mg+2, Fe+2, Fe+3, Zn+2, Al+3, etc. in the pH range between 7 and 14.

Sodium glucoheptonates have superior hydrolytic stability compared to sodium gluconates in highly alkaline, high temperature baths and, therefore, are much better sequestrants under these conditions. Sodium glucoheptonates are also superior to the polyphosphates which hydrolyze and become ineffective under the conditions cited above. Moreover, sodium glucoheptonates are non-corrosive and non-toxic materials.

As a result of the high purity raw materials we use in our manufacturing process, Harcros simultaneously produces both Crystal sodium glucoheptonate (H-Quest™ C-100) and standard liquid sodium glucoheptonates (H-Quest™ B-105 and L-50 LA). Crystal sodium glucoheptonate has no odor and light color and hence is in high demand. Recognizing the market need for a liquid product with the same desirable characteristics of crystal product for some demanding applications, our chemists have developed several liquid sodium glucoheptonates. The liquids are similar in physical and chemical properties to a solution of sodium glucoheptonate crystal. The liquids have a shelf life of 12 months. H-Quest™ C-100 may be used at high pH conditions without the release of ammonia and will provide the outstanding chelating performance.

Sodium glucoheptonates are used in concrete admixtures, bottle washing, aluminum etching and cleaning, textile specialties, metal finishing, heavy-duty alkaline cleaners, agricultural micronutrients, and other applications. See page 6 for a more complete description of applications.

Harcros Specialties Glucoheptonate Product Line

H-Quest™ C-100	Crystalline (Alpha isomer)	> 99% Dry powder
H-Quest™ L-50 LA	50% Liquid (Low pH and odor)	50% Aqueous Liquid
H-Quest™ B-105	50% Liquid (High pH)	50% Aqueous Liquid
Calcium Glucoheptonate	38% Liquid	38% Aqueous Liquid

Product characteristics and physical and sequestration properties are found in Tables I, II, III, and IV.

H-Quest™ C-100 Crystalline Sodium Glucoheptonate

CHEMICAL STRUCTURE: Alpha Isomer

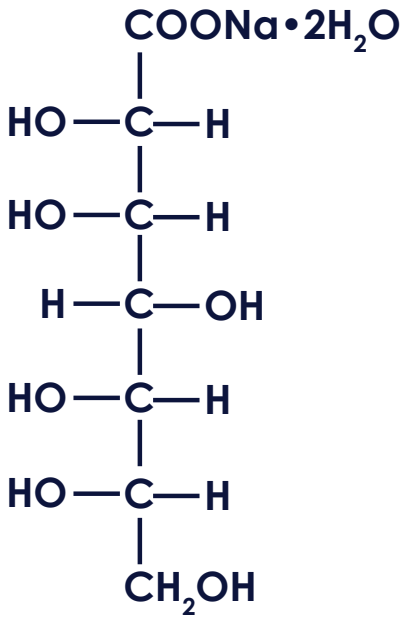

TABLE I. Characteristics & Physical Properties of H-Quest™ C-100 Crystalline Sodium Glucoheptonate

Appearance	Off-white powder
Molecular weight	284
Percent Moisture	1.0 maximum
Bulk Density	45-50 lbs. per cubic ft.
pH, 1% Solution	8.8 ± .5
Sequestering Capacity Min. (3% NaOH)	500 mg CaCO3 per gram sequestrant (dry basis)

TABLE II: Sequestration Properties Of Crystalline Sodium Glucoheptonates

pH	Sequestration Value*,(mg CaCO3/gm sequestrant)
8.0	46
9.0	48
10.0	60
11.0	64
12.0	70
0.65% NaOH	182
1.10% NaOH	292
1.50% NaOH	365
2.40% NaOH	489
2.70% NaOH	532
3.00% NaOH	658
3.20% NaOH	709
3.60% NaOH	720
4.10% NaOH	720
4.50% NaOH	740
5.00% NaOH	750
7.80% NaOH	328
10.00% NaOH	177
15.40% NaOH	120

*Sequestration of calcium carbonate in the presence of 0.3% sodium carbonate indicator

H-Quest™ L-50 LA 50% Liquid Sodium Glucoheptonates

TABLE III. Characteristics & Physical Properties Of H-Quest™ 50% Liquid Sodium Glucoheptonates

Properties	H-Quest™ Liquids
Appearance	Dark liquid
Color	Amber Liquid
Odor	Ammonia odor

TABLE IV: Sequestration Properties Of 50% Liquid Sodium Glucoheptonates

pH	Sequestration Value*,(mg CaCO3/gm sequestrant)
8.0	38
9.0	40
10.0	52
11.0	68
12.0	70
0.50% NaOH	125
1.00% NaOH	220
1.50% NaOH	282
1.75% NaOH	330
2.15% NaOH	425
2.60% NaOH	454
3.00% NaOH	495
5.00% NaOH	540
5.55% NaOH	550
5.90% NaOH	530
8.30% NaOH	215
20.0% NaOH	126

*Sequestration of calcium carbonate in the presence of 0.3% sodium carbonate indicator

