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(54) **Title:** MULTI-MODAL HAIR CARE COMPOSITION COMPRISING CATIONIC GUAR BLENDS AND PROCESS FOR PREPARATION THEREOF

HAIR CHARACTERISTICS

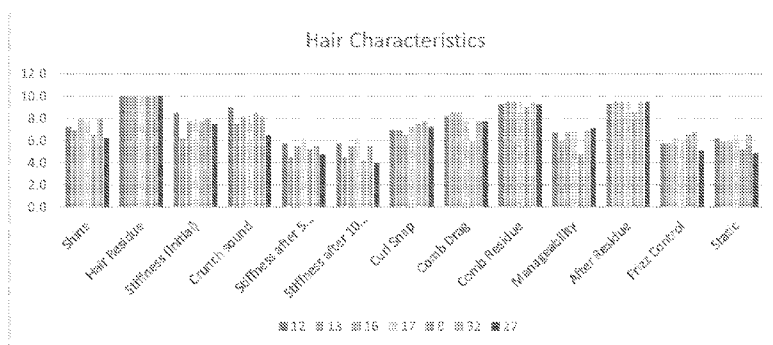
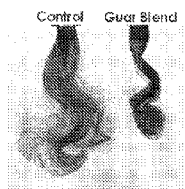


FIG. 1

(57) **Abstract:** Provided herein is a hair care composition of multi-modal guar blends comprising: (i) at least one high weight average weight average molecular weight cationic guar blends comprising: (a) at least one modified cationic guar; and (b) at least one unmodified cationic guar; and (ii) at least one cosmetic functional ingredient. Further provided herein is the application of the said multi-modal hair care composition in hair styling, mending hair split ends, thermal and mechanical protection of hair from brush and blow drying and protecting hair from the heat of hot flat ironing.



SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, RU, TJ, TM), European (AL, AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HR, HU, IE, IS, IT, LT, LU, LV, MC, ME, MK, MT, NL, NO, PL, PT, RO, RS, SE, SI, SK, SM, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, KM, ML, MR, NE, SN, TD, TG).

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**MULTI-MODAL HAIR CARE COMPOSITION COMPRISING CATIONIC GUAR
BLENDS AND PROCESS FOR PREPARATION THEREOF**

FIELD OF THE INVENTION

[0001] The present disclosure relates to a multi-modal hair care composition comprising cationic guar blends, and processes for preparing the same.

BACKGROUND OF THE INVENTION

[0002] Hair is a keratinous filament which is subjected to various repeated stresses including mechanical stress from everyday grooming practices (such as frequent brushing and combing), environmental stress (such as UV exposure), damaging chemical treatments (such as bleaching, coloring) and thermal insult from the use of heat styling tools. The damaging effects of these exposures often manifest several types of damage to the hair fiber including structural degradation of the cortex, lifted cuticles, split ends, and other damaging effects that often result in further injury and hair breakage. Formulators of hair care and hair styling are constantly looking for products with multi-functional benefits that can effectively treat and style hair. Synthetic and nature derived polymers are widely used to achieve the desired sensory attributes to hair care. Hair styling and conditioning products encompass both fully synthetic and nature derived polymers to deliver conditioning and styling benefits. Consumers and formulators are searching for sustainable, environmentally friendly (*e.g.* biodegradable) and nature derived solutions. Many traditional synthetic hair care and styling polymers do not fit the sustainability criteria put forward by governmental and non-governmental entities. As such, there is increasing pressure on manufacturers of hair care and styling products to provide formulations which meet the expected care and styling benefits, while using nature derived, sustainable, biodegradable ingredients. Due to the increased demand for sustainable ingredients, the hair care industry is transitioning from using synthetic chemicals to biodegradable, nature-derived, plant based chemicals. Polysaccharides are a class of nature-derived polymers with a good sustainability profile, typically used in rinse off formulations, especially shampoos, to provide conditioning and deposition of actives.

[0003] US Patent No. 11052,033 assigned to Rhodia Operations discloses personal care composition comprising guar derivative with mean average weight average molecular weight of

about 250,000 g/mol to about 600,00 g/mol and Guar hydroxypropyl trimonium chloride having a cationic degree of substitution from about 0.20 to 0.30.

[0004] Present inventors attempt to prepare a hair care composition using nature derived and biodegradable cationic guar blends. *Accordingly*, the present applicant discloses cationic polysaccharides traditionally used in rinse-off formulations, that provide excellent styling and conditioning benefits to hair. By combining cationic polysaccharides of high weight average molecular weights and different degree of substitutions, it is possible to customize the styling and care benefits of formulations. The combination of polysaccharides with different chemical properties allows formulators to “dial-in” performance and aesthetic properties important to consumers, such as hair stiffness, conditioning, slip properties, humidity resistance, styleability and durability of style. *Further*, the cationic polysaccharides also help in mending hair split ends, protection from thermal and mechanical damage, and protection of hair from hot flat ironing up to 450^oF.

