

Introduction to Xanthan

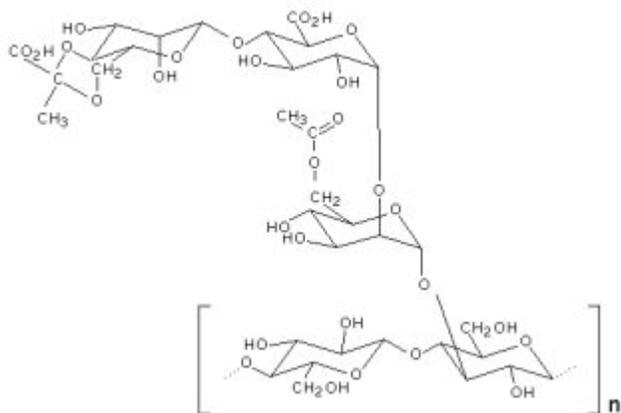
Xanthan was originally discovered in a USDA programme in 1959 to look at novel polysaccharide producing organisms that might have some commercial potential. Several different *Xanthomonas* cultures have been studied for their xanthan producing properties. It is believed that the original culture of *Xanthomonas Campestris* was deposited at the USDA in 1953. The unique rheology was first noted in the literature by (Jeanes et al). Kelco-AIL (Alginate Industries Ltd) commercialised the process and xanthan gum was approved for use in foods in 1969.

Xanthan has been allowed in foods since 1969 by the FDA and 1974 by the EU where it is known by its e-number E415. It has become one of the most successful hydrocolloids largely due to its high functionality, particularly in difficult environments such as acid, high salt and high shear stress.

Structure

Xanthan has a particularly complicated molecular structure. however the backbone of xanthan is a β -(1-4)-D-glucose which is the same as cellulose. Every alternate glucose residue has a three sugar side chain consisting of two mannose residues with a glucuronic acid residue between them. The mannose residue nearest the main chain can carry a C6 acetyl group and the terminal mannose can carry a pyruvate group between C4 and C6. The acetylation and pyruvylation levels vary depending on fermentation conditions but typical values. Typically pyruvate residues can be found on 30-40% of the terminal mannose residues whereas 60-70% of the internal mannose residues may contain acetate groups. Recent work has looked at the properties of GM modified strains of xanthan gum that are either deficient in acetate groups, pyruvate groups or both. (Talashek).

Xanthan is produced in its native state as a twin stranded, right handed five fold helix. The stability of the helix is strongly affected by the ionic environment. Upon heating the xanthan helix goes through a transition to a disordered state and upon cooling it reverts to a helical structure. However it is believed that native xanthan exists in a form where chains are paired and once that has been lost and the xanthan molecules allowed to reorder the exact pairing cannot be retained and a partially crosslinked structure is formed as helices twist around various neighbours.



Xanthan structure

References

Jeanes A, Pittsley JE, Senti FR, Polysaccharide B-1459: A new hydrocolloid polyelectrolyte produced from glucose by bacterial fermentation, Appl Poly Sci, 5 pp519-526 (1961)

Talashk T, Seheult M, Carter T, Navarrete R, Chang H, Non-pyruvylated xanthan in oil field applications utilizing high density calcium-based brines, WO01/88058

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