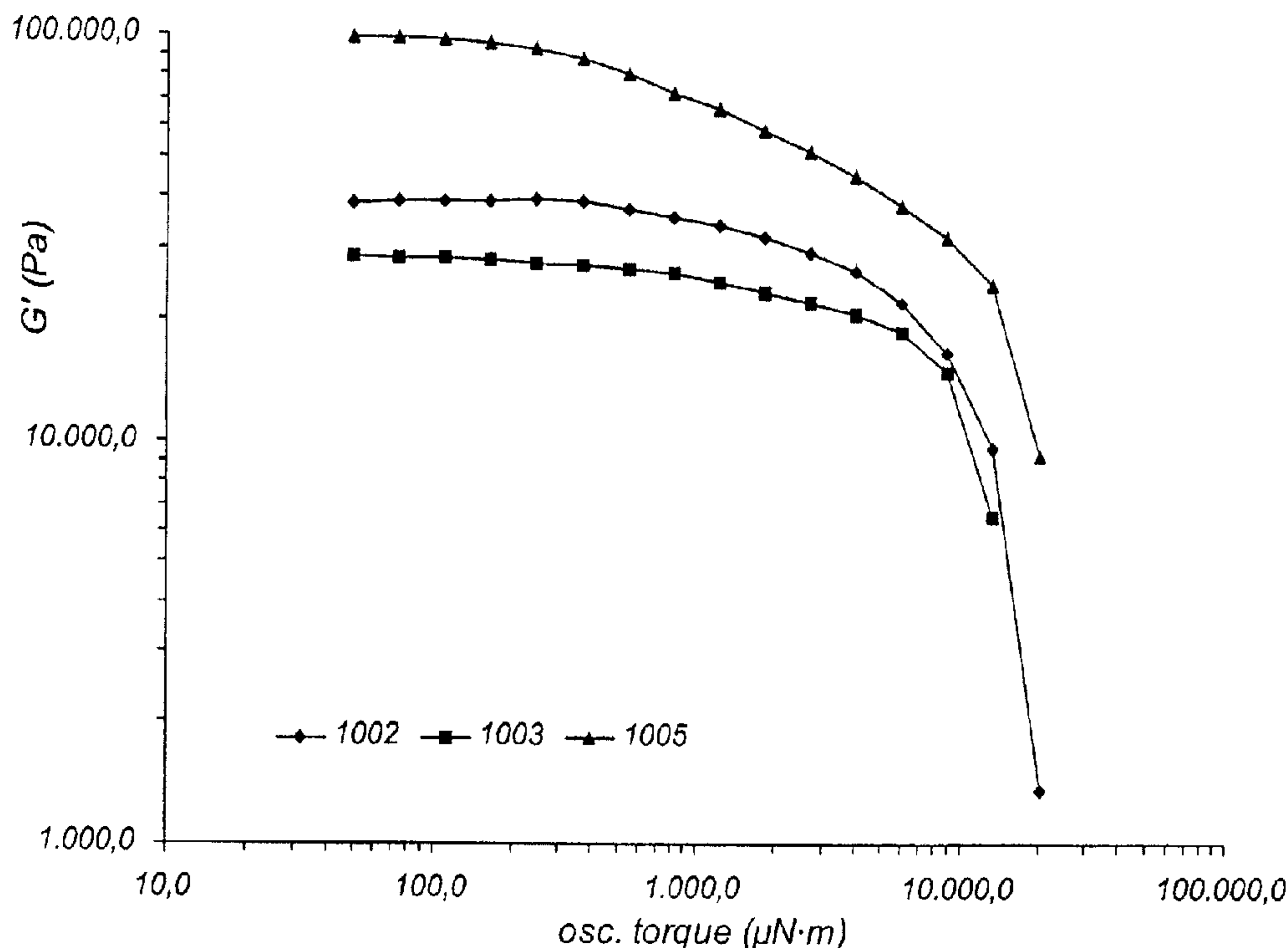




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(72) Inventeurs/Inventors:
ANDERSEN, LONE, DK;
WITTORFF, HELLE, DK
(73) Propriétaire/Owner:
GUMLINK A/S, DK
(74) Agent: MARKS & CLERK

