

Thickening Agents

Bio-polymers for viscosity control in aqueous systems

 **Deuteron**[®]
ADDITIVES TO YOUR SUCCESS

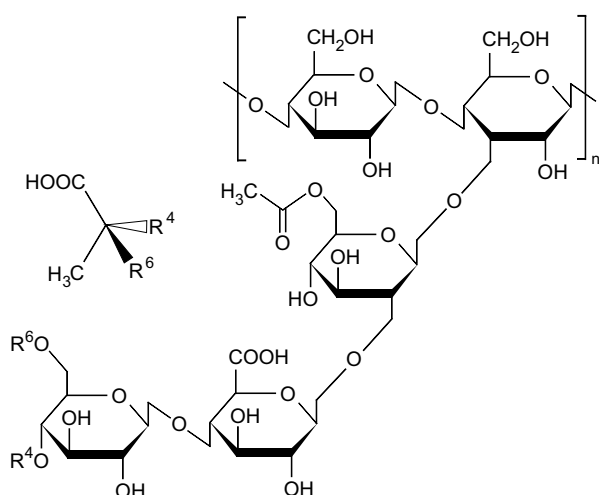


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Thickening Agents by Deuteron

Since the 1980s Deuteron is producing and selling rheology additives based on Xanthan. Over the last 40 years these bio-based thickening additives have seen increasing use in the water-based coatings market. Today Xanthan based additives are well established as thickening additives and stabilizers in many water-based applications all over the globe.



Structural formula of Xanthan – anionic heteropolysaccharides

Rheology control of aqueous coatings is a versatile application with a huge variety of available products.

Inorganic	Minerals	Silicas and Bentonites
	Natural polymers	Starch
	Modified natural polymers	Cellulose, Xanthan-, Guar gum
Organic	Synthetic / Synthetic polymers	Associative thickener Polyacrylate, Polyurethanes

Xanthan (E 415) and Guar gum (E 412) are recognized as food additives.

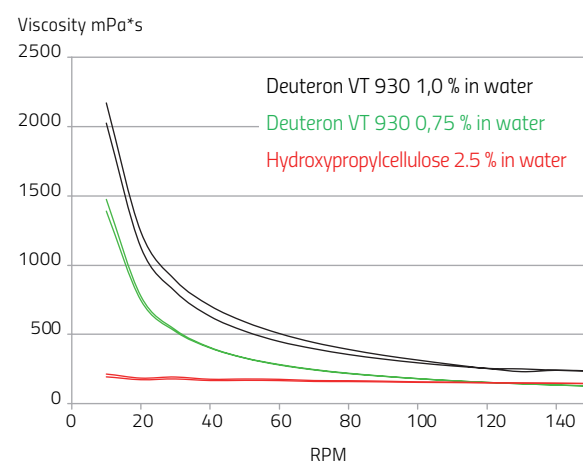
Working mechanism

Xanthan (as well as other polysaccharides) undergoes a swelling process when it comes in contact with water. The polymer starts to detangle into a wide mesh network that interconnects via hydrogen bonding. The resulting gel network shows a shear thinning rheology and does not represent a true solution of Xanthan, but a highly distributed particle gel. Under shear stress the hydrogen bonds will be temporarily destabilized. This destabilization leads to a viscosity reduction – the higher the shear rates the less hydrogen bonds remain stable and the lower the viscosity drops. After shearing the Xanthan molecules start to reorganize the gel network and the viscosity returns to the previous level.

This viscosity behaviour makes Xanthan based thickeners ideal for many coating related applications such as:

- Anti-settling of pigment preparations
- Anti-floating of wax additives
- Brush and roller applications

Newtonian rheology additives (e.g. cellulosic thickeners) are usually not suitable for such applications.



Comparison of Deuteron VT structural thickeners against a newtonian cellulosic thickener.



*Comparison of 2.5% Cellulosic thickeners (left)
vs. 0.75% Deuteron VT 930 (right) in water*

Processing

Xanthan is a bio-polymer with an anionic character. Xanthan is therefore suitable for the use in anionic and nonionic systems – this represents the majority of today's water-based coating systems and pigment preparations. In cationic preparations Xanthan can lead to a destabilization and kick-out effects.

