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(71) Applicant *(for all designated States except US)*: HERCULES INCORPORATED [US/US]; Hercules Plaza, 1313 North Market Street, Wilmington, DE 19894 (US).

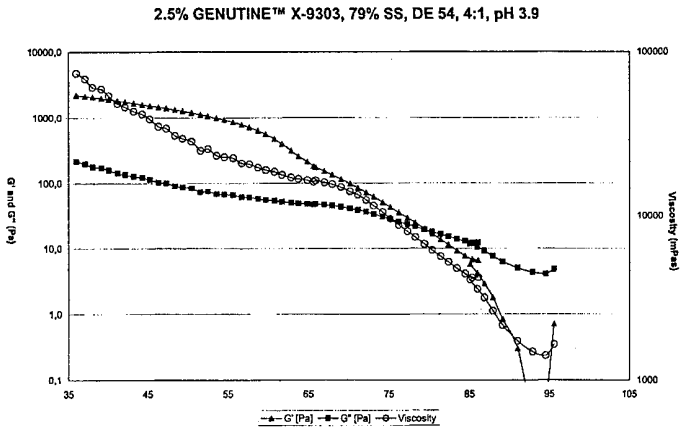
(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: JØNSSON, Torben [DK/DK]; Fortunvej 17, DK–2920 Charlottenlund (DK). KRISTENSEN, Jeanette [DK/DK]; Gevninge Bygade 38, DK–4000 Roskilde (DK). GRØNDAL, Jan [DK/DK]; Meteorvej 7, DK–4040 Jyllinge (DK).

(74) Agent: CHAS. HUDE A/S; H.C. Andersens Boulevard 33, DK–1553 Copenhagen V (DK).

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(54) Title: FOOD COMPOSITION WITH HIGH SOLIDS CONTENT, A METHOD FOR ITS PREPARATION AS WELL AS THE USE OF CARRAGEENANS FOR GELLING A FOOD COMPOSITION



(57) Abstract

A food composition comprising soluble solids in the range of about 50 % to about 90 % by weight, at least 70 % by weight thereof being a sweetening comprising sucrose and non sucrose sweeteners in a weight ratio of sucrose to non sucrose sweeteners of 0:100 to 95:5, wherein the non sucrose sweetener is of a DE (Dextrose Equivalent) of at least about 30, a carrageenan component in an amount sufficient to form a gel, and water to balance, and wherein the gelation temperature of said composition is < 95 °C. Said food composition may be produced by a process comprising: (a) dispersing carrageenan in a syrup of a non sucrose sweetener at a temperature sufficient to disperse the carrageenan in said syrup while stirring; (b) adding water and heating the mixture to the boiling point thereof; (c) adjusting the soluble solids content to from about 50 % to about 90 % by weight, (d) depositing said mixture and (e) cooling said mixture to below the depositing temperature of said mixture. The food composition gels rapidly and forms a gel at temperatures of below 95 °C. The food composition is especially confectionery products such as soft candies, marshmallows or glazings.

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Title

Food Composition with High Solids Content, A Method for Its Preparation as well as the Use of Carrageenans for Gelling a Food Composition

Technical Field

This invention relates to a food composition having high solids content, a method for its preparation as well as the use of carrageenans for gelling a food composition. More particularly, this invention relates to confectionery products such as e.g. soft candies comprising as gelling agent one or more carrageenans, a method for the preparation thereof as well as the use of carrageenans for gelling a food composition.

Background Art

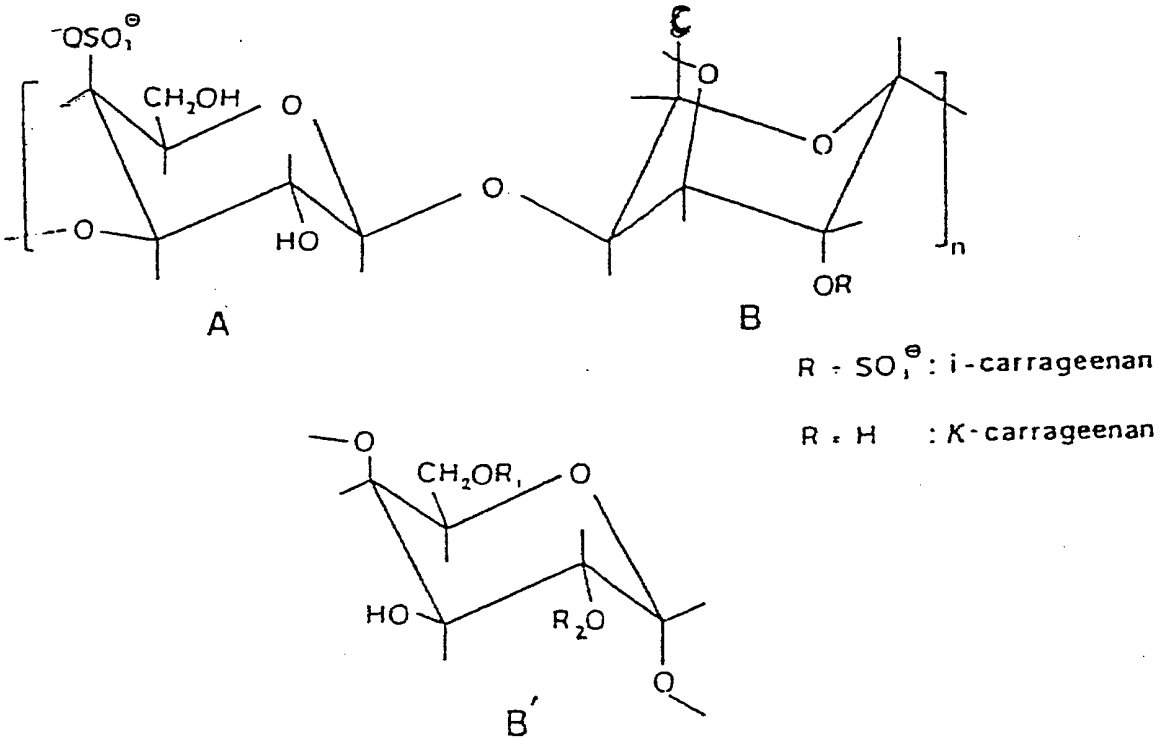
Food compositions having high solids content,such as confectionery products, e.g. soft candies or wine gum, are conventionally gelled by the use of gelatine, a heterogenous mixture of water-soluble high molecular weight proteins. Gelatine is derived from collagen, usually by boiling animal hides or bones.

Despite its excellent gelling capability, gelatine suffers from a number of drawbacks which can be attributed to its animal origin. Thus, gelatine is unacceptable to those of Muslim and Jewish faith, as it is often prepared from swine skin. Further, recently the use of gelatine in foods has been questioned due to the possible link between consumption of foods containing gelatine of bovine origin and the occurrence of the Creutzfeldt-Jakob disease. Finally, the consumption of animals and animal-derived foods may be objectionable for some from an ethical point of view.

There is therefore a need for a vegetable alternative to gelatine.

One such alternative is carrageenan. Carrageenans extracted from seaweed are known to be useful as thickening, viscosifying and gelling agents. Carrageenans are polysaccharides consisting of alternating copolymers of β(1→3)-D-galactose and α(1→4)-3,6-anhydro-D-galactose units. Several members of the carrageenan family are known, differing in their amounts of sulfate ester and/or other substituent groups, viz iota carrageenan, kappa carrageenan and lambda carrageenan, of which only iota and kappa carrageenans have gelling properties.

A general formula for carageenan is disclosed by Nijenhuis, K. in Advanced Polymer Science, 130, 203-18, (1997):



Idealised AB repeating unit of iota and kappa carrageenan polymers based on 1,3-linked β-D-galactose residue (A) and 1,4-linked 3,6-anhydro-α-D-galactose residue (B). The sequence is broken occasionally by residues of the general type B'.

Stortz, C.A. and Cerezo, A.S. describe in Carbohydrate Research, 145 (1986), 219-235, the different members of the carrageenan family by their idealised repeating units:

Carrageenan	3-linked residue	4-linked residue
Beta	Beta-D-galactopyranose 4-sulfate	3,6-anhydro-alpha-D-galactopyranose
Kappa	Beta-D-galactopyranose 4-sulfate	3,6-anhydro-alpha-D-galactopyranose
Iota	Beta-D-galactopyranose 4-sulfate	3,6-anhydro-alpha-D-galactopyranose 2-sulfate
Mu	Beta-D-galactopyranose 4-sulfate	Alpha-D-galactopyranose 6-sulfate
Nu	Beta-D-galactopyranose 4-sulfate	Alpha-D-galactopyranose 2,6-disulfate
Lambda	Beta-D-galactopyranose 2-sulfate (70%) and Beta-D-galactopyranose (30%)	Alpha-D-galactopyranose 2,6-disulfate
Theta	Beta-D-galactopyranose 2-sulfate	3,6-anhydro-alpha-D-galactopyranose-2-sulfate
Xi	Beta-D-galactopyranose 2-sulfate	Alpha-D-galactopyranose 2-sulfate

However, it is well-known to anyone skilled in the art that the solubility of carrageenans in systems of high soluble solids content is very limited,see e.g. "Carrageenan" by W.R. Thomas in Thickening and Gelling Agents for Food, Ed. A. Imeson, 1992, from which it appears that iota carrageenan is insoluble at soluble

solids contents of 50% and above, whereas kappa carrageenan is only hot soluble at 50% soluble solids (SS) content. Consequently, carrageenans have in the past mainly been used either in lower SS systems or in systems not requiring any gel formation.

US 5,631,034 discloses a method for preparing an aqueous sugar frosting mix comprising from about 70 to about 90 % by weight of sugar, from about 9 to about 29% by weight of aqueous liquid and from about 0.05 to about 1.0% by weight of a crystal growth inhibitor. Said crystal growth inhibitor may be a carrageenan. The purpose of the use of carrageenan in this system is to inhibit crystal growth of the sugar and to provide binding properties of the sprayable solution.

US 5,306,519 discloses a syrup composition having a sufficiently low viscosity so that it can be poured or pumped yet upon contact with a calcium containing confection its viscosity increases. Said syrup comprises from about 25 to about 60 % sugar solids, water, at least one sequestrant, and an amount of at least one calcium reactive gum sufficient to thicken the syrup upon contact with the calcium containing confection. Said calcium reactive gum may be a carrageenan which may be incorporated into the syrup at a level from about 0.05 to about 0.5 %, preferably from about 0.1 to 0.3 %.

WO 95/12985 discloses an injectable fondant and method of manufacturing same. Said injectable fondant presents in its cooled state, at least 0,5 day after manufacture, a solids content of 68 - 75 % by weight, including less than 1 % by weight of stabiliser. Said stabiliser may be a carrageenan.

US 5,607,716 discloses a low or no fat, water and sugar based high solid confection comprising at least 80 % to 90 % total solids by weight, wherein the carbohydrate content is at least 70 % by weight of the total solids, a cation containing edible material, a cation reactive and thermosensitive hydrocolloid, and up to 7 % by weight of fat, said confection having a water activity below 0.65 and a pH from 3.0

to 8.5. The hydrocolloid may be a carrageenan in an amount of from 0.25 to 3.5 % by weight.

US 5,132,128 discloses a dessert topping having a pH greater than 4,6 and having a water activity of less than 0,84 and comprising a blend of carrageenan gum, a powdered cellulose bulking agent, a non-heat thinning cellulose gum bulking agent, high fructose corn syrups, an edible humectant and non-fat milk. The carrageenan gum may be used in an amount in the range of 0.75-1.75 % by weight of said topping, and the high fructose corn syrup is in the range of 50-60 % by weight of said topping. Said blend of carrageenan gum provides both gelling and viscosity control in order to obtain a suitable low viscosity upon heating while providing a viscous texture of the topping when placed on a dessert, particularly ice cream.

EP 0 045 522 A2 discloses edible food containers for use with a food product by applying a barrier coating composition to at least the interior surface thereof. The barrier coating composition comprises a sugar solution having a sugar content of at least 50% by weight and optionally other ingredients such as a flavour-producing material or a vegetable gum. Said gum material, which may be a carrageenan, may be present in an amount of about 0.1 to 2% by weight. The barrier coating composition forms a film, which through the use of said gum material adheres to the inner surface of the food container.