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(54) Title: BIODEGRADABLE CHEWING GUM COMPRISING AT LEAST ONE HIGH MOLECULAR WEIGHT BIODEGRADABLE POLYMER



(57) Abrégé/Abstract:

The invention relates to a chewing gum comprising at least one biodegradable polymer, wherein the molecular weight of said polymer is at least 105000 g/mol (Mn). According to the invention, it has moreover been realized that this problem may be effectively dealt with by increasing the molecular weight of at least one of the biodegradable polymers in the chewing gum when compared to conventional chewing gum polymers and thereby increasing the robustness of the chewing gum with respect to softeners, emulsifiers and e.g. flavor.



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(71) Applicant (for all designated States except US): **GUM-LINK A/S** [DK/DK]; Dandyvej 19, DK-7100 Vejle (DK).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **ANDERSEN, Lone** [DK/DK]; Gl. Strandvej 1, DK-5500 Middelfart (DK). **WITTORF, Helle** [DK/DK]; Hegnsgårdsvej 63, DK-7120 Vejle Ø (DK).

(74) Agent: **PATENTGRUPPEN APS**; Arosgården, Åboulevarden 31, DK-8000 Århus C (DK).

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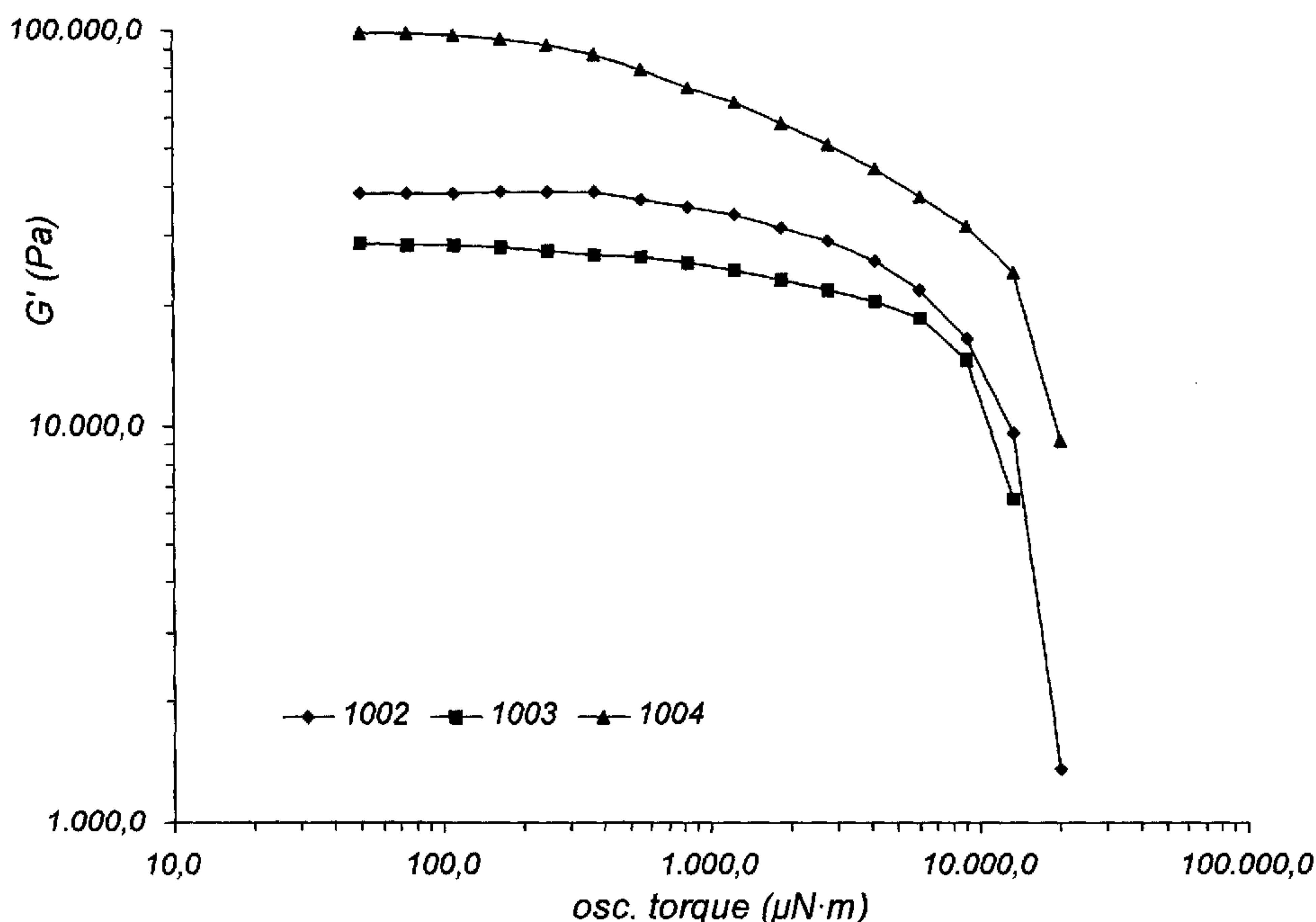
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(54) Title: BIODEGRADABLE CHEWING GUM COMPRISING AT LEAST ONE HIGH MOLECULAR WEIGHT BIODEGRADABLE POLYMER



