



PECTIN

GENU[®] Pectin

CP Kelco is the world's leading producer of pectin, a family of rheology modifiers for aqueous systems.

Pectin is the gel-forming component of fruit. Because of its use in food products, pectin is well known by consumers and accepted favorably on product labels.

In addition to gelling, pectins have useful water-binding and film-forming properties.

Composition

Pectins are partially methyl esterified, anionic polysaccharides occurring in fruits and vegetables. The major commercial raw material is citrus peel. CP Kelco has recently added sugar beet pectin to its extensive range.

There are three basic types of pectin, differing in degree of methyl esterification (DE):

HM (high DE) citrus pectin forms gels and structured liquids under conditions of low pH and low water activity (for example, at high concentrations of sugar, sorbitol or glycerol).

High DE beet pectin is non-gelling.

LM (low DE) pectin forms gels in the presence of divalent cations, such as calcium and magnesium.

Pectate, made by complete de-esterification of pectin, forms gels, fibers and films with divalent cations. Pectate is stable in alkaline and neutral pH media.



Global Leader in Hydrocolloids



Product Range and Applications

- HM pectins, complying with the requirements of the National Formulary. Applications include wound dressings, ostomy products and pharmaceutical suspensions.
- LM pectins, differing in terms of their sensitivity to divalent cations. Applications include pharmaceuticals (gastric reflux suppressant) and reconstituted tobacco.

As well as offering standard pectin products, CP Kelco works in conjunction with customers to develop new products and formulations for specific applications.

Pektine von CP Kelco

Pektine von CP Kelco werden hauptsächlich aus den Schalen von Zitrusfrüchten extrahiert. Die Pektine zeigen einen unterschiedlichen Anteil an Methylestern an den Säuregruppen (Methoxygruppen) auf, wodurch eine Unterscheidung in 3 Gruppen stattfindet:

- Hochmethoxylierte Pektine mit Methoxygruppen > 50%
- Niedermethoxylierte Pektine mit Methoxygruppen < 50%
- Nicht-methoxylierte Pektine mit Methoxygruppen = 0 = Pektate (Salze)

HM-Pektine = hochmethoxyliert (high methoxylated)

HM-Pektine bilden im sauren pH-Bereich Gele oder strukturierte Flüssigkeiten. Da sich Gele erst bei einem pH-Wert unter 4 bilden, steht für die Kosmetik die Anwendung der Pektine besonders wegen ihrer filmbildenden Eigenschaften im Vordergrund.

LM-Pektine = niedermethoxyliert (low methoxylated)

Die LM-Pektine bilden bei Zugabe von zweiwertigen Ionen Gele aus. Wenn der Methoxyierungsgrad sehr tief ist und gegen Null zugeht, wird die Stabilität im neutralen und leicht alkalischen pH-Wert verbessert (GENU PECTIN X-914-02).

Bei einzelnen Pektinen ist eine Amid-Gruppe angehängt, was die Empfindlichkeit gegenüber Salzen reduziert und sie damit in der Handhabung vereinfachen. Amidierte Pektine reagieren im allerersten Moment stärker bei Zugabe von Salzen, bleiben jedoch bei weiterer Zugabe von Ionen in der Konsistenz konstanter. Gerade LM-Pektine können dabei in ihrer Sensibilität gegenüber Ionen-Verdickung etwas toleranter gemacht werden, was die Handhabung in der Fabrikation erleichtert.

Pektine sind aus Stabilitätsgründen fast ausschliesslich im sauren pH-Bereich anwendbar. Der empfohlene pH-Bereich liegt zur Filmbildung bei 4.0-4.5, zur Gelbildung muss er unter 4 liegen. Die Ausnahme in der Pektin-Range ist GENU PECTIN X-914-02: es kann bei pH-Wert 6-7 verarbeitet werden, zeigt jedoch grosse Empfindlichkeit gegenüber Salzen.

Pektine können für die Kosmetik als reizmildernde Polysaccharide von Interesse sein. Gerade im sauren pH-Bereich (z.B. Intimpflege oder Säure-Peeling) ist ein hochmolekularer Hilfsstoff mit anti-Irritant-Wirkung sinnvoll. Pektine hinterlassen auf der Haut einen angenehmen, pflegenden Film. Auch ein sauer eingestelltes Erfrischungs- bzw. Straffungsspray mit Pektin könnte daher ein Anwendungsprodukt darstellen (Richtrezeptur „Facial astringent with GENU PECTIN USP/100“).

Selektion für die Kosmetik-Anwendung:

Produkt	Quelle	Methoxylierung	Amidiert	NF-konform
GENU PECTIN USP/100	Zitrus	Hoch	Nein	Ja
GENU PECTIN X-914-02	Zitrus	Sehr niedrig	Nein	Nein
GENU PECTIN X-916-02	Zitrus	Niedrig	Ja	Nein

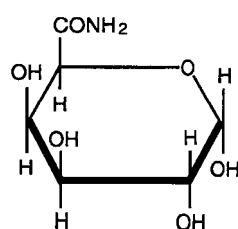
Sämtliche Pektine sind kalt verarbeitbar. Die empfohlene Einsatzkonzentration liegt je nach Anwendungsbereich bei 0.5-3%.