The swelling process of Xanthan in water can be rather quick. The incorporation of untreated Xanthan grades should be done under medium to high shear forces. In order to prevent the formation of lumps and gel particles we recommend to slowly add the Xanthan powders while stirring. The shear rate should be carefully controlled while the viscosity increases to prevent the incorporation and stabilization of air bubbles and foam.

With **Deuteron VT 819** and **VT 910** we offer a range of pre-treated products that are easier to use and incorporate. A chemical surface treatment slows down the hydration process and delays the gel formation. The surface treatment is a pH sensitive layer on the Xanthan particle that will dissolve at a pH level above 7. It is recommended to incorporate our "easy-to-use" products before adjustment of the pH value. In order to fully activate both products the pH value has to be increased to 7.5 or above.

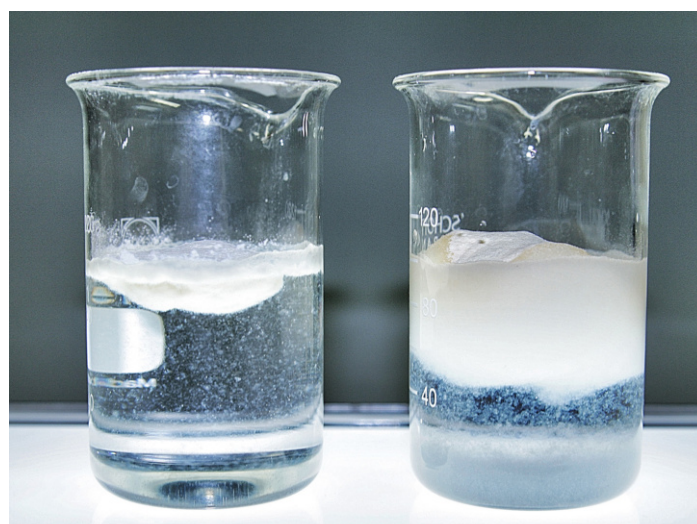
Deuteron's second generation of "easy-to-use" thickeners follows a different route. Our second-generation products do not utilize a chemical surface treatment but a modified supply-form. With our **Deuteron VT 920** and **VT 930** we deliver granulated powders. These granules are free of any chemical surface treatment and thus fully suitable for food and in food contact applications. They are "easy-to-use" and ensure a dust free handling. The incorporation can be done under low to medium shear conditions and takes slightly longer compared to fine powder grades.

Other "easy-to-use" alternatives are our liquid preparations of Deuteron XG in water-compatible solvents. **Deuteron VT 855** and **VT 856** are "easy-to-use" liquids that can be poured in during stirring and need short stirring times to be activated. Both products are also suitable as post-addition additives to adjust viscosity of ready-made paints.

For easier incorporation it is also possible to make own liquid intermediates with our untreated Xanthan powders **Deuteron XG** and **Deuteron SR 28** using a suitable glycol or glycol ether and add between 40% – 50% of the Xanthan powder. This intermediate can be used for easier and dust free incorporation.

Xanthan polymers are sensitive to shear forces, especially in grinding applications. To prevent the polymer from being destroyed during the grinding process we recommend to add them after grinding or any shear-intensive production steps.

Our products are biopolymers, it is recommended to add some biocidal stabilization to a water-based Xanthan preparation. All commonly used biocides are compatible and suitable with Xanthan thickeners. Some examples for excellent in-can stabilization are: CIT/MIT, Bronopol or BIT mixtures. Other biocides should be tested carefully.