SUMMARY OF THE INVENTION

[0005] In one aspect, the present application provides a hair care composition of multi-modal guar blends comprising: (I) 0.1 to 99.0 *wt. %* of at least one cationic guar blend comprising: (a) 1 to 99 *wt. %* of at least one modified cationic guar; and (b) 1 to 99 *wt. %* of at least one unmodified cationic guar; and (II) 0.1 to 99.0 *wt. %* of at least one cosmetic functional ingredient; wherein: the modified cationic guar has a weight average molecular weight range of 800 to 1200 KDa, and low degree of substitution (0.01 to 0.10); and the unmodified cationic guar has a: (i) weight average molecular weight range of 800-1200 KDa; and (ii) (a) low degree of substitution (0.01 to 0.10), (b) medium degree of substitution (0.10 to 0.20), or combination of (ii)(a) and (ii) (b).

[0006] In another aspect, the present application provides a hair care composition of multi-modal guar blends comprising: (I) 0.1 to 99.0 *wt. %* of at least one cationic guar blend comprising: (a) 1 to 99 *wt. %* of at least one modified cationic guar; and (b) 1 to 99 *wt. %* of at least one unmodified cationic guar; and (II) 0.1 to 99.0 *wt. %* of at least one cosmetic functional ingredient; wherein: the modified cationic guar has a weight average molecular weight range of 800 to 1200 KDa, and low degree of substitution (0.01 to 0.10); and the unmodified cationic guar has a: (i) weight average molecular weight range of 800-1200 KDa; and (ii) (a) low degree of substitution (0.01 to 0.10), (b) medium degree of substitution (0.10 to 0.20), or combination of (ii)(a) and (ii) (b).

[0007] In another aspect, the present application provides a hair care composition of multi-modal guar blends for mending split ends, the composition comprising: (I) 0.1 to 99.0 *wt. %* of at least one cationic guar blend comprising: (a) 1 to 99 *wt. %* of at least one modified cationic guar; and (b) 1 to 99 *wt. %* of at least one unmodified cationic guar; and (II) 0.1 to 99.0 *wt. %* of at least one cosmetic functional ingredient; wherein: the modified cationic guar has a weight average molecular weight range of 800 to 1200 KDa, and low degree of substitution (0.01 to 0.10); and the unmodified cationic guar has a: (i) weight average molecular weight range of 800-1200 KDa; and (ii) (a) low degree of substitution (0.01 to 0.10), (b) medium degree of substitution (0.10 to 0.20), or combination of (ii)(a) and (ii) (b).

[0008] In another aspect, the present application provides an aqueous hair styling composition comprising: (I) 0.1 to 99.0 *wt. %* of at least one cationic guar blend comprising: (a) 1 to 99 *wt. %* of at least one modified cationic guar; and (b) 1 to 99 *wt. %* of at least one unmodified cationic guar; and (II) 0.1 to 99.0 *wt. %* of at least one cosmetic functional ingredient; wherein: the modified cationic guar has a weight average molecular weight range of 800 to 1200 KDa, and low degree of substitution (0.01 to 0.10); and the unmodified cationic guar has a: (i) weight average molecular weight range of 800-1200 KDa; and (ii) (a) low degree of substitution (0.01 to 0.10), (b) medium degree of substitution (0.10 to 0.20), or combination of (ii)(a) and (ii) (b); (iii) 1.0 to 60 *wt. %* of at least one solvent; (iii) 0.1 to 10 *wt. %* of at least one cosmetic functional additive; and (iv) 0.1 to 95 *wt. %* of water.

[0009] In another aspect, the present application provides a method for repairing split ends of hair comprising contacting hair with split ends with a hair care composition of multi-modal guar blends comprising: (I) 0.1 to 99.0 *wt. %* of at least one cationic guar blend comprising: (a) 1 to 99 *wt. %* of at least one modified cationic guar; and (b) 1 to 99 *wt. %* of at least one unmodified cationic guar; and (II) 0.1 to 99.0 *wt. %* of at least one cosmetic functional ingredient; wherein: the modified cationic guar has a weight average molecular weight range of 800 to 1200 KDa, and low degree of substitution (0.01 to 0.10); and the unmodified cationic guar has a: (i) weight average molecular weight range of 800-1200 KDa; and (ii) (a) low degree of substitution (0.01 to 0.10), (b) medium degree of substitution (0.10 to 0.20), or combination of (ii)(a) and (ii) (b), followed by rinsing the hair with water.