EP 0 366 248 A2 discloses preservative compositions for fruits and vegetables comprising antidiscolouration agent and edible thixotropic gum. A typical composition may contain 20-60% by weight of edible bulk filler (eg maltodextrin, preferably a low dextrose equivalent maltodextrin), 20-60 % ascorbic acid and 1-50 % edible thixotropic gum and 1-25 % natural or artificial flavouring. Thus, a thixotropic material is provided.

WO 98/20860 discloses a chewable composition for delivery of a pharmacologically active material to a user comprising sweetener, carrageenan and water, said composition comprising from about 50 to about 83 % of solids. Carrageenan may be present in an amount from about 2% to 5,5% and optionally one or more of an additional hydrocolloid is present in a total amount of from about 0.5 % to about 2% . Any suitable sweetener may be used.

EP 0 273 001 discloses a soft, sugarless, aerated confectionery comprising soluble solids in the form of hydrogenated starch hydrolysates in the range from 35 to 89% by weight and up to 5.5 % by weight of hydrocolloid such as a seaweed extract. The disclosed confectionery does not include any sugar and is deposited at temperatures of about 130 to 140° C.

US 5,603,979 discloses a method for the preparation of a fat-free peanutbutter like product comprising 15-40% by weight of water, 0.5 - 1.5 % by weight of natural gum, 5-20% by weight of peanut flour, 20 - 35% by weight of syrup and 5-13 % by weight of humectant. Carrageenan may be used as gum component. The product obtained must be spreadable.

Thus, as can be seen, the prior use of carrageenan has either been in lower soluble solids systems or in non-gelled end-products. Alternatively, the application of high operating temperatures have been required. It has hitherto not been possible to disperse efficiently a carrageenan in a high solids system at a temperature of below 100° C at atmospheric pressure in order to form a gelled end-product, in which said carrageenan provides the main gel structure and texture.

Brief Description of the Invention

The object of the present invention is thus to provide a gelled food composition having high soluble solids content wherein said composition has an adequate low

viscosity during depositing in e.g. moulds, gels rapidly and can successfully be produced at temperatures not requiring special apparatuses or arrangements to be met.

In its first aspect, the present invention relates to a food composition comprising soluble solids in the range of 50% to 90% by weight, at least 70% by weight thereof being a sweetening system comprising sucrose and non sucrose sweeteners in a weight ratio of sucrose to non sucrose sweeteners of 0:100 to 95:5, wherein the non sucrose sweetener is of a DE (Dextrose Equivalent) of at least about 30, a carrageenan component in an amount sufficient to form a gel, and water to balance, wherein the gelation temperature of said composition is $< 95°C$.

By the term "gelation temperature" is meant the temperature, at which the gel-forming process is initiated. It is determined as the intersection of the graphs of elastic modulus, G', and viscous modulus, G", of any given product.

The elastic modulus, G', indicates the solid behaviour of a gel, and is a measure of the gel strength, while the viscous modulus, G", indicates the liquid behaviour of the gel, which correlates to the degree of bounciness and trembling of the gel.

In a second aspect, the present invention provides a process for producing a food composition as defined above comprising (a) dispersing carrageenan in a syrup of a non sucrose sweeetener at a temperature sufficient to disperse the carrageenan in said syrup while stirring, (b) adding water and heating the mixture to the boiling point thereof, (c) adjusting the soluble solids content to from about 50% to about 90% by weight, (d) depositing said mixture, and (e) cooling said mixture to below the depositing temperature of said mixture.

As used herein, the term "depositing temperature" means the lowest temperature, at which depositing is possible, i.e. at which temperature the food composition is still

flowable, such as through a "Mogul" plant or depositor.

In a third aspect, the present invention provides the use of a carrageenan component for gelling a food composition of a soluble solids content of about 50 to about 90% by weight, at least 70% by weight thereof being a sweetening system comprising sucrose and non sucrose sweeteners in a weight ratio of sucrose to non sucrose sweeteners of 0:100 to 95:5, wherein the non sucrose sweetener is of a DE of at least about 30, and wherein the gelation temperature of said composition is < 95°C.

Brief Description of the Drawing

The invention is described in more details with reference to the accompanying drawing, wherein

Figs 1.1 to 1.9 illustrate viscosity, elastic modulus, G', and viscous modulus G", versus temperature for food compositions produced according to example 8, and

Fig 2 illustrates viscosity, elastic modulus, G', and viscous modulus, G", versus temperature for food compositions I, II and VI according to Example 9.

Further scope of applicability of the present invention will become apparent from the detailed description given hereinafter. However, it should be understood that the detailed description and specific examples, while indicating preferred embodiments of the invention, are given by way of illustration only, since various changes and modifications within the scope of the invention will become apparent to those skilled in the art from this detailed description.

Best mode for carrying out the invention

The food composition according to the invention in a preferred embodiment comprises a sweetening system comprising sucrose and non sucrose sweeteners in a weight ratio of sucrose to non sucrose sweetener of 0:100 to 95:5, wherein the non sucrose sweetener is a hydrogenated starch hydrolysate syrup of a DE of at least about 30, preferably a DE > 30 fructose or glucose syrup.

In a particularly preferred embodiment of the present invention, said non sucrose sweetener is a hydrogenated starch hydrolysate syrup with a DE of at least about 40, preferably a DE > 40 fructose or glucose syrup.

As used herein, the term "DE" stands for "Dextrose Equivalent". DE indicates the degree to which a carbohydrate starting material has been decomposed to dextrose.

Thus, it has been found that at DE values below about 30, the carrageenan employed will swell excessively, leading to excessive gelling causing a gelation temperature well above 100° C. However, gelation temperatures of above 100° C are undesirable from a practical point of view, necessitating special precautions and requirements in terms of e.g. apparatus.

By employing the above mentioned sweetening system, it has, however, surprisingly been shown that it is possible to dissolve a carrageenan component in a high solids system of about 50 to about 90% by weight of soluble solids using a minor amount of water. A particular advantage of the present invention is thus the fact that the amount of water added can be limited compared to a conventional process whereby less energy is needed for the subsequent evaporation thereof to obtain a final product of a desired soluble solids content. The present invention thus represents a substantially increased process efficiency.

In a preferred embodiment, the non sucrose sweetener is a hydrogenated starch hydrolysate syrup with a DE in the range of about 40 to about 100, particularly preferred about 50 to 90, especially about 60 to 70. A non sucrose sweetener with a maltose content ≥ 50% and a DE of about 50 to 60 is particularly preferred. Said embodiment provides the optimum characteristics in terms of sweetness level, texture and solubility of the gelled food composition.

In another embodiment of the present invention, the sucrose and/or non-sucrose sweeteners can be replaced wholly or partly by an aqueous solution of a sugar alcohol. Said sugar alcohol is preferably, but not exclusively, selected among sorbitol, mannitol, xylitol, isomalt, lactitol, maltitol or a maltitol syrup.

In a preferred embodiment of the present invention, the sweetening system comprises sucrose and non sucrose sweeteners in a weight ratio of sucrose to non sucrose sweetener of from about 10:90 to about 70:30, preferably from about 20:80 to about 30:70, particularly preferred about 1:2. Thus, it has been found that at the disclosed ratios, an acceptable sweetness level still providing a composition having a gelation temperature of < 95° C is obtained.

Particularly preferred, the gelation temperature of said food composition is < 85° C, preferably < 80° C.

The present invention is highly suitable for preparing gelled food compositions having high soluble solids content. In a preferred embodiment, said soluble solids content is in the range of 70 to 85% by weight, particularly preferred about 75 to 80% by weight.

Advantageously, at least about 80%, preferably at least about 90% of the soluble solids are comprised by the above sweetening system. Thus, it has been shown that even at such high concentrations of sweetening system a gelled product having a

satisfactory gelation temperature may be obtained.

As carrageenan component an iota carrageenan or a kappa carrageenan or mixtures thereof are employed, preferably in an amount of about 0.25 to 10.0% by weight, preferably about 0.75 to 5.0%, especially about 1 to 3% by weight of the food composition. Suitable carrageenans are commercially available as e.g. GENUTINE™ type X-8300, X-8302, and X-9303 from Hercules Copenhagen, Denmark, or GENUGEL™ type WR-713 or X-8605, likewise available from Hercules Copenhagen.

While the above carrageenans are the preferred ones, it must be understood that the invention is not limited thereto. Thus, any carrageenan component, which will provide the required gelling capability, may be employed in a food composition according to the present invention. More particularly, a carrageenan component in a non-purified form, such as in the form of seaweed, particularly red seaweeds, may also be employed.

Further, one or more additional hydrocolloids may be employed in combination with the above disclosed carrageenans to provide a particular gelling property, such as pectin, e.g. GENU™ Pectin, available from Hercules Copenhagen, agar-agar, e.g. GENU™ Agar, available from Hercules Copenhagen, cellulose, such as AVICEL™, cellulose extracts and derivatives such as carboxy methyl cellulose (CMC), e.g. Blanose cellulose gum, methyl cellulose, e.g. Benecel™, hydroxy propyl cellulose, e.g. Klucel, hydroxy propyl methyl cellulose and mixtures thereof, starch, such as Avebe ™ Perfectagel MPT, Avebe ™ Perfectagel 928 and Avebe ™ Perfectamyl Gel MB, alginates, xanthans such as Keltrol or Kelgum from Kelco Biopolymers, curdlan, gelatine, guar, locust bean gum, tara gum, karaya gum, gellan gum such as Kelcogel from Kelco Biopolymers, furcellaran, tragacanth, and gum arabic, generally in an amount of up to about 10% by weight.

As further optional ingredients, conventional additives to obtain a desired, tasty food composition, may be added, such as conventional milk solids, vitamins, minerals, food grade acids and salts thereof, flavourings, colourings, artificial sweeteners, preservatives, bulking agents such as Simpless™ from Kelco Biopolymers, isomaltose, trehalose, tagatose, erythritol and polydextrose

Suitable food grade acids comprise inter alia citric acid, fumaric acid, acetic acid, adipic acid, malic acid, ascorbic acid, tartaric acid, lactic acid, sorbic acid and mixtures thereof.

As flavourings may be employed any food grade flavourings desired for the particular purpose, such as fruit flavours, e.g. strawberry, raspberry, orange or lemon, vanilla, peppermint, wintergreen, cinnamon, eucalyptus, coffee, tea, liquorice, etc. Further food grade colourings may be added to obtain a desired appearance of the food composition.

Optionally, one or more artificial sweeteners may be employed in order to obtain a particular sweetness level, such as saccharin and salts thereof, cyclamate salts, acesulfame K, aspartame, alitame, neohesperidin DC, sucralose, stevioside, and thaumatin.

As preservatives any approved preservative may be used, such as benzoic acid, sorbic acid and salts and esters thereof.

It has been found that the above disclosed food composition allows obtention of a lowering of the gelation temperature of the food composition in question to less than 95° C. A lowering of the gelation temperature and, consequently, the depositing temperature represents a substantial improvement in the confectionery industry, since less complicated apparatuses and simpler and more cost effective production methods may be employed during manufacture.

The food composition according to the invention is in a preferred embodiment a high sugar confectionery, such as soft candies, also known as wine gums, gummy candies or chews. Thus, it has been shown that the present invention provides a food composition having a unique new texture resembling the chewiness conventionally obtained by means of gelatine as gelling agent.

The food composition in another embodiment of the invention is an aerated confectionery and further comprises a whipping agent. Aerated confectioneries, such as marshmallows, can thus successfully be prepared by the present invention.

Further, the food composition according to the invention can take the form of glazings.

It must be appreciated, however, that the present invention is not limited to the above disclosed specific embodiments. On the contrary, the present invention may be employed to produce a variety of other high sugar confectioneries, such as leathers, angel kisses, chocolate containing candies, fillings, reversible glazings, heat stable glazings, thixotrophic glazings, nappages, lollypops, liqourice products, candy bars, jelly beans and pastils etc.