(57) Abstract: The invention relates to a chewing gum comprising at least one biodegradable polymer, wherein the molecular weight of said polymer is at least 105000 g/mol (Mn). According to the invention, it has moreover been realized that this problem may be effectively dealt with by increasing the molecular weight of at least one of the biodegradable polymers in the chewing gum when compared to conventional chewing gum polymers and thereby increasing the robustness of the chewing gum with respect to softeners, emulsifiers and e.g. flavor.

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BIODEGRADABLE CHEWING GUM COMPRISING AT LEAST ONE HIGH MOLECULAR WEIGHT BIODEGRADABLE POLYMER

Field of the invention

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The present invention relates to biodegradable chewing gum.

Background of the invention

10 US patent 5,672,367 discloses a chewing gum made on the basis of a biodegradable polymer having polymeric properties, i.e. a polymer. A significant advantage, as explained in the patent, is that the resulting chewing gum may be degraded when disposed in the nature or e.g. on streets as a result of normal environmental influence. The disclosed chewing gum is claimed as having a structure and chewing
15 characteristics comparable to those of chewing gum based on conventional, non-degradable polymers. It has moreover been realized, that the exchange of polymers provides a reduced tackiness.

US patent 6,153,231 discloses a chewing gum comprising a biodegradable polymer
20 and where the polymer comprises a poly(lactic acid-dimer fatty acid oxazoline) copolymers or a poly(lactic acid-diol-urethane) copolymer.

A problem of the above disclosed chewing gums is that the biodegradable polymers as such does not simply replace the polymer or polymers of conventional chewing
25 gum. It has been realized that the simple polymer substitution results in an overall chewing gum having different characteristics than conventional chewing gum. This problem indicates that the substituted polymer reacts differently with the remaining chewing ingredients than the biodegradable polymers thereby rendering conventional chewing gum formulations more or less useless.

30

It is an object of the invention to provide a biodegradable chewing gum capable of incorporating at least certain important chewing gum ingredients.

Summary of the invention

- 5 The invention relates to chewing gum comprising at least one biodegradable polymer, wherein the molecular weight of said at least one polymer is at least 105,000 g/mol (Mn).

10 According to the invention, it has been realized that chewing gums made on the basis of biodegradable polymers are somewhat vulnerable to different conventional chewing gum additives or components. Most critically, it has been realized that softeners, which are highly needed when obtaining the desired chewing gum texture, tend to dissolve the chewing gums even when applied in small amounts.

- 15 According to the invention, it has moreover been realized that this problem may be effectively dealt with by increasing of the molecular weight of at least one of the biodegradable polymers in the chewing gum when compared to conventional chewing gum polymers and thereby increasing the robustness of the chewing gum with respect to softeners, emulsifiers and e.g. flavor.