[0010] In another aspect, the present application provides a method for thermal and mechanical protection from brush and blow drying, comprising contacting the hair with a hair care composition of multi-modal guar blends comprising: (I) 0.1 to 99.0 *wt. %* of at least one cationic guar blend comprising: (a) 1 to 99 *wt. %* of at least one modified cationic guar; and (b) 1 to 99 *wt. %* of at least one unmodified cationic guar; and (II) 0.1 to 99.0 *wt. %* of at least one cosmetic functional ingredient; wherein: the modified cationic guar has a weight average molecular weight range of 800 to 1200 KDa, and low degree of substitution (0.01 to 0.10); and the unmodified cationic guar has a: (i) weight average molecular weight range of 800-1200 KDa; and (ii) (a) low degree of substitution (0.01 to 0.10), (b) medium degree of substitution (0.10 to 0.20), or combination of (ii)(a) and (ii) (b).

[0011] In another aspect, the present application provides a method of protecting hair from the heat of hot flat ironing up to 450⁰F comprising contacting the hair with a hair care composition of multi-modal guar blends comprising: (I) 0.1 to 99.0 *wt. %* of at least one cationic guar blend comprising: (a) 1 to 99 *wt. %* of at least one modified cationic guar; and (b) 1 to 99 *wt. %* of at least one unmodified cationic guar; and (II) 0.1 to 99.0 *wt. %* of at least one cosmetic functional ingredient; wherein: the modified cationic guar has a weight average molecular weight range of 800 to 1200 KDa, and low degree of substitution (0.01 to 0.10); and the unmodified cationic guar has a: (i) weight average molecular weight range of 800-1200 KDa; and (ii) (a) low degree of substitution (0.01 to 0.10), (b) medium degree of substitution (0.10 to 0.20), or combination of (ii)(a) and (ii) (b).

BRIEF DESCRIPTION OF DRAWINGS

[0012] In addition to the cited advantages and objects of the disclosure, one or more descriptions of the disclosure briefly summarized can be added by reference to certain embodiments thereof which are illustrated in the appended drawings. These drawings form part of the specification. However, it is to be noted that the appended drawings illustrate preferred embodiments of the disclosure and therefore are not limiting in their scope.

[0013] FIG. 1 illustrates hair characteristics being improved over the control samples.

[0014] FIG. 2 illustrates high humidity curl retention data.

[0015] FIG. 3 illustrates curl compression data.

[0016] FIG. 4 illustrates 3-Point Bending data.

DETAILED DESCRIPTION OF THE INVENTION

[0017] The technical solutions of the present disclosure will be described clearly and better understood in combination with specific embodiments below, but those skilled in the art will understand that embodiments described below are part of embodiments of the present disclosure but not all of them and are only used for illustration of the present disclosure and should not be considered as limiting the scope of the disclosure. If any specific condition or process are not indicated in the examples, it is to be understood that the conditions are conventionally used by the manufacturer and is commercially available.

[0018] As utilized in accordance with the disclosure, the following terms, unless otherwise indicated, shall be understood to have the following meanings.

[0019] Unless otherwise defined herein, technical terms used in connection with the disclosed and/or claimed inventive concept(s) shall have the meanings that are commonly understood by those of ordinary skill in the art. *Further*, unless otherwise required by the context, singular terms shall include pluralities and plural terms shall include the singular.

[0020] The singular forms "a," "an," and "the" include plural forms unless the context clearly dictates otherwise specified or clearly implied to the contrary by the context in which the reference is made. The term "Comprising" and "Comprises of" includes the more restrictive claims such as "Consisting essentially of" and "Consisting of".

[0021] For purposes of the following detailed description, other than in any operating examples, or where otherwise indicated, numbers that express, for example, quantities of ingredients used in the specification and claims are to be understood as being modified in all instances by the term "about". The numerical parameters set forth in the specification and attached claims are approximations that may vary depending upon the desired properties to be obtained in carrying out the invention.

[0022] All percentages, parts, proportions, and ratios as used herein, are by weight of the total composition, unless otherwise specified. All such weights as they pertain to listed ingredients are based on the active level and, therefore; do not include solvents or by-products that may be included in commercially available materials, unless otherwise specified.

[0023] All publications, articles, papers, patents, patent publications, and other references cited herein are hereby incorporated herein in their entirety for all purposes to the extent consistent with the disclosure herein.

[0024] As used herein, the term "at least one" will be understood to include one as well as any quantity more than one, including but not limited to, 1, 2, 3, 4, 5, 10, 15, 20, 30, 40, 50, 100, etc. The term "at least one" may extend up to 100 or 1000 or more depending on the term to which it is attached. In addition, the quantities of 100/1000 are not to be considered limiting as lower or higher limits may also produce satisfactory results.

[0025] As used herein, the term "cationic polymers" refers to polymers displaying at least one primary amine, secondary amine or tertiary amine or quaternary ammonium group in their principal chain or branched chain or in the substituted form.