The present invention also provides a process for producing the food composition according to the invention by (a) dispersing carrageenan in a syrup of a non sucrose sweetener at a temperature sufficient to disperse the carrageenan in said syrup while stirring, (b) adding water and heating the mixture to the boiling point thereof, (c) adjusting the soluble solids content to from about 50% to about 90% by weight, (d) depositing said mixture and (e) cooling said mixture to below the depositing temperature of said mixture. Any sucrose to be employed in order to obtain a desired sweetness level is added after heating the mixture to the boiling point thereof.

The food composition obtained through the above process is preferably deposited in moulds and left to stand for a few minutes up to about one hour. Thus, whereas prior art gelatine gelled confectioneries tend to adhere to moulds of plastics and metal and consequently have to be deposited in starch moulds and necessitates standing for up to a week in order to obtain a final texture, the food composition according to the invention gels instantaneously, can be deposited in any type of mould, such as metal and plastic moulds, and can be demoulded within minutes up to about one hour. The present invention thus allows a faster and more flexible production of gelled food compositions.

Any further ingredients of the food composition, such as food grade acids, flavourings, colourings, artificial sweeteners or preservatives are preferably added after adjustment of the soluble solids content in step (c). In the case of production of aerated confectioneries, a whipping agent is separately mixed with water and any icing or confectioner's sugar and beaten to a stiff foam before addition to the high solids composition.

While the above disclosed process is the preferred one, the present invention is not limited thereto. Thus, the food composition according to the invention may also be produced by a process, whereby carrageenan is dispersed in sucrose, if any, the dry mixture obtained is dissolved in water and heated, non sucrose sweetener and optionally any additional sucrose is added to the hot mixture, whereupon the soluble solids content is adjusted to the desired level. Finally, the product obtained is cooled to below the depositing temperature. The latter process is particularly useful in connection with the preparation of glazings.

Further, the food composition according to the invention may be prepared by dispersing carrageenan in water while heating, adding said dispersion to a hot sweetener solution, whereupon the soluble solids content is adjusted to the desired level and any additional ingredients are added.

The present invention also provides the use of a carrageenan component for gelling a food composition of a soluble solids content of about 50 to about 90% by weight, at least 70% by weight thereof being a sweetening system comprising sucrose and non sucrose sweeteners in a weight ratio of sucrose to non sucrose sweeteners of 0:100 to 95:5, wherein the non sucrose sweetener is of a DE of at least about 30, and wherein the gelation temperature of said composition is below 95°C. The carrageenan component is preferably an iota carrageenan or a kappa carrageenan or mixtures thereof.

Thus, a vegetable alternative to gelatine has been provided giving a product of a similar texture as gelatine gelled products and which allows the preparation of food compositions of high soluble solids content in a cost and energy efficient, industrially applicable process.

Examples

In the examples given below the following apparatus and chemicals have been used to prepare and test food compositions according to the invention:

Apparatus:

- Texture Analyzer, TA-XT2. 5 kg. Software Texture Expert™, manufactured by Stable Micro Systems, England.

Chemicals:

- Sucrose, food grade, Danisco A/S, Denmark
- Citric acid, monohydrated, MERCK in 50% w/v solution
- Tri-sodium citrate, $2H_2O$, MERCK
- GENUTINE™ types X-8302, X-8300, and X-9303 carrageenan, Hercules

Copenhagen, Denmark

- GENUGEL™ types WR-713 and X-8605 carrageenan, Hercules Copenhagen, Denmark
- GENU™ type 900-A1 Agar, Hercules Copenhagen, Denmark
- Glucose syrup (DE 39 to 42) 80 to 84% SS, IGOS, Denmark
- High Iso Fructose FT-1750 (DE 95), Cerestar, Denmark
- High Maltose glucose syrup (DE 54), Cargill HM 70, 80% SS, Cargill, The Netherlands
- Glucose HMF 70.9, 80% SS, Cargill, The Netherlands
- Invert syrup (DE 95)
- Glucose syrup FT 01700 (DE 62 64), Cerestar, Denmark
- Maltitol syrup Lyasin 80/55, Roquette, Lille Cedex, France
- Hyfoama™ DSN whipping agent.

Example 1.1

- High Maltose glucose syrup (DE 54) Cargill HM 70, 80% SS, Cargill, The Netherlands.

Preparation of a gelled soft candy (wine gums) containing 60% SS and a ratio of DE 40 glucose syrup:DE 95 fructose syrup:sucrose of 27:13:60.

362.2 g of DE 40 glucose syrup and 207.8 g of DE 95 fructose syrup (components A) are heated to about 60°C in a sauce pan. 50.0 g of iota carrageenan type X-8300 (component B) is added to the syrup while stirring with a high speed mixer.

Upon complete dispersion of the carrageenan 870.6 g of water and a buffering agent in the form of 20.8 g of tri-sodium citrate (components C) are added to the slurry which is then heated to the boiling point (100°C) while stirring.

Thereafter 659.6 g of sucrose (component D) is added to the slurry which is then boiled (100°C) while stirring to adjust the content of soluble solids to 60% by weight by evaporation of water.

To this slurry 40.0 g of 50% w/v citric acid (component E) is added in order to obtain a pH of about 3.8 while stirring to obtain a total of 2 kg of final slurry.

The slurry is then poured into a hot depository funnel and filled into moulds. After depositing for about one hour a soft candy with a firm and chewy texture is obtained. The depositing temperature of the individual samples is noted. The average depositing temperature of slurry 1.1 is presented in table VI together with the texture of the deposited slurries, as well as their pH and content of soluble solids tested according to the measurement methods given below.

Examples 1.2 to 4.4

Table I provides a recipe for preparing the soft candies according to examples 1.2 to 4.4. The amount of each ingredient used in the preparation of these are given in grams per 100 grams of final slurry. The method of preparation is performed analogously to Ex. 1.1.

Table I

Ingredients added in the preparation of soft candies (wine gums) according to the examples 1.1 to 4.4

Component	Ingredients	%SS	Ex. 1.1		Ex. 1.2	
			(g)	(g) SS	(g)	(g) SS
A	40 DE syrup	84	18.11	15.21	21.37	17.95
	95 DE fructose syrup	70	10.39	7.27	12.26	8.58
B	GENUTINE™ type X-8300 carrageenan	100	2.50	2.5	2.50	2.5
C	Water 1:1	0	43.53	0	32.44	0
	Tri-sodium citrate	100	1.04	1.04	1.04	1.04
D	Sucrose	100	32.98	32.98	38.93	38.93
E	Citric acid 50% w/v	50	2.00	1	2.00	1
	Evaporation		10.54		10.54	
	Yield		100		100	
	Yield soluble solids			60		70

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Table I (cont.)

Component	Ingredients	%SS	Ex. 2.1		Ex. 2.2	
			(g)	(g) SS	(g)	(g) SS
	60 DE glucose syrup	80	55.13	44.1	65.06	52.05
B	GENUTINE™ type X-8300 carrageenan	100	2.50	2.5	2.50	2.5
C	Water 1:1	0	38.52	0	26.53	0
	Tri-sodium citrate	100	1.04	1.04	1.04	1.04
D	Sucrose	100	11.36	11.36	13.41	13.41
E	Citric acid 50% w/v	50	2.00	1	2.00	1
	Evaporation		10.54		10.54	
	Yield		100		100	
	Yield soluble solids			60		70

Table I (cont.)

Component	Ingredients	%SS	Ex. 3.1		Ex. 3.2		Ex. 3.3	
			(g)	(g) SS	(g)	(g) SS	(g)	(g) SS
A	95 DE fructose syrup	70	63.00	44.1	74.36	52.05	85.71	60
B	GENUTINE™ type X-8300 carrageenan	100	2.50	2.5	2.50	2.5	2.50	2.5
C	Water 1:1	0	30.64	0	17.23	0	3.83	0
	Tri-sodium citrate	100	1.04	1.04	1.04	1.04	1.04	1.04
D	Sucrose	100	11.36	11.36	13.41	13.41	15.46	15.46
E	Citric acid 50% w/v	50	2.00	1	2.00	1	2.00	1
	Evaporation		10.54		10.54		10.54	
	Yield		100		100		100	
	Yield soluble solids			60		70		80

Table I (cont.)

Component	Ingredients	%SS	Ex. 4.1		Ex. 4.2		Ex. 4.3		Ex. 4.4	
			(g)	(g) SS	(g)	(g) SS	(g)	(g)SS	(g)	(g) SS
A	60 DE glucose syrup	80	56.61	45.29	66.55	53.24	76.49	61.19	81.46	65.17
B	GENUGEL™ type WR-713 carrageenan	100	1.00	1	1.00	1	1.00	1	1.00	1
C	Water 1:1	0	38.22	0	26.23	0	14.24	0	8.25	0
	Tri-sodium citrate	100	1.04	1.04	1.04	1.04	1.04	1.04	1.04	1.04
D	Sucrose	100	11.67	11.67	13.72	13.72	15.77	15.77	16.79	16.79
E	Citric acid 50% w/v	50	2.00	1	2.00	1	2.00	1	2.00	1
	Evaporation		10.54		10.54		10.54		10.54	
	Yield		100		100		100		100	
	Yield soluble solids			60		70		80		85

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Example 5

Preparation of sugarfree gelled soft candies

Table II provides a recipe for preparing sugarfree soft candies. The amount of each ingredient used in the preparation is given in grams per 100 grams of final slurry. The method of preparation is performed analogously to Example 1.1.

Table II

Component	Ingredients	% SS	Example 5	
			(g)	(g) SS
A	Maltitol syrup Lyasin 80/55	75	100	75.0
B	GENUTINE™ type X-9303 carrageenan	100	2.5	
C	Water	-	5.0	
	Tri-sodium citrate	100	0.5	0.5
D	Citric acid, 50% w/w	50	1.0	0.5
	Evaporation		9.0	
	Yield		100	
	Yield soluble solids			78.5

Example 6.1

Preparation of an aerated food composition (marshmallows)

Aerated confectioneries (marshmallows) were produced according to the following table:

Table III

Component	Ingredients	% SS	(g)	(g) SS
A	Water	-	16.00	-
	Sucrose	100	46.00	46.00
	Glucose syrup (DE-39)	84	18.00	15.12
	Invert syrup	75	19.00	14.25
B	Water	-	13.50	-
	GENUTINE™ type X-8300	100	1.12	1.12
	GENU™ Agar type 900-A1	100	0.45	0.45
C	Water	-	6.50	-
	Icing sugar	100	3.00	3.00
	Hyfoama™ DSN	100	0.40	0.40
D	Flavour and colour		Optional	
	Evaporation		23.97	
	Yield		100.00	
	Yield soluble solids			80.34

A sugar syrup is prepared by mixing the components (A) and heating to the boiling point. Separately a dispersion of carrageenan and a further hydrocolloid in the form

of GENU™ type 900-A1 agar is dispersed in 90° C water (Component B) while stirring with a high speed mixer for two minutes. Component (B) is added to component (A) and boiled to 86% of soluble solids. Separately therefrom the ingredients of component (C) are mixed and beaten to a stiff foam.

The mixture of component (A) and (B) is slowly added to component (C) while whipping and beating for about three minutes at high speed.

Thereupon, optional flavour and colour are added, and the slurry is deposited immediately in a hot state in a manner analogous to example 1.1.

Example 7.1

Preparation of a high sugar glazing

A high sugar glazing was produced according to the following table.

Table IV

Component	Ingredients	% SS	(g)	(g) SS
A	GENUGEL™ type X-8605 carrageenan	100	0.4	0.4
	Sucrose	100	4.0	4.0
	Tri-sodium citrate	100	0.6	0.6
B	Water	-	18.0	-
C	Sucrose	100	20.0	20.0
D	Glucose syrup**	80	60.0	48.0
E	Potassium sorbate 20% w/v	20	0.5	0.1
F	Citric acid 50% w/v	50	1.4	0.7
	Evaporation		4.9	
	Yield		100.0	
	Yield soluble solids			74.0

** Cerestar FT 01700.

The ingredients of Component (A) are dry-blended and dispersed in component (B) and heated to boiling to dissolve the carrageenan. Component (C) is added while heating, whereupon Component (D) is mixed thereto under continued heating. The heating is continued to obtain a soluble solids content in the range of 73 to 75%, whereupon Component (E) as a preservative and Component (F) as a buffer is added. The composition is deposited as disclosed in example 1.1.