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According to the invention, it has moreover been realized that an increasing of the molecular weight of at least one of the biodegradable polymers and thereby an increasing of the rheological stiffness (G') may in fact be more than compensated by addition of softeners.

25

In other words, according to the invention an improved texture of a biodegradable polymer containing chewing gum may in fact surprisingly be obtained by an initial worsening of the rheological properties of the biodegradable polymer and finally be more than compensated by the addition of suitable softeners.

30

Due to the hydrophilic nature of biodegradable polymers, the polymers tends to swallow water, e.g. from mouth induced saliva. Thereby, the intermolecular forces

between the neighboring molecular chains will decrease and the chewing gum structure will weaken.

According to the invention, a higher resistance to the decreasing of intermolecular forces has been obtained partly due to the fact that the resulting intermolecular forces are increased between the polymer chain and moreover due to the fact that the increasing of the size of the molecular chains results in increased entanglement between the polymer chains of neighboring polymers.

According to the invention, it has moreover been realized that an improved long-term release of chewing gum ingredients may be obtained, with increased molecular weight of the applied biodegradable polymer.

In an embodiment of the invention the molecular weight of said at least one biodegradable polymer is at least 150000 g/mol (M_n).

In an embodiment of the invention the molecular weight of said at least one biodegradable polymer is within the range of 105000 g/mol (M_n) to 1000000 g/mol (M_n).

According to the invention, it has been concluded that a sufficient amount of softeners may be added to a biodegradable polymer having a molecular weight of $M_n = 113,900$ g/mol.

In an embodiment of the invention the molecular weight of said at least one biodegradable polymer is within the range of 105000 g/mol (M_n) to 500000 g/mol (M_n).

In an embodiment of the invention the molecular weight of said at least one biodegradable polymer is within the range of 105000 g/mol (M_n) to 350000 g/mol (M_n).

In an embodiment of the invention the molecular weight of said at least one biodegradable polymer is within the range of 105000 g/mol (Mn) to 250000 g/mol (Mn).

- 5 In an embodiment of the invention the molecular weight of said at least one biodegradable polymer is less than 2,000,000 g/mol (Mn).

In an embodiment of the invention the polydispersity of said at least one biodegradable polymer is within the range of 1 to 5.

10

In an embodiment of the invention the polydispersity of said at least one biodegradable polymer is within the range of 1 to 2,5 (2½).

- 15 In an embodiment of the invention the at least one biodegradable polymer comprises at least 25% of the chewing gum polymers, preferably at least 50%.

In an embodiment of the invention all the biodegradable polymers comprised in the chewing gum comprise at least 25%, preferably at least 50% of the chewing gum polymers.

20

In an embodiment of the invention all the biodegradable polymers comprised in the chewing gum comprise at least 80%, preferably at least 90% of the chewing gum polymers.

- 25 In an embodiment of the invention the chewing gum is substantially free of non-biodegradable polymers.

In an embodiment of the invention said chewing gum ingredients comprise flavoring agents.

30

In an embodiment of the invention said flavoring agents comprise natural and synthetic flavourings in the form of natural vegetable components, essential oils,

essences, extracts, powders, including acids and other substances capable of affecting the taste profile.

5 In an embodiment of the invention said chewing gum comprise flavor in an amount of 0.01 to about 30 wt%, said percentage being based on the total weight of the chewing gum.

10 In an embodiment of the invention said chewing gum comprising flavor in an amount of 0.2 to about 4 wt%, said percentage being based on the total weight of the chewing gum.

In an embodiment of the invention said flavor comprises water soluble ingredients.

15 In an embodiment of the invention said water soluble flavor comprises acids.

According to the invention, a surprising initial release of acids has been obtained.

In an embodiment of the invention said flavor comprises water insoluble ingredients.

20 In an embodiment of the invention, said chewing gum ingredients comprise sweeteners.

In an embodiment of the invention said sweetener comprises bulk sweeteners.

25 In an embodiment of the invention the chewing gum comprises bulk sweeteners in an amount of about 5 to about 95% by weight of the chewing gum, more typically about 20 to about 80% by weight of the chewing gum.