[0026] As used herein, the term "charge density" refers to the ratio of the number of charges on a polymer unit to the weight average molecular weight of said polymer unit. Charge Density is further defined as the number of milliequivalents of charge per gram (meq/g) of polymer.

[0027] As used herein, the terms "comprising" (and any form of comprising, such as "comprise" and "comprises"), "having" (and any form of having, such as "have" and "has"), "including" (and any form of including, such as "includes" and "include") or "containing" (and any form of containing, such as "contains" and "contain") are inclusive or open-ended and do not exclude additional, unrecited elements or method steps.

[0028] As used herein, the term "cosmetically acceptable" refers to molecular entities regarded as safe, approved by regulatory body, listed in pharmacopoeia for use in topical contact with tissues (*e.g.*, the skin) without undue toxicity, incompatibility, instability, irritation, allergic response, or the like. This term is not intended to limit the composition it describes as for use solely as a cosmetic (*e.g.*, the composition may be used as a pharmaceutical).

[0029] As used herein, the term "degree of substitution (DS)" or "substituted degree" or "substitution degree" generally refers to number of cationic groups per anhydro sugar unit (cationic groups per galactomannan unit). Galactomannans are linear polysaccharides-(1,4)-linked D-mannose units substituted with D-galactose monomeric branches.

[0030] As used herein, the term “multi-modal” refers to multi-modal refers to blends of cationic polysaccharides with different weight average molecular weights and degree of substitution values. These blends encompass polysaccharides with multiple Weight average molecular weight and Degree of Substitution ranges.

[0031] As used herein, the term "polymer" refers to a compound comprising repeating structural units (monomers) connected by covalent chemical bonds. Polymers may be further derivatized, crosslinked, grafted or end capped. Non-limiting examples of polymers include copolymers, terpolymers, tetra polymers, quaternary polymers, and homologues. The term "copolymer" refers to a polymer consisting essentially of two or more different types of monomers polymerized to obtain said copolymer.

[0032] As used herein, the term “personal care composition” and “cosmetics” refer to compositions intended for use on or in human body such as skin, hair, oral including those to alter the color and appearance of skin and hair.

[0033] In one non-limiting embodiment, the present disclosure is directed to a hair care composition of multi-modal guar blends, the composition comprising: (I) 0.1 to 99.0 wt. % of at least one cationic guar blend comprising: (a) 1 to 99 wt. % of at least one modified cationic guar; and (b) 1 to 99 wt. % of at least one unmodified cationic guar; and (II) 0.1 to 99.0 wt. % of at least one cosmetic functional ingredient; wherein: the modified cationic guar has a weight average molecular weight range of 800 to 1200 KDa, and low degree of substitution (0.01 to 0.10); and the unmodified cationic guar has a: (i) weight average molecular weight range of 800-1200 KDa; and (ii) (a) low degree of substitution (0.01 to 0.10), (b) medium degree of substitution (0.10 to 0.20), or combination of (ii)(a) and (ii) (b).

[0034] The present application employs cationic guar polymers in blends provided with high weight average molecular weights and varying values of degree of substitution. Such blends of cationic moieties with high weight average molecular weights and varying degree of substitution values brings unique advantages such as customizable aesthetic and styling properties along with functional benefits to the hair care composition. *Accordingly*, the present application provides a multi-modal hair care composition, wherein the multi-modal implies cationic guar having high weight average weight average molecular weights and degree of substitution. *Accordingly*, the

multi-modal hair care composition is bi-modal, tri-modal, quadra-modal or penta-modal blend of cationic guar polymers.

[0035] Guar gum is a natural compound extracted from the seeds of guar bean (*Cyamopsis tetragonoloba taub*). Guar gum chemically comprises beta 1,4-glycosidic mannose units that statistically alternate between one alpha 1,6-bound galactose unit forming a side branch.

[0036] Guar polysaccharides can be substituted with derivatives encompassing cationic moieties which may be linked to the reactive functional group by a bivalent linking group, such as an alkylene or oxyalkylene group. Suitable cationic moieties include primary, secondary, or tertiary amino groups or quaternary ammonium, sulfonium, or phosphonium groups. Suitable quaternary ammonium groups are selected from trialkyl ammonium moieties, such as trimethylammonium moieties, triethylammonium moieties, or tributyl ammonium moieties, aryldialkyl ammonium moieties, such as benzyl dimethyl ammonium moieties. Cationic guar are polysaccharide derivatives, produced from the quaternization of guar gum. They have unique conditioning properties and are therefore widely used in shampoos, detergents, hair conditioners etc.