The texture of the above food composition is short, creamy and very transparent. It can be melted without dilution by heating to 60 to 70° C. However, it may also be diluted by about 20% of water to obtain a glazing suitable for fruit and ice cream tarts.

Examples 7.2 to 7.4

Further glazing compositions were produced analogously with the above disclosed procedure. The recipes used appear from the below table V.

Table V

Component	Ingredients	Ex. 7.2			Ex. 7.3			Ex. 7.4		
		% SS	(g)	(g) SS	% SS	(g)	(g) SS	% SS	(g)	(g) SS
A	GENUGEL™ type X-8605 carrageenan	100	0.4	0.4	100	0.4	0.4	100	0.4	0.4
	Sucrose	100	4.0	4.0	100	4.0	4.0	100	4.0	4.0
	Tri-sodium citrate	100	0.6	0.6	100	0.6	0.6	100	0.6	0.6
B	Water	-	20.0	-	-	17.0	-	-	15.0	-
C	Sucrose	10.0	17.0	17.0	100	22.0	22.0	100	27.0	27.0
	Glucose syrup*	80	60.0	48.0	80	60.0	48.0	80	60.0	48.0
D	Citric acid 50% w/v	50	1.4	0.7	50	1.4	0.7	50	1.4	0.7
	Evaporation		3.4			5.4			8.4	
	Yield		100.0			100			100	
	Yield soluble solids		70.7				75.7			80.7

* CERESTAR FT 01700

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The texture of the products of ex. 7.2 to 7.4 is pleasantly soft, creamy and short.

Test results of the above compositions appear from the table VII below.

Experimental results

Measurement methods:

Texture, pH and content of soluble solids are determined as follows:

Texture

The textures of the deposited samples are characterised by the following parameters: Break strength (BS) (in grams of force), at 5°C, Gel strength (in grams of force), at 5° C at a 2 mm, 4mm, and 8 mm compression distance, and Distance to break (DT) at 5° C, which parameters are measured with a Texture Analyzer on test samples deposited in Bloom glasses.

Bloom glasses: Pyrex™ glass cylinders of a diameter of 700 mm and a height of 40 mm, available from Bibby Sterilin Ltd., Stone, Staffordshire, Great Britain.

Break strength.

The Break strength (BS) is determined as the force (in grams) required to compress the sample to break with a 0.5" (1.25 cm) diameter probe.

Gel strength.

The Gel strength is determined as the force (in grams) required to compress the gel 2, 4, and 8 mm, respectively, with a 0.5" (1.25 cm) diameter probe.

Distance to break.

The Distance to break (DT, Distance Travelled) is determined as the distance (in mm) it takes to break the gel.

In these experiments the probe speed is 1 mm/sec.

Refractometer.

Part of the gel from one of the Bloom glasses is used for measurement of soluble solids in a refractometer, available from Bellingham & Stanley Ltd., Great Britain, covering the range 40 to 80% SS or 75 to 93% SS.

Depositing temperature.

Said temperature is measured with a thermometer placed in the centre of a depository funnel. The depositing temperature is read as the temperature just before the material is non-flowable.

Gelation temperature.

The gelation temperature, T_{gel}, is the temperature at which the gel-forming process initiates. It is determined as the intersection of the graphs of elastic modulus, G', and viscous modulus, G", respectively.

Rheological measurements: Rheological measurements to determine the elastic modulus, G', the viscous modulus, G", as well as the viscosity versus temperature were performed using a Haake Rheometer, RS100, Rheostress, Haake, Germany.

Measurements were performed using the following settings:

-Gradient 1 °C/min, 0,4640 Hz

95 °C-65 °C, t=1800 s, 0,50 Pa

65 °C-35 °C, t=1800 s, 2,50 Pa

-Stress sweep 35 °C

0,10 Pa-20,00 Pa, 0,4640 Hz

Springiness.

Springiness is a measure of the ability of the sample to regain its original shape after compression. The sample is placed under a cylinder probe, avoiding any irregular or non-representative areas. The probe then compresses the sample until it has compressed 20% of the product height. The probe holds this position for 60 seconds and then withdraws from the sample and returns to its starting position. The force on the probe after 60 seconds at the 20%-position is recorded (F 60). % springiness is calculated from the expression:

$$\% \text{ springiness} = \frac{F\,60}{F_o} \times 100\%$$

wherein F_o is the force measured after 0 seconds.

Test results for examples 1.1 to 4.4 and 7.2 to 7.4 appear from the below Tables VI and VII, respectively.

Table VI

Test results for examples 1.1 to 4.4, soft candies (wine gums)

		Ex. 1.1	Ex. 1.2	Ex. 2.1	Ex. 2.2
% SS (calculated)		60	70	60	70
Sucrose:Non sucrose		60:40	60:40	20:80	20:80
DE of non sucrose		~DE 60	~DE 60	DE 60	DE 60
TA.XT2 measurements in Bloom glasses					
Gel strength	2 mm (g)	6.7	6.8	6.0	6.9
	4 mm (g)	15.3	16.2	14.1	16.3
	8 mm (g)	40.0	41.2	37.2	41.0
BS (g)		739	873	660	830
DT (mm)		29.6	29.8	29.3	30.0
Depositing temperature (°C)		74-76	84-86	76-78	84-86
pH		3.8	3.8	3.8	3.9
% SS (measured)		60.0	70.0	60.0	67.0

Table VI (cont.)

		Ex. 3.1	Ex. 3.2	Ex. 3.3	Ex. 4.1	Ex. 4.2	Ex. 4.3	Ex. 4.4
% SS (calculated)		60	70	80	60	70	80	85
Sucrose:Non sucrose		20:80	20:80	20:80	20:80	20:80	20:80	20:80
DE of non sucrose		DE 95	DE 95	DE 95	DE 60	DE 60	DE 60	DE 60
TA.XT2 measurements in Bloom glasses								
Gel strength	2 mm (g)	9.3	8.1	8.8	298	347	194	118
	4 mm (g)	18.8	17.6	19.2	623	706	546	379
	8 mm (g)	44.1	42.8	45.2	254	395	1335	1234
BS (g)		453	555	714	417	534	1403	2140
DT (mm)		26.4	27.1	30.0	27.4	29.2	9.1	14.1
Depositing temperature (°C)		67-69	74-76	86-88	53	63	86	76
pH		3.8	3.8	3.7	3.9	4.0	4.0	4.0
% SS (measured)		57.0	68.0	79.0	65.0	68.0	79.0	83.0

Table VII

Test results for examples 7.2 to 7.4, glazings

		Ex. 7.2	Ex. 7.3	Ex. 7.4
% SS		70.7	75.7	80.7
Sucrose:Non sucrose		30:70	35:65	40:60
DE of non sucrose		62	62	62
TA.XT2 measurements in Bloom glasses				
Gel strength	2 mm (g)	93	93	35
	4 mm (g)	185	238	112
	8 mm (g)	181	239	333
BS (g)		274	347	444

Example 8

Further test results were obtained, in which gelled soft candies (wine gums) were prepared essentially as described in the above examples 1.1. to 4.4, using GENUTI-NE™ X-9303 carrageenan at a fixed amount of 2.5%, but varying the weight ratios of sucrose and non-sucrose sweeteners, the DE values of the non sucrose sweetener, and the % SS values.

The characteristics of the different preparations were then determined, and the test results are listed in Table VIII below. Also, the corresponding data (G', G", and viscosity) are shown in Figs 1.1 to 1.9.

Viscosity (mPa·s), elastic modulus G' (Pa), and viscous modulus G" (Pa) were plotted as a function of the temperature in Figs 1.1-1.9. The data were obtained,

using a Haake rheometer.

The gelation temperature of each composition is read from each of the Figs 1.1 to 1.9 as the temperature at which the respective G' curve and the G" curve intersects.

All the compositions tested resulted in gelation temperatures below 95° C, water activities above 0.65 and springiness values above 30 (Table VIII).

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Table VIII

Ex. No	Use level	Carrageenan	Gelation temp. (°C)	De-posit temp.	Viscosity at 95°C	Syrup: sugar	Syrup type	DE	% Soluble solids	Aw	Springiness %
8.1	2.5	GENUTINE™ X-9303	81.1	75	2788	4:1	HM 70	DE 54	79(81)	0.705	48.1
8.2	2.5	GENUTINE™ X-9303	71.3	71	1455	2:1	HM 70	DE 54	76		49.4
8.3	2.5	GENUTINE™ X-9303	80.0	76	3293	2:1	Igos	DE 40	76		44.4
8.4	2.5	GENUTINE™ X-9303	74.2	70	974	2:1	Igos	DE 40	73		
8.5	2.5	GENUTINE™ X-9303	73.5	71	796	2:1	HM 70	DE 54	73		
8.6	2.5	GENUTINE™ X-9303	89.7	87	9699	4:1	Igos	DE 40	79.5	0.711	38.7
8.7	2.5	GENUTINE™ X-9303	78.3	80	2019	4:1	HM 70	DE 54	76	0.724	41.2
8.8	2.5	GENUTINE™ X-9303	85.5	81	3862	5:95	HM 70	DE 54	78.5	0.673	31.1
8.9	2.5	GENUTINE™ X-9303	81.4	77	3212	100:0	HM 70	DE 54	79	0.718	52.6

it appears, all formulations tested gave satisfactory results in terms of gelation temperatures well below 95°C, and a springiness in the order 40-50 %.

Example 9

US 5,607,716 discloses a low fat confectionery gelled by the use of carrageenan. The confectionery according to US 5,607,716, however, does not possess the desired characteristics according to the present invention in terms of gelation temperature, ease of handling, and springiness.

In order to further verify this, tests were performed comparing compositions prepared according to the recipes of examples 6 and 8 of the US 5,607,716 patent.

The type of carrageenan used in this comparative test was GENUTINE™ X-9303 and the results are shown in table X and Fig 2 below, wherefrom the gelation temperature (intersection point of the G' and G" curves) is obtained.

The compositions were:

I. Composition prepared according to example 6 of US 5,607,716, however using 0.2% GENUTINE™ X-9303, and 87% SS.

II. Composition prepared according to example 8 of US 5,607,716, however using 0.6% GENUTINE™ X-9303, and 89% SS.

III. Composition prepared according to example 6 of US 5,607,716, increasing the amount of GENUTINE™ X-9303 to 2.5%, the amount presently preferred according to the present invention, and reducing the SS content to 75%.

IV. Composition prepared according to example 8 of US 5,607,716, increasing the amount of GENUTINE™ X-9303 to 2.5% and reducing the SS content to 75%.

V. Composition prepared according to the present invention containing 2.5% GENUTINE™ X-9303, 79% SS, a sucrose:non sucrose ratio of 1:4, and a DE 54

of the non-sucrose sweetener.

VI. Composition prepared as in V with 5% evaporated skim milk added.

For details on the composition, see Table IX below. The results obtained are given in Table X.

Tabel IX

Ingredients / Sample	I	II	III	V	VI
Evaporated Skim Milk	36.55	34.86	31.71		6.39
Di-sodium phosphate	0.06	0.01	0.06		
Tri-sodium citrate				0.46	0.46
High Fructose syrup, 55% fructose	61.04	58.24	52.98		
High Maltose syrup, Cargill HM70				68.81	63.25
Sugar				13.76	13.80
Butter		4.00			
Butter flavour	0.15		0.15		
AVICEL GP 3252	1.00	1.00	1.00		
Water		0.30	10.60	13.76	13.80
GENUTINE™ X-9303	0.20	0.60	2.50	2.29	2.30
NaCl	0.50	0.50	0.50		
Lecithin	0.20	0.19	0.20		
K-2000 (mono- and diglycerides)	0.30	0.30	0.30		
Citric acid (50% w/v solution)				0.92	
Total	100.00	100.00	100.00	100.00	100.00

Table X

Composition	Appearance	Depositionable	Gelation temp. (°C)	Viscosity at 95° C	Springiness
I	Thick, uneven	Yes	> 95	~ 20.000	< 10
II	Very thick, uneven	No	> 95	~ 100.000	< 15
III	Thick, very uneven, inhomogeneous	No	> 95	> 100.000	28
*IV	-	-	-	-	-
V	Thin, even, homogeneous	Yes	81	~ 2.800	48
VI	Even, homogeneous	Yes	90	~ 10.000	35

*This composition was not possible to make.