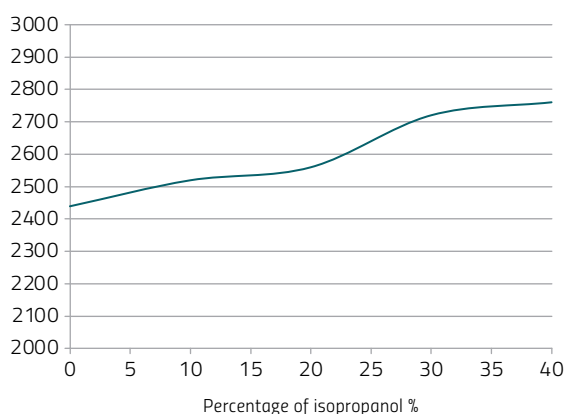
*Comparison of untreated Deuteron XG (left) and surface treated
Deuteron VT 910 (right).*

Properties

Xanthan is not swellable in organic solvents but highly tolerant to solvents when pre-dispersed in water. After proper activation in water, a Xanthan preparation can be diluted using almost any water compatible solvent such as alcohol or glycol ether. Solvent contents up to 40% are possible without significantly changing the viscosity profile.

Deuteron SR 28 is less tolerant to solvents and can potentially lose part of the thickening ability. It is recommended to perform proper testing.

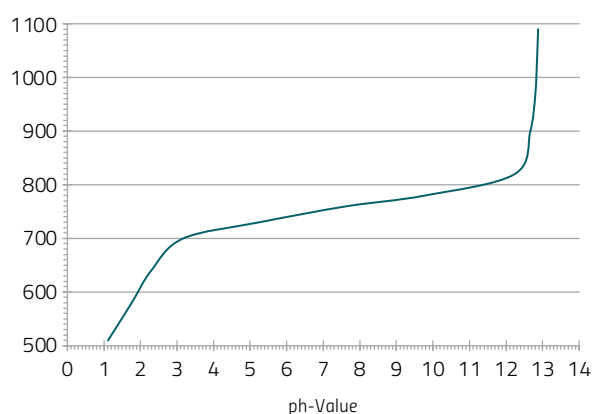
Viscosity mPa*s



Solvent tolerance curve of 1% DEUTERON XG in Water / Isopropanol

Another important property of Xanthan preparations is their high stability against a wide range of pH values. Aqueous gels made with Xanthan remain stable between pH 3 – 12. In acidic environments we specifically recommend to use either **Deuteron VT 920** or **VT 930** due to their higher acidity tolerance.

Viscosity mPa*s



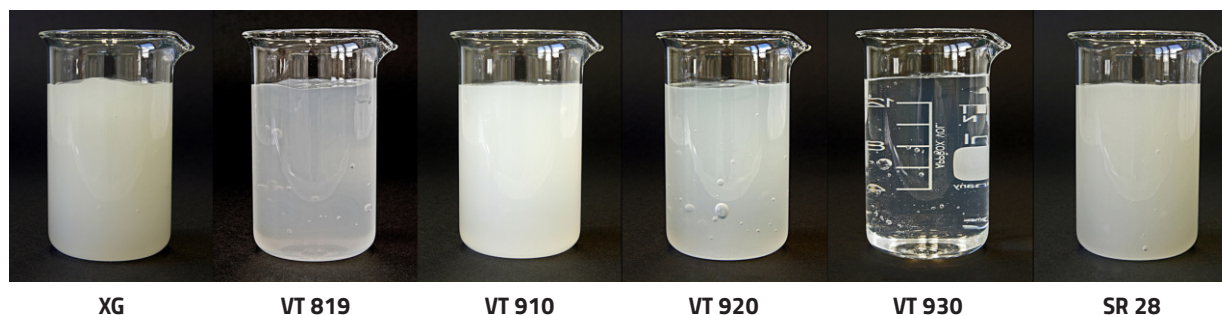
Viscosity of 0.5% DEUTERON XG at different pH levels.

Dosage

The dosage of our thickening agents depends on the system composition and the desired effect. Lowest dosages below 0.1% already help to stabilize pigments and other particles from phase separation. Higher addition levels can be used to control sagging and levelling or even form highly stable gels. Liquid preparations and intermediates need to be added at higher dosages to compensate the lower active content levels.

Starting point per desired effect:

Stabilization of solid components:	0.1 % - 0.3%
Control sagging:	0.1% - 0.5%
Thickening / Gel formation:	0.1% - 1%



Comparison of the appearance of our different products (1% in water)

Additives to your Success.