[0037] Accordingly, the weight average weight average molecular weight of cationic guar blend (I) (a) and (I) (b) are present in weight ratio of 92:8, 90:10, 80:20, 75:25, 60:40, and 50:50. Particularly, the modified cationic guar blend is selected from the group consisting of cationic Hydroxy propyl (HP) guar, Guar hydroxypropyltrimonium chloride, and cassia hydroxypropyltrimonium chloride and the unmodified cationic guar blend is selected from the group consisting of guar hydroxypropyl trimonium chloride.

[0038] In another non-limiting embodiment, the cationicity of the polysaccharide derivative can also be expressed in terms of “*degree of substitution*” (DS). The degree of substitution of cationically modified guar blend can have low degree of substitution in the range of from about 0.01 to 0.10 or in medium degree of substitution in the range of about 0.10 to 0.20. Preferably, the cationic guar blends have low degree of substitution in the range of 0.01 to 0.13 and medium degree of substitution in the range of 0.13 to 0.16.

[0039] Present application employs blends of cationic or cationically modified guar in preparing hair care compositions, wherein the cationically modified guar is selected from cationic hydroxyethyl guar, cationic hydroxypropyl guar, cassia hydroxypropyltrimonium chloride, and guar hydroxypropyltrimonium chloride. Hydroxypropyl Guar Hydroxypropyltrimonium Chloride

(chemically, it is guar gum, 2- hydroxypropyl-2-hydroxy-3-(trimethylammonio) propyl ether chloride); Guar Hydroxypropyl trimonium Chloride (chemically, it is guar gum, 2- hydroxy-3-(trimethylammonio)propyl ether, chloride); *Caesalpinia Spinosa* Hydroxypropyltrimonium Chloride (chemically, it is tara gum, 2- hydroxy-3-(trimethylammonio)propyl ether, chloride); Locust Bean Hydroxypropyltrimonium Chloride; *Trigonella Foenum-Graecum* Hydroxypropyltrimonium Chloride.

[0040] In another non-limiting embodiment, the cationic guar blend is selected from the group comprising: (i) blend of (a) guar hydroxypropyltrimonium chloride, and (b) guar hydroxypropyltrimonium chloride, and (ii) blend of (a) guar hydroxypropyltrimonium chloride, and (b) cationic hydroxypropyl guar.

[0041] In another non-limiting embodiment, the present hair care composition further comprises non-ionic guar. Non-ionic guar are selected from the group consisting of hydroxymethyl guar, hydroxyethyl guar, hydroxypropyl guar and hydroxybutyl guar.

[0042] In another non-limiting embodiment, the present hair care composition can be used in a hair care formulation in the range of from about 0.01 *wt. %* to about 10.0 *wt. %*, and from about 0.01 to about 5.0 *wt. %* based on the total weight of the formulation.

[0043] In another non-limiting embodiment, the present hair care composition can be used in a hair care formulation in the range may include from about 0.01 *wt. %* to about 1.0 *wt. %*; from about 1.0 *wt. %* to about 2.0 *wt. %*; from about 2.0 *wt. %* to about 3.0 *wt. %*; from about 3.0 *wt. %* to about 4.0 *wt. %*; *and* from about 4.0 *wt. %* to about 5.0 *wt. %*.

[0044] In another embodiment, the current hair care composition is used for hair styling, hair straightening, hair split end mending, hair cuticular smoothing, hair conditioning, protecting hair from thermal and mechanical damage, and protecting hair from thermal damage from heat styling tools up to 450°F.

[0045] The present hair care composition comprising cationically modified guar blends shows a pH in the range of from about 3 to about 13. Other non-limiting range of pH for the present include from about 3 to about 6; from about 6 to about 9; and from about 9 to about 13.

[0046] The hair care composition may contain at least one personal care additive including but not limited to acids, amino acids, antidandruff agents, anti-statics, antioxidants, anti-inflammatory

agents, anti-microbial agents, acidifying agents, basifying agents, bodying agents, buffers, bleaches, cationic surfactants, cleansing agents, chelating agents, collagen, conditioning ingredients, compressed gases, dyes, de-ionized water, defoamers, emollients, emulsifiers, flexibility enhancers, fatty substances, fragrances, fillers, foam stabilizers, functional polymers, gel formers, humectants, α -hydroxycarboxylic acids, hydrophilic active agent, hair conditioning ingredients, hydrotropes, keratin hydrolyzates, light protection agents, lipophilic active agent, lipids, moisturizers, neutralizing agents, oxidizing agents, organosilicones, protein hydrolyzates, hydrotropes, perfumes, pigments, preservatives, propellants, proteins, pH modifier, polysaccharides, polyalkylene glycols, reducing agents, rheology modifiers, solvents, solubilizers, suspension agents, silicones, silicone-containing polymers, split modifiers, shine enhancers, softeners, sequestering agents, surfactants, styling polymers, thickeners, texturizing agents, tinting agents, tanning agents, UV-A or UV-B blocker/filters, UV protectants, viscosifiers, vitamins, water proofing agents, water softening agents, wetting agents, and blends thereof.