This test shows (Table X) that the recipe given in Examples 6 and 8 of US 5,607,716 will not result in a composition with the desired gelation temperature below 95° C, neither if the carrageenan is used in 0.2 to 0.6% amounts (see I and II), nor if the amount is increased to 2.5% (see III and IV). Only the sweetening system used according to this invention (see V and VI) will result in a product with the desired characteristics.

It is evident from the above results that the composition according to the invention (V) has the desired gelation temperature below 95° C, is easier to work with and has more springy characteristics.

The above description of the invention reveals that it is obvious that it can be varied in many ways. Such variations are not to be considered a deviation from the scope of the invention, and all such modifications which are obvious to persons skilled in the art are also to be considered comprised by the scope of the succeding claims.

Claims

1. A food composition comprising soluble solids in the range of about 50% to about 90% by weight, at least 70% by weight thereof being a sweetening system comprising sucrose and non sucrose sweeteners in a weight ratio of sucrose to non sucrose sweeteners of 0:100 to 95:5, wherein the non sucrose sweetener is of a DE (Dextrose Equivalent) of at least about 30, a carrageenan component in an amount sufficient to form a gel, and water to balance, and wherein the gelation temperature of said food composition is < 95° C.

2. The composition according to claim 1, wherein said non sucrose sweetener is a hydrogenated starch hydrolysate syrup of a DE of at least about 30, preferably a DE > 30 fructose or glucose syrup.

3. The composition according to claim 1, wherein said non sucrose sweetener is a hydrogenated starch hydrolysate syrup of a DE of at least about 40, preferably a DE > 40 fructose or glucose syrup.

4. The composition according to claim 1, wherein said non sucrose sweetener is a hydrogenated starch hydrolysate syrup with a DE in the range of about 40 to about 100, particularly preferred about 50 to 90, especially about 60 to 70.

5. The composition according to claim 4, wherein said non sucrose sweetener is a high maltose glucose syrup, particularly a high maltose glucose syrup of a DE of about 50 to 60.

6. The composition according to claim 1, wherein the sucrose and/or non-sucrose sweeteners can be replaced wholly or partly by an aqueous solution of a sugar alcohol.

7. The composition according to claim 6, wherein said sugar alcohol is selected among sorbitol, mannitol, xylitol, isomalt, lactitol, maltitol or a maltitol syrup.

8. The composition according to any one of the claims 1 to 7, wherein the ratio of sucrose to non sucrose sweetener is from about 10:90 to about 70:30, preferably from about 20:80 to about 30:70, particularly preferred about 1:2.

9. The composition according to claim 1, wherein the soluble solids thereof is in the range of 70 to 85% by weight, particularly preferred about 75 to 80% by weight.

10. The composition according to claim 1, wherein the gelation temperature of said food composition is less than 85° C, preferably less than 80° C.

11. The food composition according to claim 1, wherein at least about 80%, preferably at least about 90% of the soluble solids are comprised by said sweetening system.

12. The composition according to claim 1, wherein said carrageenan component is an iota carrageenan or a kappa carrageenan or mixtures thereof.

13. The composition according to claim 12, wherein said carrageenan is present in an amount of about 0.25 to 10.0% by weight, preferably about 0.75 to 5.0%, especially about 1 to 3% by weight of the food composition.

14. The composition according to claim 1 further comprising as additional gelling agent a hydrocolloid selected from the group comprising pectin, agar-agar, alginates, carboxy methyl cellulose, methyl cellulose, hydroxy propyl cellulose, curdlan, xanthans, gelatine, starch and gum arabic in an amount of up to about 10.0% by weight of the food composition.

15. The composition according to claim 1, wherein said soluble solids further comprise one or more ingredients selected among milk solids, vitamins, minerals, food grade acids and salts thereof, flavourings, colourings, artificial sweeteners, preservatives and bulking agents.

16. The composition according to claim 1, wherein said food composition is a high sugar confectionery.

17. The composition according to claim 16, wherein said food composition is soft candies or wine gum.

18. The composition according to claim 1, wherein said composition is an aerated confectionery and further comprises a whipping agent.

19. The composition according to claim 1, wherein said composition is a glazing.

20. A process for producing a food composition according to claim 1 comprising (a) dispersing carrageenan in a syrup of a non sucrose sweetener at a temperature sufficient to disperse the carrageenan in said syrup while stirring, (b) adding water and heating the mixture to the boiling point thereof, (c) adjusting the soluble solids content to from about 50% to about 90% by weight, (d) depositing said mixture and (e) cooling said mixture to below the depositing temperature of said mixture.

21. The process according to claim 20, wherein sucrose, if any, is added in step (c).

22. The process according to any one of the claims 20 to 21, wherein the temperature sufficient to disperse the carrageenan in the syrup of the non sucrose sweetener is at least about 50, especially at least about 60° C.

23. The process of any one of the claims 20 to 22, wherein one or more ingredients selected among milk solids, vitamins, minerals, food grade acids, flavourings, colourings, artificial sweeteners, preservatives and bulking agents is (are) added between steps (c) and (d).

24. The process according to any one of the claims 20 to 23, wherein in step (d) said hot mixture is deposited in moulds.

25. A use of a carrageenan component for gelling a food composition of a soluble solids content of about 50 to about 90% by weight, at least 70% by weight thereof being a sweetening system comprising sucrose and non sucrose sweeteners in a weight ratio of sucrose to non sucrose sweeteners of 0:100 to 95:5, wherein the non sucrose sweetener is of a DE of at least about 30, and wherein the gelation temperature of said food composition is < 95° C.

26. The use according to claim 25, wherein said carrageenan is an iota carrageenan or a kappa carrageenan or mixtures thereof.

Fig 1.1

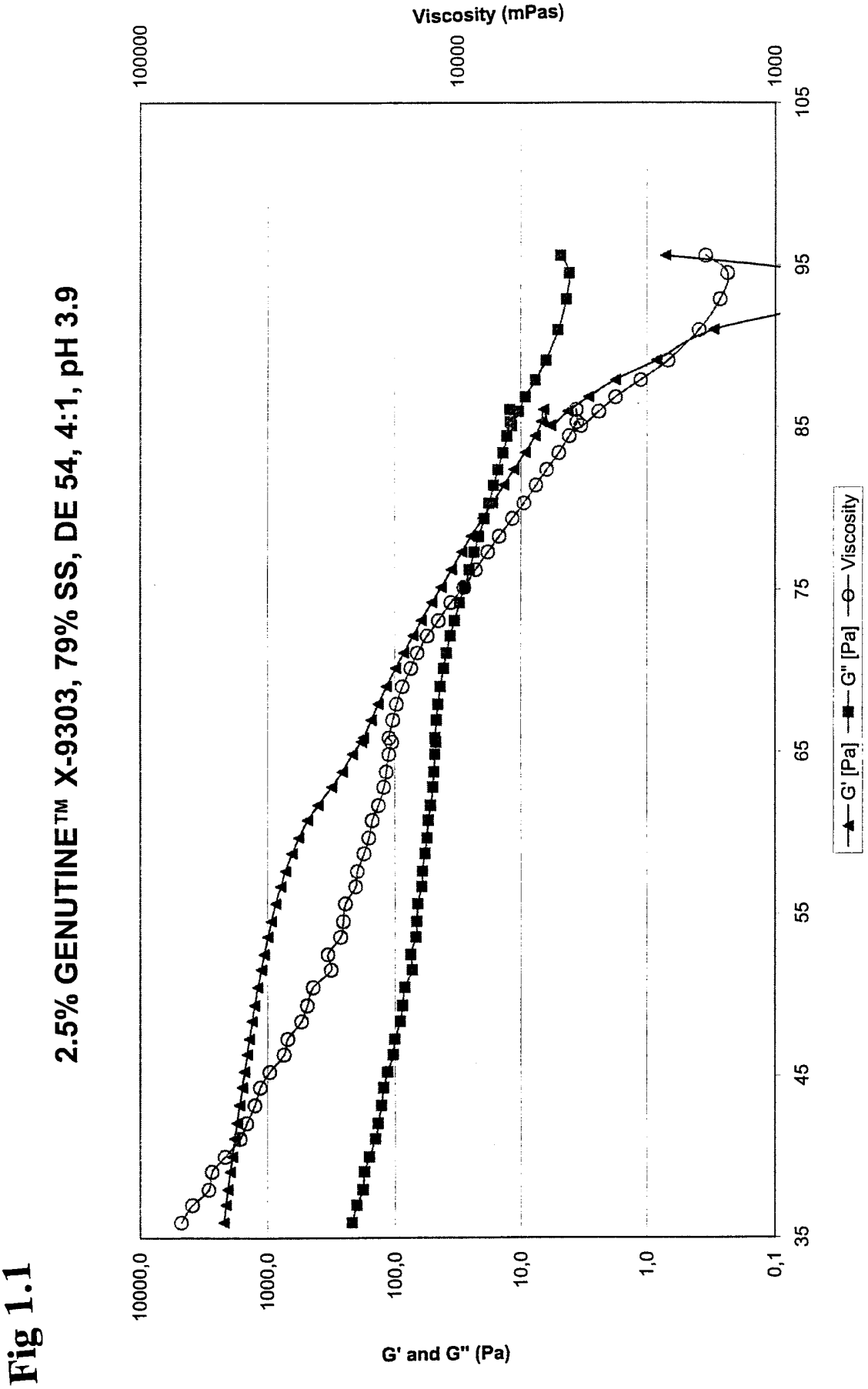

2.5% GENUTINE™ X-9303, 79% SS, DE 54, 4:1, pH 3.9
Viscosity (mPas)
100000
10000
1000
105
95
85
75
65
55
45
35
10000,0
1000,0
100,0
10,0
1,0
0,1
G' and G" (Pa)
G' [Pa]
G" [Pa]
Viscosity