30 In an embodiment of the invention the sweetener comprises high intensity sweeteners.

In an embodiment of the invention the high intensity sweeteners comprise sucralose, aspartame, salts of acesulfame, alitame, saccharin and its salts, cyclamic acid and its

In an embodiment of the invention the chewing gum comprises filler in an amount of about 0 to about 50% by weight of the chewing gum, more typically about 10 to about 40% by weight of the chewing gum.

- 5 In an embodiment of the invention the chewing gum comprises at least one coloring agent.

According to an embodiment of the invention, the chewing gum may comprise color agents and whiteners such as FD&C-type dyes and lakes, fruit and vegetable
10 extracts, titanium dioxide and combinations thereof. Further useful chewing gum base components include antioxidants, e.g. butylated hydroxytoluene (BHT), butyl hydroxyanisol (BHA), propylgallate and tocopherols, and preservatives.

- 15 In an embodiment of the invention the chewing gum is coated with an outer coating.

In an embodiment of the invention the outer coating is a hard coating.

In an embodiment of the invention the hard coating is a coating selected from the
20 group consisting of a sugar coating and a sugarless coating and a combination thereof.

In an embodiment of the invention the hard coating comprises 50 to 100% by weight of a polyol selected from the group consisting of sorbitol, maltitol, mannitol, xylitol,
25 erythritol, lactitol and isomalt.

In an embodiment of the invention the outer coating is an edible film comprising at least one component selected from the group consisting of an edible film-forming agent and a wax.

said at least one biodegradable polyester copolymer forming a plasticizer of the chewing gum and at least one non-biodegradable conventional elastomer.

According to the invention, a biodegradable polymer according to the invention may
5 form a substitute of a conventional natural or synthetic resin.

In an embodiment of the invention the chewing gum comprises
the at least one biodegradable polyester copolymer forming an elastomer of the
chewing gum and at least one non-biodegradable conventional natural or synthetic
10 resin.

According to the invention, a biodegradable polymer according to the invention may
form a substitute of a conventional low or high molecular weight elastomer.

15 In an embodiment of the invention said chewing gum comprises at least one
biodegradable elastomer in the amount of about 0.5 to about 70% wt of the chewing gum,
at least one biodegradable plasticizer in the amount of about 0.5 to about 70% wt of the
chewing gum and at least one chewing gum ingredient chosen from the groups of
softeners, sweeteners, flavoring agents, active ingredients and fillers in the amount of
20 about 2 to about 80% wt of the chewing gum.

In an embodiment of the invention edible polyesters may be applied as a degradable
chewing gum polymer.

25 Edible polyesters are obtained by esterification of at least one alcohol and one acid.

The edible polyester is produced by condensation polymerization reaction of at least one alcohol chosen from the group of trihydroxyl alcohol and dihydroxyl alcohol, and at least one acid chosen from the group consisting of dicarboxylic acid and tricarboxylic acid.

5

It is possible to use edible or food grade materials. Because the starting acids and alcohols are food grade materials the resultant polymers is edible.

Alcohols: Glycerol, propylene glycol, 1,3 butylene diol

10

Acids: Citric acid, fumaric acid, adipic acid, malic acid, succinic acid, suberic acid, sebacic acid, dodecanedioic acid, glucaric acid, glutamic acid, glutaric, azelaic acid, tartaric acid

15 Edible polyesters can replace both elastomers and elastomer plasticizers and form 1-80% of the gum base.

Drawings

The invention will now be described with reference to the drawings of which:

20

Fig. 1 illustrates G' (storage modulus) versus oscillation torque for chewing gums 1002, 1003 and 1005, all containing 3% lecithin; and

Fig. 2 illustrates $\tan(\delta)$ versus oscillation torque for chewing gums 1002, 1003 and
25 1005, all containing 3% lecithin.

Detailed Description

30 In the present context the terms environmentally or biologically degradable polymer compounds refers to chewing gum base components which, after dumping the chewing gum, is capable of undergoing a physical, chemical and/or biological