[0047] Non-limiting examples of polysaccharides include cassia, chitosan, chitin, dextrin, dextran, rosin, inulin, starch and starch derivatives, cellulose and cellulose derivatives, alginates, carrageenan, gellan, agar, pectin, arabinoxylan, pullulan and maltodextrin.

[0048] Non-limiting examples of antioxidants may be added to facilitate the enhanced shelf-life of the hair care composition of the present application. Exemplary antioxidants that can be used include vitamins such as vitamin E, vitamin E acetate, vitamin C, vitamin A, and vitamin D and derivatives thereof. Additional exemplary antioxidants include but are not limited to propyl, octyl and dodecyl esters of gallic acid, butylated hydroxyanisole (BHA), butylated hydroxytoluene (BHT), and nordihydroguaiaretic acid. In general, the required amount of antioxidant for the present composition is in the range of about 0.2 *wt.%* to about 2 *wt.%* and can be provided in an amount of about 0.5 *wt.%* to about 1.5 *wt.%*, based on the total weight of the composition.

[0049] Neutralizers or pH modifiers are employed to achieve the desired pH for the hair care composition. Non-limiting examples of neutralizing agents or pH modifiers include cosmetically acceptable acids selected from mineral acids, carboxylic acids, and polymeric acids. Specific examples for mineral acids are hydrochloric acid, nitric acid, phosphoric acid, and sulfuric acid. Examples for appropriate carboxylic acids are citric acid, glycolic acid, lactic acid, maleic acid, malic acid, succinic acid, glutaric acid, benzoic acid, malonic acid, salicylic acid, gluconic acid,

and mixtures thereof. Examples for suitable polymeric acids include straight-chain poly(acrylic) acid and its copolymers (e.g., maleic-acrylic, sulfonic-acrylic, and styrene-acrylic copolymers), cross-linked polyacrylic acids having a weight average molecular weight of less than about 2,50,000, poly(methacrylic) acid, and naturally occurring polymeric acids such as carageenic acid, carboxymethyl cellulose, and alginic acid. The neutralizing agent or pH modifier can be present in an amount of about 0.01 *wt.%* to about 8 *wt.%* of the total hair care composition. Preferably, neutralizing agents or pH modifiers include cosmetically acceptable bases selected from sodium and potassium hydroxide; organic bases such as methyl ethylamine (MEA), ammonia, amino-alcohols, lithium hydroxide, diethanolamine (DEA); triethanolamine (TEA), aminomethyl propanol, and mixtures thereof.

[0050] Non-limiting examples of cationic surfactants include quaternary ammonium salts, such as di(C10-C24)-alkyl dimethylammonium chloride or bromide, preferably di(C12-C18)-alkyldimethyl ammonium chloride or bromide; (C10-C24)-alkyldimethylethyl ammonium chloride or bromide; (C10-C24)-alkyltrimethyl ammonium chloride or bromide, preferably cetyltrimethylammonium chloride or bromide and (C20-C22)-alkyltrimethyl ammonium chloride or bromide; (C10-C24)-alkyldimethylbenzyl ammonium chloride or bromide, preferably (C12-C18)-alkyldimethylbenzyl ammonium chloride; N-(C10-C18)-alkylpyridinium chloride or bromide, preferably N-(C12-C16)-alkylpyridinium chloride or bromide; N-(C10-C18)-alkylisoquinolinium chloride, bromide or monoalkyl sulfate; N-(C12-C18)-alkylpolyoyl amino formyl methyl pyridinium chloride; N-(C12-C18)-alkyl-N-methyl morpholinium chloride, bromide or monoalkyl sulfate; N-(C12-C18)-alkyl-N-ethyl morpholinium chloride, bromide or monoalkyl sulfate; (C16-C18)-alkylpentaoxyethyl ammonium chloride; diisobutyl phenoxyethoxy ethyldimethyl benzyl ammonium chloride; salts of N,N-diethylamino ethylstearylamine and -oleylamine with hydrochloric acid, acetic acid, lactic acid, citric acid, phosphoric acid; N-acylaminoethyl-N,N-diethyl-N-methyl ammonium chloride, bromide or monoalkyl sulfate and N-acylaminoethyl-N,N-diethyl-N-benzyl ammonium chloride, bromide or monoalkyl sulfate, where acyl is preferably stearyl or oleyl. Preferably, the cationic surfactants are selected from the group consisting of cetrimonium chloride, cetrimonium bromide, dicetyldimonium chloride and palmitamidopropyl trimonium chloride.