Fig 1.2

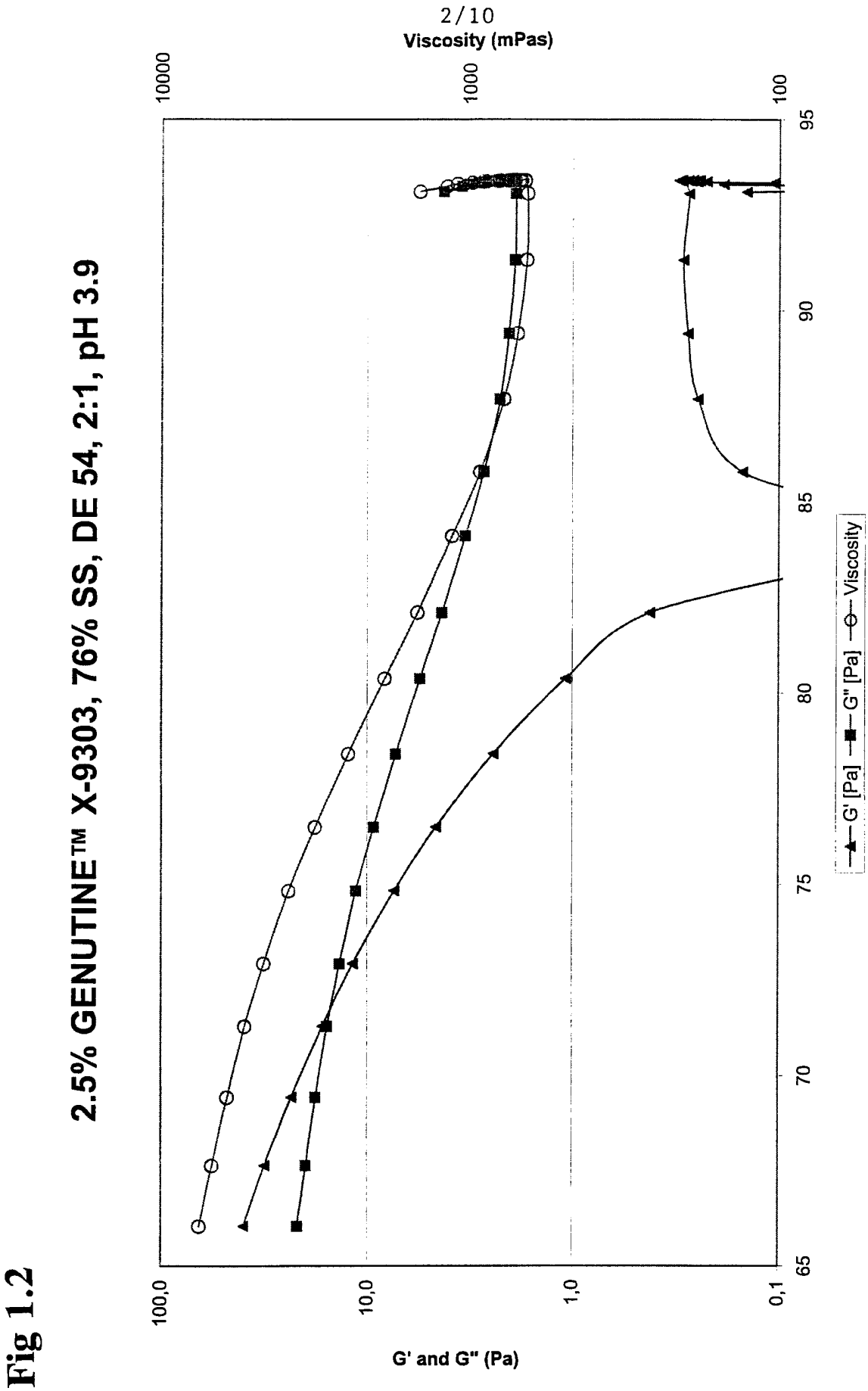
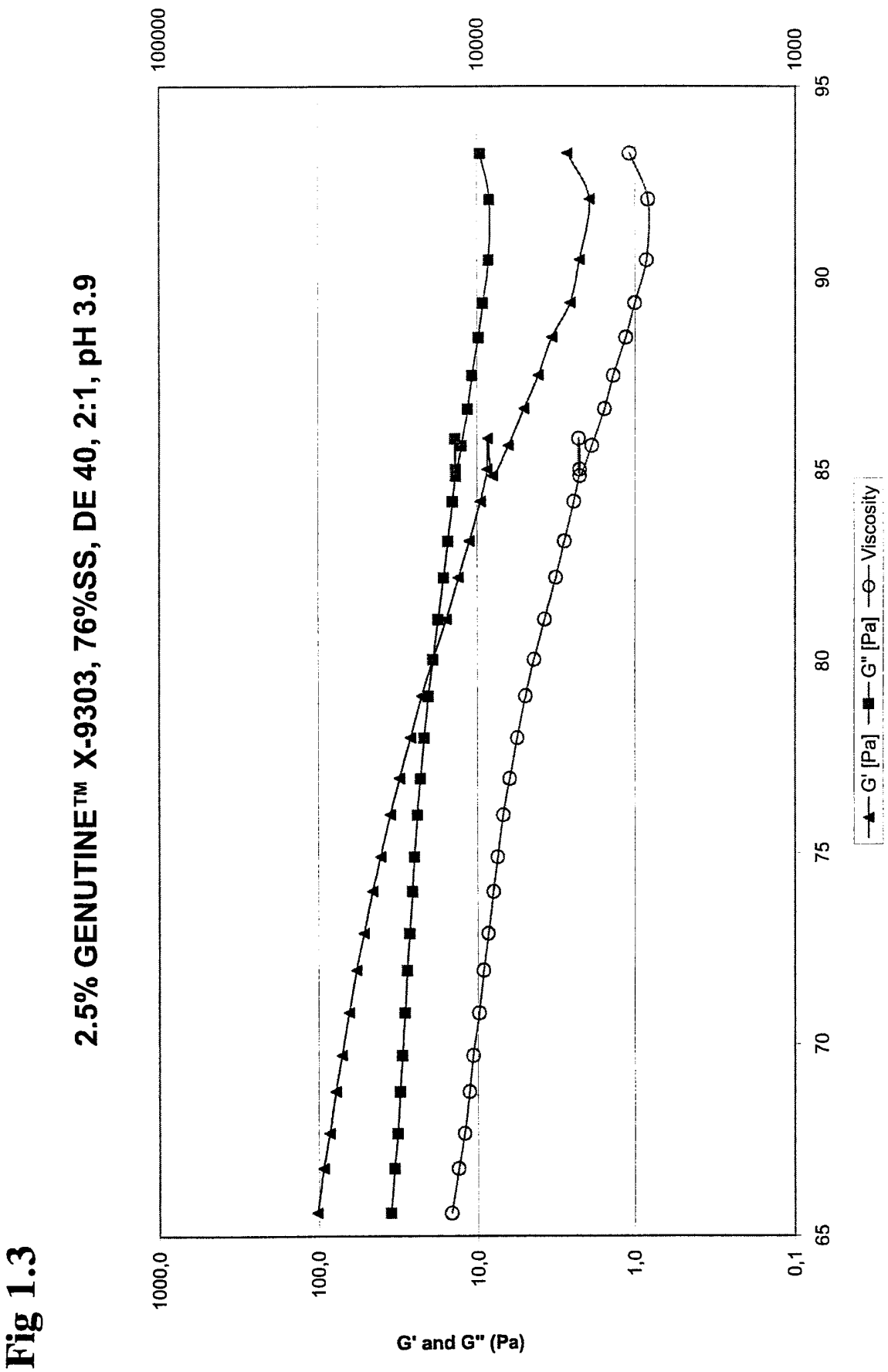

2.5% GENUTINE™ X-9303, 76% SS, DE 54, 2:1, pH 3.9
Viscosity (mPas)
10000
1000
100
95
90
85
80
75
70
65
100,0
10,0
1,0
0,1
G' and G" (Pa)
G' [Pa]
G" [Pa]
Viscosity

Fig 1.3


2.5% GENUTINE™ X-9303, 76%SS, DE 40, 2:1, pH 3.9
Viscosity (mPas)
100000
10000
1000
95
90
85
80
75
70
65
1000,0
100,0
10,0
1,0
0,1
G' and G" (Pa)
G' [Pa]
G" [Pa]
Viscosity

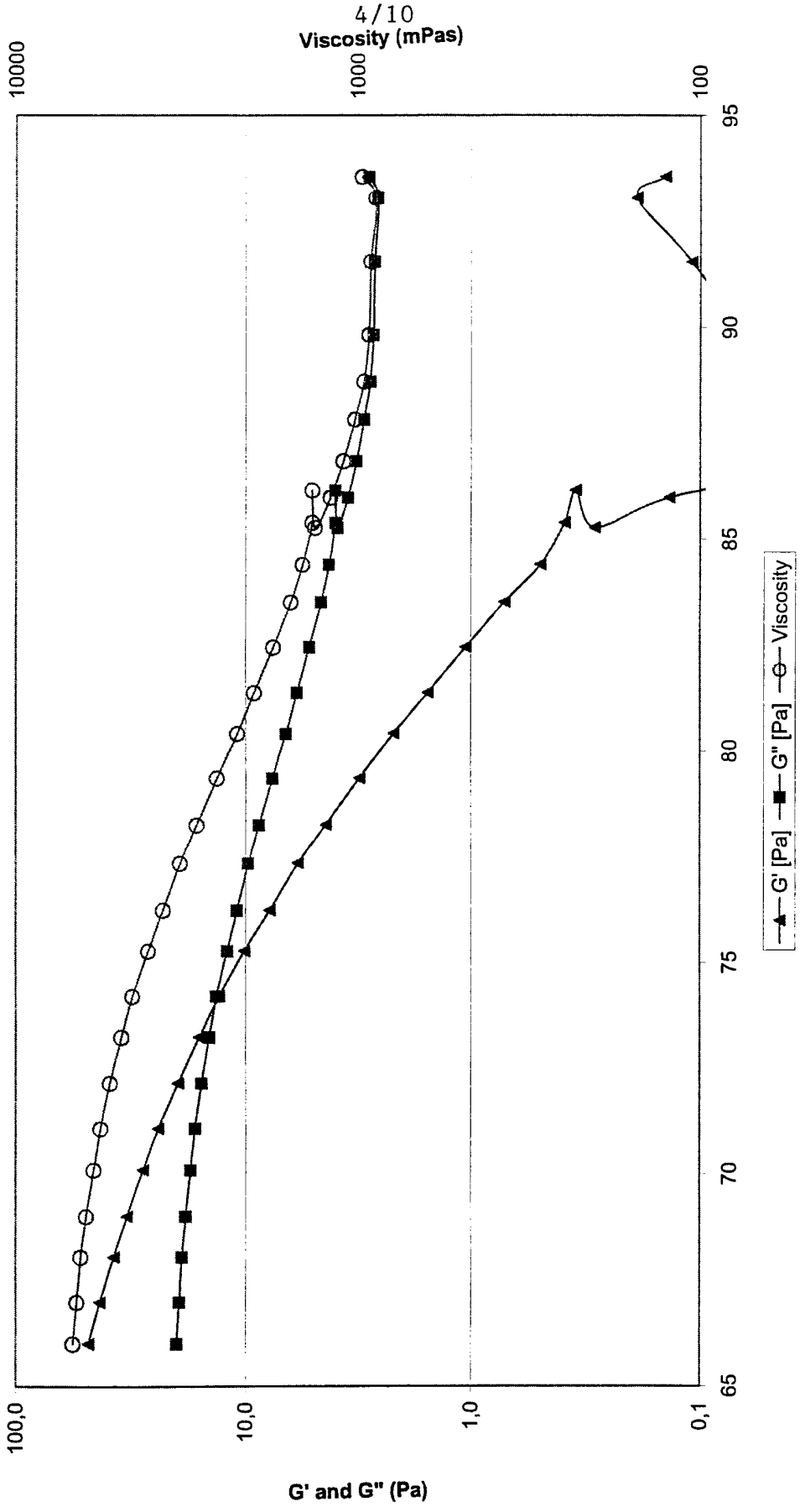

2.5% GENUTINE™ X-9303, 73%SS, DE 40, 2:1, pH 3.9
Viscosity (mPas)
10000
1000
100
95
90
85
80
75
70
65
100,0
10,0
1,0
0,1
G' and G" (Pa)
G' [Pa]
G" [Pa]
Viscosity