Features of GENU[®] pectin in Personal Care Applications

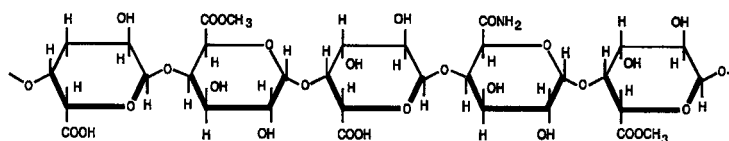
Occurrence

Pectin is a plant cell wall component and occurs in the form of a calcium complex. The cell wall is divided into three layers; middle lamella, primary, and secondary cell wall. The middle lamella is the richest in pectin. Pectin is produced and deposited during cell wall growth, and is particularly abundant in soft plant tissues under conditions of fast growth and high moisture content.

Structure



D-galactoronamide



Pectin consists of an alpha 1-4 linked polygalacturonic acid backbone intervened by rhamnose residues and substituted with neutral sugar side chains and non-sugar components such as acetate esters, methyl esters, and ferulic acid groups.

The neutral sugar side chains, which include arabinan and arabinogalactans, are attached to the rhamnose residues in the backbone. The rhamnose residues tend to cluster together on the backbone. So, with the side chains attached, this region is referred to as the hairy region and the rest of the backbone is hence named the smooth region.

The galacturonic acid residues in pectin are partly esterified and present as the methyl ester. The degree of esterification ("DE") is defined as the percentage of carboxyl groups esterified. Pectin with a degree of esterification ("DE") above 50% is named high methyl ester ("HM") pectin or high ester pectin and one with a DE lower than 50% is referred to as low methyl ester ("LM") pectin or low ester pectin. Most pectin found in fruits and vegetables are HM pectins. Acetate ester groups may further occur at carbon-2 or -3 of the galacturonic acid residues. The degree of acetate esterification ("DAC") is defined as the percentage of galacturonic acid residues containing an acetate ester group. Most native pectins have a low DAC, one exception being sugar beet pectin.

Cosmetic Applications

In cosmetic applications, the main features of pectin are:

- Gelation
- Viscosity
- Emulsification
- Moisture absorption
- Anionic character
- Molecular weight
- Chelation
- Esterification
- Swelling
- Reactive carboxylic acid
- Adhesion
- Low pH

These features are useful in a variety of cosmetic preparations, such as skin care, hair care, and oral care products, patches, foundations, lipsticks, mascaras, eyeliners, nail care products, wound management products, and sun care products.

Apart from adding structure through gelation and viscosity build-up, pectin gels form on the skin to provide moisture absorption while being skin friendly. In addition, pectin gels, which are physically disrupted during processing, are used to formulate creams and lotions without the use of surfactants.

Pectin's ability to gel is further utilized to eliminate oil coalescence and provide spreadability, and eliminate greasiness and provide gradual release properties of oil-in-water-in-oil emulsions.

Pectin gels are also used to make microcapsules from which the encapsulated agent is released in a controlled fashion over various periods of time. In special cases, pectin coatings can provide bioadhesion and a pH, which may reduce irritation and improve skin compatibility. A special feature of pectin gels is the physical nature of the gel lattice. The particular openness of the gel network allows for controlled diffusion of active ingredients to the skin.

Pectin's viscosity is used to evenly distribute and provide excellent non-slimy spreadability of hair conditioners and hair styling products. In addition, pectin provides consistence of water-in-silicone emulsions, which makes it possible to prepare non-wax sticks in which water-soluble substances are useable.

In water, pectin hydrates and swells into soft and wet particles, a feature used to provide a fat-like texture in various skin creams.

Esterification or etherification of low molecular pectin provides new compounds, which emulsify and maintain skin caring properties. Through utilization of pectin's carboxylic acid groups, anti-oxidants can be grafted on pectin to provide healing and moisturizing properties.

The pKa of pectin is about 4. This makes pectin suitable for imparting a pH, which is close to the natural pH of skin. This feature is used to formulate lotions that prevent skin irritation.

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PRELIMINARY APPLICATION NOTE

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Facial astringent with GENU[®] pectin type USP-100

Facial astringents may be used either directly from the container or by spraying on to a cloth that can then be applied to the face for a refreshing feeling.

Pectin is a natural hydrocolloid derived from citrus peel. In below formulation pectin acts as a viscosity enhancer ensuring right droplet size when applied directly to the face as well as maintaining right pH close to that of skin. Pectin has a pKa around 4.

Ingredients	Composition, %
GENU [®] pectin type USP-100	0.5
Citric acid	0.2
Glycerine	1.0
Ethanol (96%)	4.0
Eucalyptus oil	q.s.
Preservative	q.s.
Colour	as needed
Water to	100

Process

1. Disperse pectin into glycerine.
2. Mix water and ethanol.
3. Mix 1) and 2) at ambient temperature.
4. Add citric acid and preservative.
5. Add fragrance and colour as needed.

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