[0051] Non-limiting examples of preservatives include phenoxyethanol, formaldehyde solution, parabens, penta-diol, sorbic acid, caprylyl glycol, raspberry ketone, benzoic acid, dehydroacetic

acid, benzyl alcohol, propanediol, propylene carbonate, sodium benzoate, potassium sorbate, diazolidinyl urea, imidazolidinyl urea, iodopropynyl butylcarbamate, methylisothiazolinone, methylchloro isothiazolinone, phenyl propanol, 2-Bromo-2-Nitropropane, 1,3-Diol, Sodium Hydroxymethyl glycinate, 1,2-hexanediol, ethylhexylglycerin, Octenidine HCl, and chlorohexidine.

[0052] Non-limiting examples of pearlizing agents include glycol distearic esters, such as ethylene glycol distearate, but also fatty acid monoglycol esters or triethylene glycol distearate.

[0053] Non-limiting examples of coloring agents, colorants or dyes used herein include natural foods colors and dyes suitable for food, drug, and cosmetic applications. These colorants are also known as FD & C, and D&C dyes and lakes and are preferably water-soluble in nature.

[0054] In another embodiment, the present hair care composition can be formulated as an aerosol, a cream, an emulsion, a gel, a lotion, a mousse, a powder, a paste, a solution, spray, a shampoo, a vesicle dispersion, or a wax. Particularly, the present hair care composition is an aerosol, a mousse, or an actuated hair spray.

[0055] These hair care compositions are in the form of a bi-modal, tri-modal, quadra-modal or penta-modal blends of cationic guar.

[0056] In another non-limiting embodiment, the composition exhibits a high humidity curl retention of about 80% to about 100% over a 24-hour period at 90% humidity and at 80° F. *Specifically*, the composition delivers a wide range of tribological behavior; exhibits improved humidity resistance, stiffness, durability of hold, low slip, foam enhancement and curl maintenance; is nature derived and is biodegradable.

[0057] In another non-limiting embodiment, the present application provides a hair styling composition of multi-modal guar blends comprising: (I) 0.1 to 99.0 wt. % of at least one cationic guar blend comprising: (a) 1 to 99 wt. % of at least one modified cationic guar; and (b) 1 to 99 wt. % of at least one unmodified cationic guar; and (II) 0.1 to 99.0 wt. % of at least one cosmetic functional ingredient; wherein: the modified cationic guar has a weight average molecular weight range of 800 to 1200 KDa, and low degree of substitution (0.01 to 0.10); and the unmodified cationic guar has a: (i) weight average molecular weight range of 800-1200 KDa; and (ii) (a) low

degree of substitution (0.01 to 0.10), (b) medium degree of substitution (0.10 to 0.20), or combination of (ii)(a) and (ii) (b).

[0058] *Accordingly*, the hair styling composition is a bi-modal hair styling composition involving two cation guar polymer blends. *Particularly*, the hair styling composition comprises Guar hydroxypropyltrimonium chloride and Hydroxypropyl Guar Hydroxypropyl trimonium Chloride blend.

[0059] In another non-limiting embodiment, the present application provides a hair care composition for mending split ends, the composition comprising: (I) 0.1 to 99.0 wt. % of at least one cationic guar blend comprising: (a) 1 to 99 wt. % of at least one modified cationic guar; and (b) 1 to 99 wt. % of at least one unmodified cationic guar; and (II) 0.1 to 99.0 wt. % of at least one cosmetic functional ingredient; wherein: the modified cationic guar has a weight average molecular weight range of 800 to 1200 KDa, and low degree of substitution (0.01 to 0.10); and the unmodified cationic guar has a: (i) weight average molecular weight range of 800-1200 KDa; and (ii) (a) low degree of substitution (0.01 to 0.10), (b) medium degree of substitution (0.10 to 0.20), or combination of (ii)(a) and (ii) (b).

[0060] *Accordingly*, the cosmetic functional ingredient is selected from the group consisting of acids, amino acids, antidandruff agents, anti-statics, antioxidants, anti-inflammatory agents, anti-microbial agents, acidifying agents, basifying agents, bodying agents, buffers, bleaches, cationic surfactants, cleansing agents, chelating agents, collagen, conditioning ingredients, compressed gases, dyes, de-ionized water, defoamers, emollients, emulsifiers, flexibility enhancers, fatty substances, fragrances, fillers, foam stabilizers, functional polymers, gel formers, humectants, α -hydroxycarboxylic acids, hydrophilic active agent, hair conditioning ingredients, hydrotropes, keratin hydrolyzates, light protection agents, lipophilic active agent, lipids, moisturizers, neutralizing agents, oxidizing agents, organosilicones, protein hydrolyzates, hydrotropes, perfumes, pigments, preservatives, propellants, proteins, pH modifier, polysaccharides, polyalkylene glycols, reducing agents, rheology modifiers, solvents, solubilizers, suspension agents, silicones, silicone-containing polymers, split modifiers, shine enhancers, softeners, sequestering agents, surfactants, styling polymers, thickeners, texturizing agents, tinting agents, tanning agents, UV-A or UV-B blocker/filters, UV protectants, viscosifiers, vitamins, water proofing agents, water softening agents, wetting agents, and blends thereof.