Fig 1.4

Fig 1.5

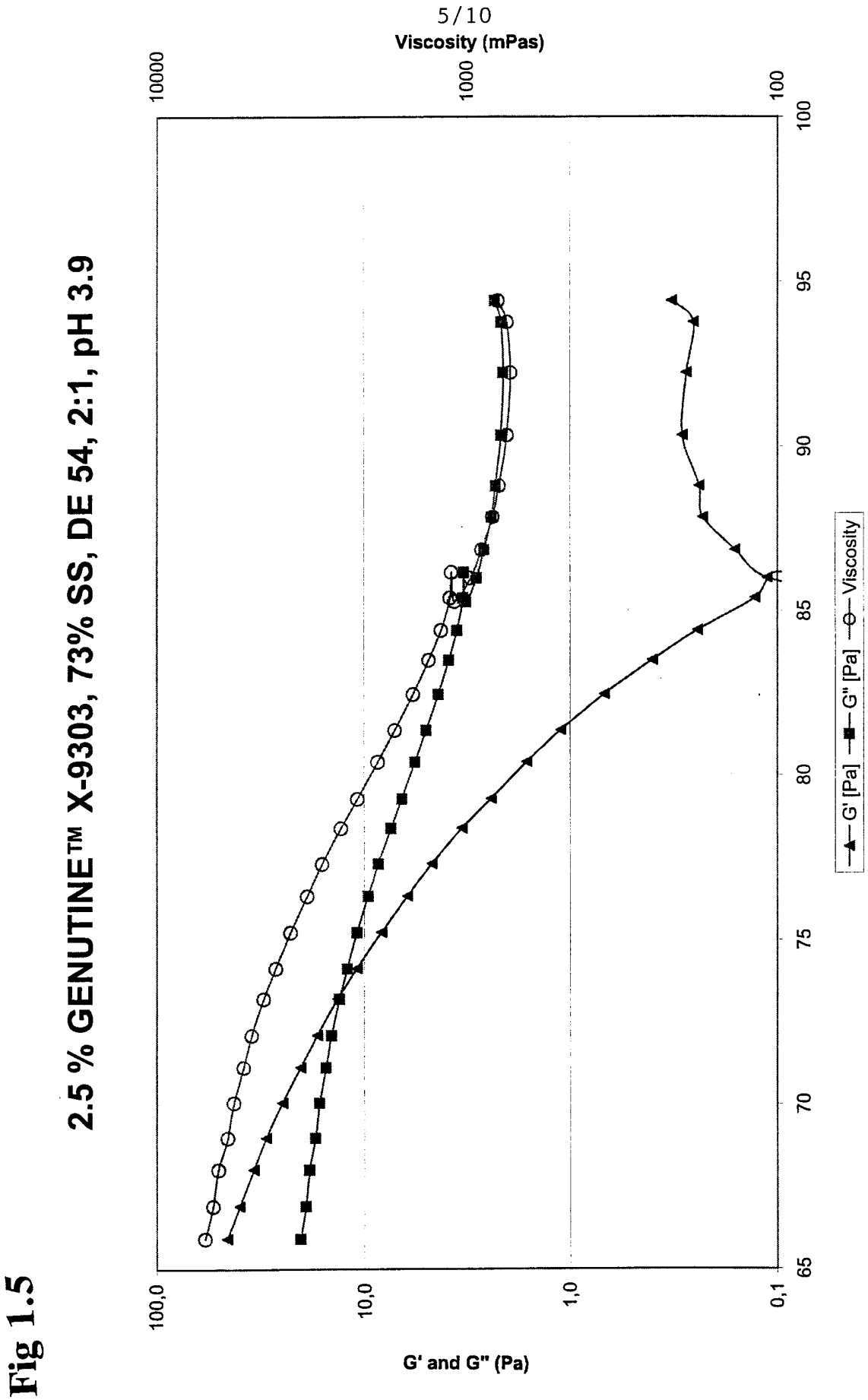

2.5 % GENUTINE™ X-9303, 73% SS, DE 54, 2:1, pH 3.9
Viscosity (mPas)
10000
1000
100
100,0
10,0
1,0
0,1
G' and G" (Pa)
65
70
75
80
85
90
95
100
G' [Pa]
G" [Pa]
Viscosity

Fig 1.6

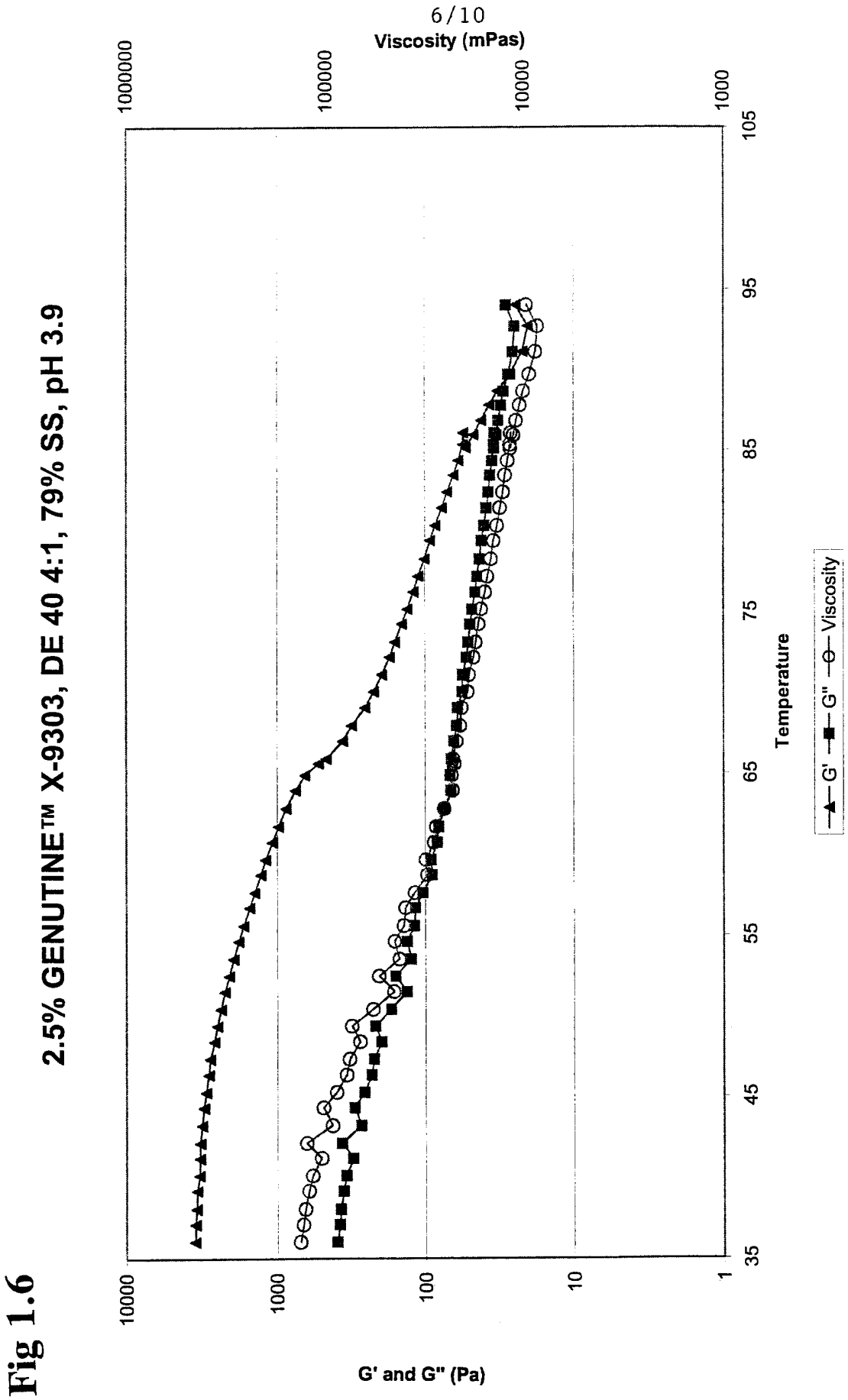

2.5% GENUTINE™ X-9303, DE 40 4:1, 79% SS, pH 3.9
Viscosity (mPas)
1000000
100000
10000
1000
G' and G" (Pa)
10000
1000
100
10
1
Temperature
35
45
55
65
75
85
95
105
G'
G"
Viscosity

Fig 1.7

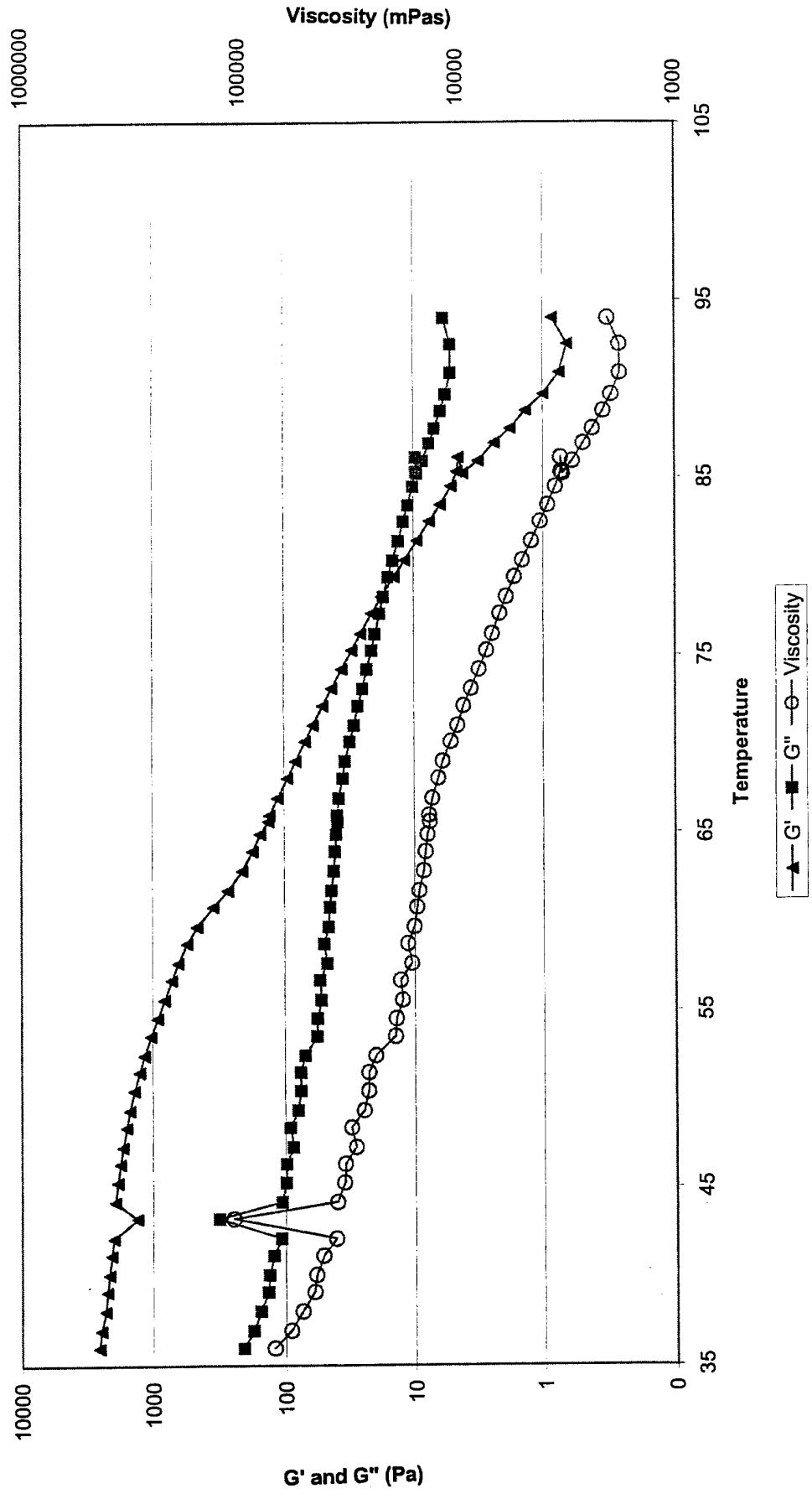

2.5% GENUTINE™ X-9303, DE 54 4:1, 76% SS, pH 3.9
Viscosity (mPas)
1000000
100000
10000
1000
105
95
85
75
65
55
45
35
Temperature
G' and G" (Pa)
10000
1000
100
10
1
0
G'
G"
Viscosity