Standard grades

Our standard grades are untreated Xanthan powders. The standard grades immediately start to hydrate and swell when exposed to water. To prevent the formation of gel particles (difficult to disperse further - high shear forces and time are needed) it is recommended to add the products gently while stirring. High shear rates are needed for proper dispersion.



Deuteron XG – Highly effective Xanthan grade. No further treatment.

Deuteron SR 28 – Synergistic mixture of Xanthan and Galactomanan. Even low addition rates can form high viscosity gels. Lower pH stability.

Granulated grades

Our second generation “easy-to-use” products are based on fine particle preparations that are prepared as larger granulated materials. The granulated form makes it easy to disperse and prevents the formation of larger gel particles during the dosage step. Low and medium shear forces are needed for proper dispersion. Compared to surface treated grades the activation time can be slightly longer.



Deuteron VT 920 – Standard Xanthan in granulated form. FDA, pharma and cosmetic grade.

Deuteron VT 930 – Special grade in granulated form – highest clarity for clear preparations. FDA, pharma and cosmetic grade.

Surface treated grades

A surface treatment using Glyoxal prevents fast hydration of the Xanthan particle. It delays the detangling and thickening process and makes the incorporation significantly easier. Once the surface treatment is removed the Xanthan starts to swell immediately and the viscosity builds up. It is important to mention that the Glyoxal treatment is pH sensitive during the incorporation. At pH levels above 7 the Glyoxal layer starts to dissolve rapidly and releases the Xanthan particle surface. Thus, it is recommended to incorporate our surface-treated products at pH levels around 7 or even slightly lower. After proper dispersion the pH value should be adjusted above 7.5 to fully activate the thickener.



Deuteron VT 819 – High-efficiency grade with surface treatment for easy incorporation. Especially suitable for the use in low ion content media.

Deuteron VT 910 – High-efficiency grade with surface treatment for easy incorporation.

Liquid preparations

Our liquid preparations are based on our Deuteron XG. The thickener is pre-dispersed in water soluble solvents for easier incorporation. The liquid preparations can be easily dispersed using medium shear force. It is recommended to slowly pour in the dispersion while stirring.



Deuteron VT 855 – Xanthan; pre-dispersed in Ethyl lactate

Deuteron VT 856 – Xanthan; pre-dispersed in Ethoxypropanol



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Properties at a glance

- Shear thinning rheology with quick viscosity recovery
- Excellent anti-settling additive
- High efficiency (low dosage)
- "Easy-to-use" products available
- Liquid products for dust-free application available
- Transparent version available
- Compatible with all standard rheology additives
- Stable over a wide pH range
- Highly tolerant against salt ions
- Stable in alcoholic solutions (50% EtOH and 40% IPA)
- High freeze/ thaw stabilit.

Technische data

	Delivered as	Surface treatment / Solvent	Active content %	Shear force necessary	Dosage	Viscosity mPa·s		Food Pharma Cosmetic	Appearance		
						Supply form	1 % in water				
Deuteron VT 855	Paste	Ethyl lactate	40	No	0.1 - 2.0	5000	660*	No	Milky Yellowish		
Deuteron VT 856		Ethoxypropanole				11000	520*				
Deuteron VT 819	Powder	Glyoxal	100	Yes	0.1 - 0.5	-	2700			Yes	Turbid / White
Deuteron VT 910							2500				
Deuteron SR 28		No		3400							
Deuteron XG				2400							
Deuteron VT 920	Powder Granulate	No		Moderate			2200	Yes	Colourless clear		
Deuteron VT 930											

* Related to the active content



Deuteron: First-class products for the coating industry

Deuteron successfully develops and sells innovative additives since 1977. Our product range consists of matting agents, anti-static additives, texturing additives, thickeners and UV initiators. In the course of our company history we have become an important partner of the national and international paint, lacquer and coating industry with sales agencies around the globe.

Visit us on the Internet

Our documents such as product datasheets, safety datasheets, regulatory information and brochures are available in the download area of our website without registration.

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