



PRODUCT DATA SHEET

GUAR GUM

The Stan Chem Group is one of the largest distributors of natural Guar Gum in the UK with sales into a wide range of industries. Both Food and Technical grades are sold, the most popular grades being 3500cps and 5000cps.

RESUME OF THE PROPERTIES OF GUAR GUM

Guar Gum is derived from the seed of the guar plant "Cyamopsis Tetragonolobus" leguminosae', a pod bearing, nitrogen fixing, drought resistant annual legume which grows best in sandy soils. The guar plant has been cultivated in India for centuries as fodder for horses and cattle. The guar-harvesting season in India and Pakistan commences at the end of the year.

Guar gum was originally developed as a replacement for locust bean gum during World War II. Although both gums are galactomannans, significant differences in composition and behaviour soon became apparent.

Guar gum is an amazingly versatile and efficient high polymer hydrophilic hydrocolloid, economical in use and easy to handle. Its ability to form highly viscous colloidal dispersions at low concentrations, without heating, makes it one of the most interesting of the hydrocolloids.

Guar gum is one of the newest chemically available water-soluble gums, chemically classed as a galactomannan and having a molecular weight reported to be 220,000. It is non-toxic and non-ionic and is compatible and miscible with virtually all known water soluble gums, both natural and synthetic, and is one of the most powerful water binders and viscosity builders, superior to practically all known water soluble gums. Comparative viscosities of 1% solutions of various products at 25° C are given below:

PRODUCT	Cp
Gum Arabic (20% by wt)	50
Locust bean gum	100
Methyl cellulose	150
Gum Tragacanth	200
Carrageen	300
High viscosity sodium CMC	1200
Gum karaya	1500
Sodium alginate	2000
GUAR GUMS	4000+
Water at 27°C	1 cps

Guar gum solutions are stable over a wide pH range and the non-ionic nature of the molecule is responsible for the almost constant viscosity of its solutions in the pH range of 1-10.5. The optimum rate of hydration occurs between pH 7.5 and 9 but, despite rate differences, maximum viscosities attained are the same in both acidic and alkaline media. Furthermore, being non-ionic, it is compatible with salts over a wide range of electrolyte concentrations of multivalent salts affect hydration to produce gels.

The viscosity of guar gum solutions is dependent upon the following factors:

(i) Purity (ii) time (iii) temperature (iv) concentration (v) pH (vi) ionic strength and (vii) type of agitation. The rate of hydration is increased by short term heating whereas the degradation effect of prolonged heat tends to decrease the viscosity the lower the temperature, the lower the hydration rate and consequently the lower rate at which viscosity increases. In dilute solutions the viscosity increases linearly with concentrations up to about 0.5%

and thereafter guar gum solutions behave as non-Newtonian solutions mainly as a result of complex surface interactions at higher concentrations.

Guar gum solutions may be heated or boiled for some time without loss in viscosity provided the pH is close to neutral. Mineral acids cause hydrolysis and loss of viscosity but solutions will tolerate acids usually found in foods if not subjected to excessive heat. Alkalis in strong concentration also tend to reduce the viscosity, whereas the addition of borax to a solution of guar gum will form a gelatinous mass.

As with most naturally occurring materials, guar gum solutions are subject to bacterial and enzymatic degradation but being also compatible with all common preservatives, these are often employed for aqueous solutions prepared more than 24 hours before use. Among the more effective preservatives are formaldehyde and chlorinated phenolics, while food preservatives such as benzoic and sorbic acids are used where appropriate.

Properties

Guar Gum is a galactomannans and has a large number of d-galactopyransol branches in its molecule adding to its h-bonding properties allowing easy hydration in cold water. Hydration increases with increasing temp.

Guar Gum is able to develop high viscosity at low concentrations and without heating. The viscosity depends on concentration, pH, ionic strength and type of agitation. Suspensions may be boiled for some time without loss in viscosity if pH is close to neutral. In dilute solutions the viscosity increases linearly for concentrations up to about 0.5% but with non-Newtonian behaviour for higher concentrations.

Mineral acids cause hydrolysis and loss of viscosity but solutions will tolerate acids usually found in foods if not subjected to excessive heat. Strong alkaline concentrations also tend to reduce the viscosity guar gum but the addition of borax to a solution of guar gum will form a gelatinous mass.

Uses

Fire fighting

Used to reduce friction giving faster rate of water and reducing energy costs. Also used to improve the dispersion of water and improve cohesion of the jet to allow more concentrated delivery of water.

Foodstuffs

- Dairy - an emulsion stabiliser for ice cream, thickeners for milk shakes & yogurt, cream cheese etc
- Freeze - thaw stability prevents large crystals from forming, retaining correct texture. Stable in fruit acids at effective at 0.2% - 0.8% of total weight
- Bakery - used as a binder and texturiser, improves consistency of dough and cake mixes & fillings
- Convenience - hydratable viscosity agent use in dried soups, instant noodles, etc
- Sauces & Relished - as a viscosity agent to stop sedimentation of insoluble components in ketchup, relish and mayonnaise
- Fish / Animal Feed
 1. Guar meal adds proteins and is used as a binder in prawn feed (extrusion produced) which allows feed to be stable in water longer giving a greater chance for the slow feeding shrimps to feed off it before it disintegrates
 2. Pet foods to produce "meat chunks" and to stabilise solids

Oil Drilling

Guar is used in drilling fluids because of its water loss control, viscosity control, friction reduction, suspension aid and mobility control properties

Pharmaceuticals

Traditionally used as a bulking agent in laxatives, binding agent in compressed tablet, bulking agent in slimming aids. Tests have been done on reducing insulin intake in diabetic industry

Water treatment

Guar is used as a coagulant aid in water treatment to increase floc size and improve filtration efficiency. Inorganic suspensions are readily flocculated by Guar without preliminary treatment. Wastewater containing organic matter must be pre treated with ferric sulphate and lime in order to initiate coagulation. Large flocs are formed which resist compaction and are easily settled or filtered.

As Guar is an accepted food additive, it can be used for drinking water plants and is accepted by most public water utilities worldwide

Others:

Slurry explosives as a thickening agent and as a gelation agent for water insensitive aqueous, inorganic, oxidising salt/organic explosive type, blasting slurry compensations. It does this by inhibiting leaching out of the inorganic oxidiser and desensitisation of the explosive under wet conditions; mining industry, waste water treatment, cosmetics, ceramics, inks and tobacco industries