Fig 1.8

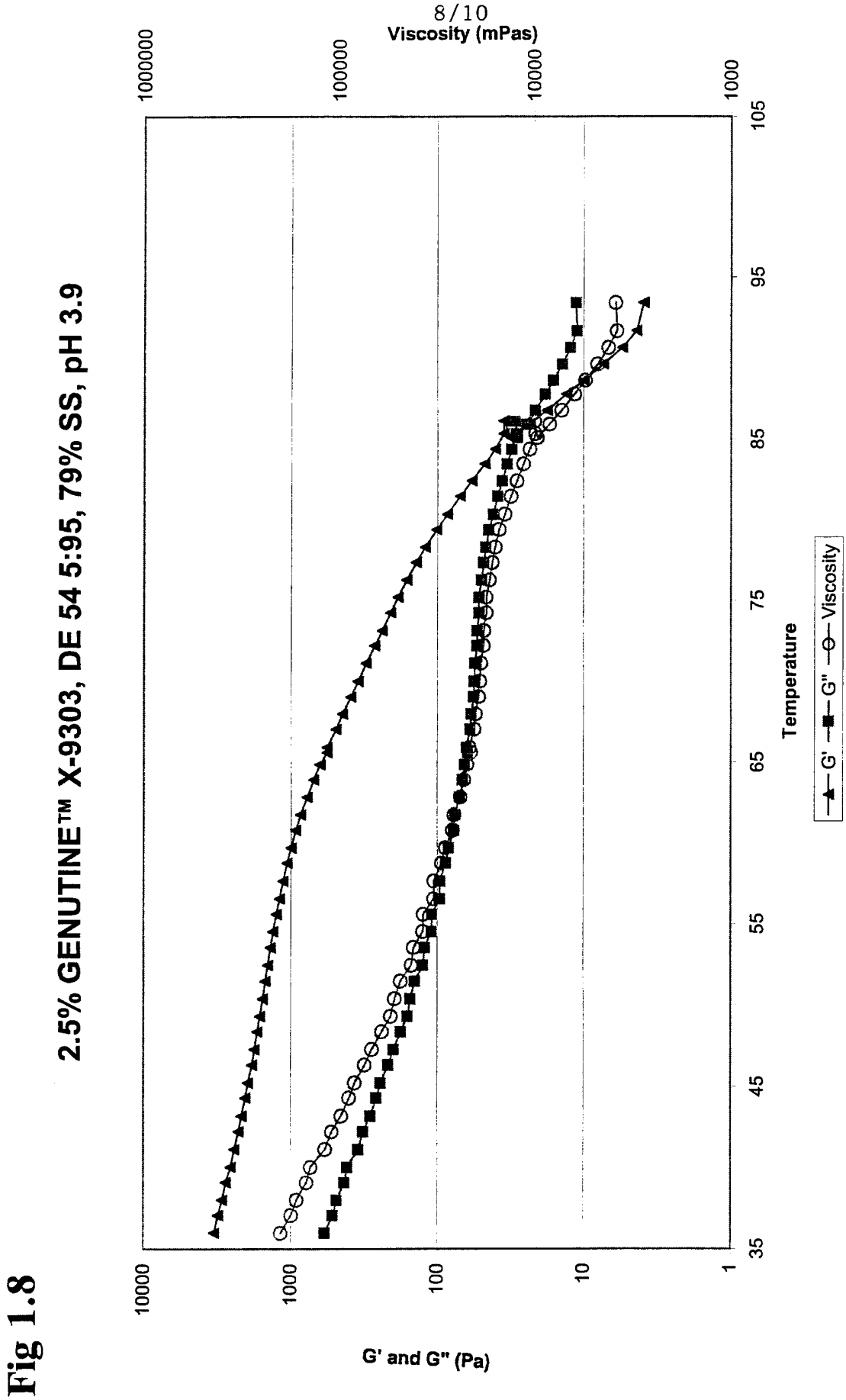
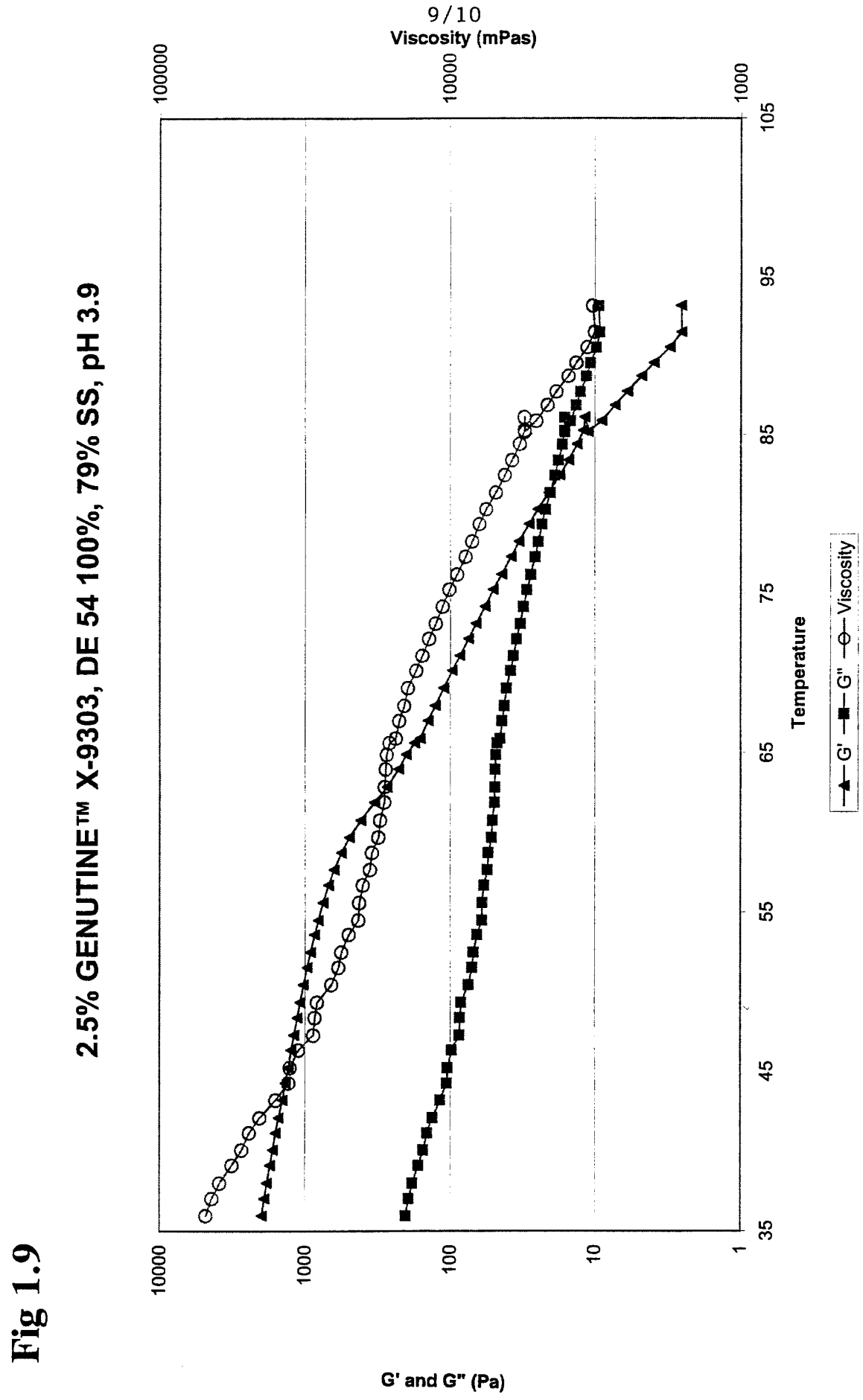

2.5% GENUTINE™ X-9303, DE 54 5:95, 79% SS, pH 3.9
Viscosity (mPas)
1000000
100000
10000
1000
105
95
85
75
65
55
45
35
Temperature
G' and G" (Pa)
10000
1000
100
10
1
G'
G"
Viscosity

Fig 1.9


2.5% GENUTINE™ X-9303, DE 54 100%, 79% SS, pH 3.9
Viscosity (mPas)
100000
10000
1000
105
95
85
75
65
55
45
35
Temperature
G' —■— G" —○— Viscosity
10000
1000
100
10
1
G' and G" (Pa)

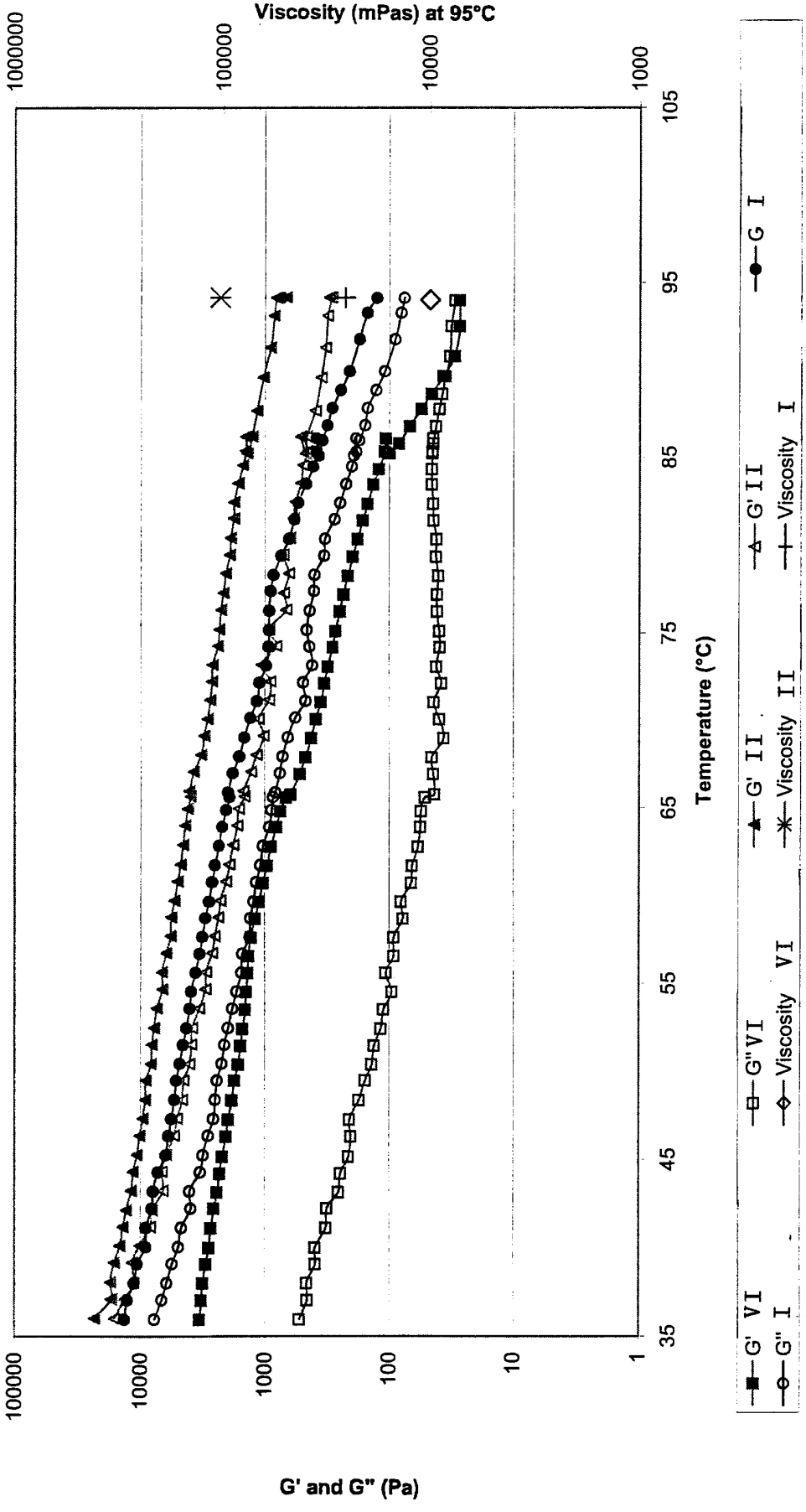

Viscosity (mPas) at 95°C
1000000
100000
10000
1000
105
95
85
75
65
55
45
35
Temperature (°C)
100000
10000
1000
100
10
1
G' and G" (Pa)
G' VI
G" VI
G' II
G I
G" I
Viscosity VI
Viscosity II
G' II
Viscosity I

Fig 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK 00/00252

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: A23G 1/00, A23G 3/00, A23L 1/05
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: A23G, A23L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 5607716 A (CHERYL A. DOHERTY ET AL), 4 March 1997 (04.03.97), example 5	1-26
A	US 5000974 A (HEINZ ALBERSMANN), 19 March 1991 (19.03.91)	1-26
A	US 5132128 A (LOUIS B. ROCKLAND), 21 July 1992 (21.07.92)	1-26
A	WO 9820860 A2 (FMC CORPORATION), 22 May 1998 (22.05.98)	1-26

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
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"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
"&" document member of the same patent family

Date of the actual completion of the international search
15 August 2000

Date of mailing of the international search report
11 09. 2000

Name and mailing address of the International Searching Authority
European Patent Office P.B. 5818 Patentlaan 2
NL-2280 HV Rijswijk
Tel(+31-70)340-2040. Tx 31 651 epo nl.
Fax(+31-70)340-3016

Authorized officer
R. OCKERS

Telephone No.

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/DK 00/00252

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
US 5607716 A	04/03/97	AT 130728 T	15/12/95
		AU 655462 B	22/12/94
		AU 1528392 A	05/11/92
		CA 2067595 A	02/11/92
		DE 69206322 D,T	15/05/96
		EP 0515864 A,B	02/12/92
		FI 921946 A	02/11/92
		JP 5227894 A	07/09/93
		MX 9202008 A	01/12/92
		NO 921708 A	02/11/92
		NZ 242548 A	27/07/93
US 5000974 A	19/03/91	DE 3638662 A,C	11/06/87
		EP 0267325 A	18/05/88
US 5132128 A	21/07/92	NONE	
WO 9820860 A2	22/05/98	AU 5105398 A	03/06/98