GRINDSTED® Xanthan

A new Gum in Danisco
### Origin of Commercial Hydrocolloids

<table>
<thead>
<tr>
<th>Marine Plants</th>
<th>Terrestrial Plants</th>
<th>Microbial Polysaccharides</th>
<th>Polysaccharide Derivatives</th>
</tr>
</thead>
<tbody>
<tr>
<td>Agar</td>
<td>Guar</td>
<td>Dextran</td>
<td>CMC</td>
</tr>
<tr>
<td>Alginates</td>
<td>Gum Arabic</td>
<td>Gellan Gum</td>
<td>MHPC</td>
</tr>
<tr>
<td>Carrageenan</td>
<td>Gum Tragacanth</td>
<td>Rhamsan Gum</td>
<td>HPC</td>
</tr>
<tr>
<td>Furcellaran</td>
<td>Karaya Gum</td>
<td>Welan Gum</td>
<td>HEC</td>
</tr>
<tr>
<td></td>
<td>Locust Bean Gum</td>
<td>Xanthan Gum</td>
<td>Propylene Glycol Alginate</td>
</tr>
<tr>
<td></td>
<td>Pectin</td>
<td></td>
<td>HP Guar</td>
</tr>
<tr>
<td></td>
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<td>Modified Starches</td>
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</tbody>
</table>
What is Danisco Xanthan

Xanthan gum is a high molecular weight polysaccharide produced by viscous fermentation. The polymer backbone is made up of β-1, 4-linked D-glucose residues. A trisaccharide branch containing one glucuronic acid unit between two mannose units is linked to every other glucose unit at the number 3 position.

EU Number: E 415
Why do bacteria produce Xanthan?

- Protect against dehydration
- Protect against bacteriophages
- Adhesion to substrate
- Prevent water transport in host
- Protect against moderate temperature changes
Advantage of a Fermentation Process

- Consistent high quality
- Controlled stable supply
- Stable price
- Universal acceptance
**Manufacturing**

<table>
<thead>
<tr>
<th>Danisco Textural Ingredients</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laboratory Scale</td>
</tr>
<tr>
<td>Stirred Flask</td>
</tr>
<tr>
<td>Culture - Stock</td>
</tr>
<tr>
<td>Industrial Scale</td>
</tr>
<tr>
<td>Fermentation</td>
</tr>
<tr>
<td>Sterilization</td>
</tr>
<tr>
<td>Coagulation</td>
</tr>
<tr>
<td>Drying</td>
</tr>
<tr>
<td>Milling</td>
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<tr>
<td>Control</td>
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<tr>
<td>Standardization</td>
</tr>
<tr>
<td>Xanthan Gum</td>
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<tr>
<td>Shipping</td>
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</tbody>
</table>

Danisco Xanthan is manufactured in China in a new factory using state of the art fermentation technology and recovery.
### Properties of Xanthan Gum

#### Rheological Properties
- High viscosity at low concentration
- High viscosity at low shear rates
- High degree of pseudoplasticity
- High elastic modulus

#### Stability/Compatibility
- Ionic strength variations
- Heat
- pH
- Shear
- Enzymes
- Chemicals (salts, acids, base, alcohol…)

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Danisco Textural Ingredients

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DANISCO
First you add knowledge...
Effect Concentration on Viscosity

Viscosity (mPa.s)

% Concentration with 0.1% NaCl
Xanthan Gum Solution Properties

Long Range Order | Local Order | Random Segment

Low Energy | High Energy

Danisco Textural Ingredients
GRINDSTED® Xanthan for Suspension

High yield value at low concentration and low shear provides unparalleled stabilization
Using Xanthan creates a yield stress in the food product. Below that level of stress, there is no flow. The product is stable.

Xanthan Molecular Network.
Atomic Force Microscopy picture, image size 1.5 micron * 1.5 micron
Source: Institute of Food Research, UK
Effect of Increasing Shear

<table>
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<tr>
<th>Danisco Textural Ingredients</th>
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<tbody>
<tr>
<td>Viscosity (mPa.s)</td>
</tr>
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</table>

- Xanthan Gum
- Guar Gum
- Sodium Alginate

Shear Rate (s⁻¹)

0.1 | 1.0 | 10 | 100 | 1000

Suspension | Pouring | Oral evaluation | Mixing/pumping
GRINDSTED® Xanthan for Stability

Xanthan Gum is remarkably stable in low pH, high temperature systems.

Xanthan Gum is stable many hours at 70°C and pH below 4.0

Highly suitable for retorted products and autoclaved beverages, as well as food service applications
Effect of pH on Viscosity

Danisco Textural Ingredients

Viscosity (mPa.s)

0.50% Solution

0.25% Solution

LVT Brookfield at 3 rpm
Effect of Temperature

Initial decrease of viscosity is slow upon heating

Viscosity (mPa.s)

Temperature Degrees Celsius

LVT Brookfield at 3 rpm
Effect of Holding at High Temperature

Very good viscosity recovery highlights stability at high temperatures

Viscosity (mPa.s)

Temperature Degrees Celsius

LVT Brookfield at 60 rpm
Xanthan offers a unique synergistic behavior with galacto and glucomannans.

✓ **Xanthan / LBG** mixtures form thermoreversible, soft elastic gels with optimum at 50/50 ratio

✓ **Xanthan / Guar** synergy is best at 20/80 ratio and form weaker gels, but does show an increase in viscosity.

The synergy is reduced in high salt, low pH systems.
Synergy with LBG : Viscosity

**Danisco Textural Ingredients**

- Xanthan Gum/Locust Bean Gum
- Xanthan Gum
- Locust Bean Gum

<table>
<thead>
<tr>
<th>Viscosity (mPa.s)</th>
<th>Gum Concentration (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>10000</td>
<td>100</td>
</tr>
<tr>
<td>1000</td>
<td>100</td>
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<tr>
<td>100</td>
<td>100</td>
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<td>100</td>
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<tr>
<td>0.001</td>
<td>100</td>
</tr>
<tr>
<td>0.01</td>
<td>100</td>
</tr>
<tr>
<td>0.1</td>
<td>100</td>
</tr>
</tbody>
</table>

LVT Brookfield at 3 rpm
Synergy with LBG: Gelling

Optimum synergy is achieved around 50/50 gum ratio

Gel Strength (g/4mm 1" Plunger)

- pH 6
- pH 3

Blend Ratio (Xanthan Gum/Locust Bean Gum)
Optimum synergy is achieved with 20% xanthan and 80% guar.
Multiple Applications

**Culinary : Sauces & Dressings**
- Suspension of particles
- Prevention of creaming off
- Texture

**Bakery** : re-inforce gluten network in frozen dough, high fiber breads, low gluten products.

**Beverages** : Particle Suspension and Mouthfeel
- Fruit Preparations :
- Fruit flotation control
- Texture in association with pectin or LBG

**Ice Cream** (in association with other colloids like LBG)
- Air stability
- Creamy texture
Why choose Danisco Xanthan?

- Competitive Pricing
- Danisco supply and customer service
- Local inventory
- Local technical team and facilities
- Deep knowledge of the food industry
- Strong record of innovation
- Worldwide network of development centers
- Complete offering of food ingredients