Sodium Glucoheptonates Applications Summary

Application	Advantages
Concrete Additive	• Set-retarding capacity increases plasticity, strength and volume • Reduces water use by 15%
Alkaline Metal Cleaning	• Sequesters alkaline earth and transition metals under alkaline conditions • Does not attack base metal • Forms protective film against after-rusting • Removes soil, oil, phosphate deposits, paint • De-rusts metal
Metal Finishing	• Removes oxide film • Protects surface finishing • Brightens metal surface • De-rusts metal
Heavy Duty Alkaline Cleaner	• Provides superior iron control • Chelates/disperses trace metals • Prevents redeposition of metals in solution • High stability with caustic soda
Alkaline Bottle Cleaner	• Highly stable sequestrant for trace metals • Prevents scale build-up on equipment
Oilfield Cementing	• Superior thermal stability • Reduced water usage • Ability to control set time • Improved plasticity and cohesion of the wet mix

Detailed Description of Suggested Glucoheptonates Applications

Concrete Additive

The addition of small amounts of sodium glucoheptonates to concrete admixtures has a significant effect on controlling the setting time, resulting in improved plasticity and cohesion of the wet mix. In addition, the sodium glucoheptonates affect the rate of hardening of the cement, which results in increased strength development. Sodium glucoheptonate is non-corrosive to the metal used in reinforced concrete.

Alkali Cleaning, De-rusting and Paint Stripping of Metals

Sodium glucoheptonate is an effective sequestrant for alkaline earth metals such as calcium and magnesium. It is also an excellent sequestrant for iron under alkaline conditions. Due to its superior sequestering abilities in alkaline solutions, sodium glucoheptonate inhibits the formation of insoluble calcium and magnesium salts. Additionally, it dissolves ferric oxide (rust) films. Laboratory data indicate that sodium glucoheptonate/caustic soda solutions form a protective film on the metal, limiting degradation of the base metal. "After-rusting" tendencies are of lesser severity than those resulting from mineral acid cleaning or standard de-rusting procedures. Solutions of sodium glucoheptonate and caustic soda remove oil, light soil, and phosphate deposits. A sodium glucoheptonate to caustic soda ratio of 1:5 -1:10 is suggested, with a caustic concentration of 50 - 400 grams per liter of soak tank solution. A temperature range from 70-95°C is recommended. Such solutions are compatible with alkali detergent builders and wetting agents.

Aluminum Etching and Cleaning

Preparation of aluminum for anodizing, or coating requires a thorough cleaning of the surface. The addition of sodium glucoheptonate to a caustic soda solution greatly aids the process of aluminum etching and cleaning, dissolving the aluminum oxide film from the surface and subsequently preventing its redeposition as an oxide scale on the heating coils. Such caustic baths vary from 1 to 10 ounces per gallon of alkali with 1-5% of sodium glucoheptonate relative to the dry weight of caustic soda. A suggested mixture would contain 4 ounces of caustic soda and 0.12 ounces of sodium glucoheptonate at 71° C.

Alkaline Bottle and Glassware Washing

Bottle and glassware cleaning formulations are designed to eliminate bottle haze and scale build-up, which is usually caused by magnesium and calcium constituents of hard water. It is also desirable that the cleaning formulations remove rust, provide good rinsing, and above all, reduce maintenance costs. Efficient cleaning of bottle glassware has been obtained with formulations which combine the cleaning and detergent action of caustic soda with the sequestering-dispersing action of sodium glucoheptonates.

Sodium glucoheptonate is an excellent sequestrant and rinse aid when used with approximately 3% caustic soda or other builders such as phosphates in bottle and glassware operations. The sequestrant is frequently used at 2 to 5% of the dry caustic soda concentration depending upon the hardness of the water employed.

Textile Processing

The mildness of sodium glucoheptonate as a multivalent metal ion Ca+2, Mg+2, Fe+3, Cr+3, Al+3) sequestrant provides an effective, non-tendering agent for dissolution of metal contaminants, that would otherwise reduce dye brilliance. In addition, precipitation of aluminum salts used in waterproofing techniques is eliminated. Sequestration of iron impurities in kier boiling, alkaline scouring and mercerization processes results in an effective protector against iron staining of textiles. Poisonous effluent salts of chromium- based dyes are also prevented from precipitating in alkaline solutions. Stoichiometric quantities of ammonia and sodium glucoheptonate produce ammonium glucoheptonate which is extensively used in printing on cotton or linen with dissolved vat dyes. The mode of action depends upon the use of ammonia glucoheptonate as a latent acid catalyst. Partial decomposition of ammonium glucoheptonate to ammonia gas and dissolved glucoheptonic acid is achieved during the neutral steaming process used in color development. The removal of gaseous ammonia leaves the glucoheptonic acid solution of the proper acidity for color development. This provides printers with a flexibility of pH range for acid-steaming techniques. Certain highly alkaline printing pastes that utilize colored gums are impossible to use without ammonium glucoheptonate. Ammonium glucoheptonate acts as a stabilizer for the paste against the telling action of caustic soda. Thus, printers can use these less expensive printing gums.

Environmental, Toxicity and Handling Information

While sodium glucoheptonate is relatively non-toxic, it may cause skin and eye irritation. Prolonged exposure to high concentrations may cause irritation to the eyes, nose, throat, and respiratory tract.

We recommend that you carefully review the Harcros Chemicals Inc Safety Data Sheet (SDS) for sodium glucoheptonate for more information on toxicity, safe handling and first aid procedures.

For additional information on these products please visit www.harcros.com

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