[0061] In another non-limiting embodiment, the present application provides an aqueous hair styling composition of multi-modal guar blends comprising: (I) 0.1 to 99.0 *wt. %* of at least one cationic guar blend comprising: (a) 1 to 99 *wt. %* of at least one modified cationic guar; and (b) 1 to 99 *wt. %* of at least one unmodified cationic guar; and (II) 0.1 to 99.0 *wt. %* of at least one cosmetic functional ingredient; wherein: the modified cationic guar has a weight average molecular weight range of 800 to 1200 KDa, and low degree of substitution (0.01 to 0.10); and the unmodified cationic guar has a: (i) weight average molecular weight range of 800-1200 KDa; and (ii) (a) low degree of substitution (0.01 to 0.10), (b) medium degree of substitution (0.10 to 0.20), or combination of (ii)(a) and (ii) (b); (iii) 1.0 to 60 *wt. %* of at least one solvent; (iii) 0.1 to 10 *wt. %* of at least one cosmetic functional additive; and (iv) 0.1 to 95 *wt. %* of water.

[0062] Accordingly, the at least one cosmetic functional ingredient is selected from the group consisting of acids, amino acids, antidandruff agents, anti-statics, antioxidants, anti-inflammatory agents, anti-microbial agents, acidifying agents, basifying agents, bodying agents, buffers, bleaches, cationic surfactants, cleansing agents, chelating agents, collagen, conditioning ingredients, compressed gases, dyes, de-ionized water, defoamers, emollients, emulsifiers, flexibility enhancers, fatty substances, fragrances, fillers, foam stabilizers, functional polymers, gel formers, humectants, α -hydroxycarboxylic acids, hydrophilic active agent, hair conditioning ingredients, hydrotropes, keratin hydrolyzates, light protection agents, lipophilic active agent, lipids, moisturizers, neutralizing agents, oxidizing agents, organosilicones, protein hydrolyzates, hydrotropes, perfumes, pigments, preservatives, propellants, proteins, pH modifier, polysaccharides, polyalkylene glycols, reducing agents, rheology modifiers, solvents, solubilizers, suspension agents, silicones, silicone-containing polymers, split modifiers, shine enhancers, softeners, sequestering agents, surfactants, styling polymers, thickeners, texturizing agents, tinting agents, tanning agents, UV-A or UV-B blocker/filters, UV protectants, viscosifiers, vitamins, water proofing agents, water softening agents, wetting agents, and blends thereof. Preferably, the preservative is selected from the groups consisting of phenoxy ethanol, caprylyl glycol or mixtures thereof; the cationic surfactant is cetrimonium chloride, cetrimonium bromide, dicyldimonium chloride and palmitamidopropyl trimonium chloride; and the gas propellant is selected from the group consisting of dimethyl ether, isobutane, 1,1-difluoro ethane, tetrafluoro propene, propane, compressed air, compressed nitrogen, compressed carbon dioxide, nitrous oxide, and mixtures thereof.

[0063] In another non-limiting embodiment, the present application provides a method for repairing split ends of hair comprising contacting hair with split ends with a hair care composition multi-modal guar blends comprising: (I) 0.1 to 99.0 *wt. %* of at least one cationic guar blend comprising: (a) 1 to 99 *wt. %* of at least one modified cationic guar; and (b) 1 to 99 *wt. %* of at least one unmodified cationic guar; and (II) 0.1 to 99.0 *wt. %* of at least one cosmetic functional ingredient; wherein: the modified cationic guar has a weight average molecular weight range of 800 to 1200 KDa, and low degree of substitution (0.01 to 0.10); and the unmodified cationic guar has a: (i) weight average molecular weight range of 800-1200 KDa; and (ii) (a) low degree of substitution (0.01 to 0.10), (b) medium degree of substitution (0.10 to 0.20), or combination of (ii)(a) and (ii) (b).

[0064] The present composition exhibits improved humidity resistance, stiffness, durability of hold, foam enhancement and curl maintenance. The composition exhibits a high humidity curl retention of about 80% to about 100% over a 24-hour period at 90% humidity and at 80° F.

[0065] As the present composition comprises cationic modified guar which are nature derived and are biodegradable.

[0066] The multimodal composition enables improved curl maintenance, variations of hold and stiffness, while delivering improvement in the delivery aesthetics such cushion in the and slip through the hair.

[0067] In another non-limiting embodiment, the present application provides a method for thermal and mechanical protection from brush and blow drying, comprising contacting the hair with a hair care composition of multi-modal guar blends comprising: (I) 0.1 to 99.0 *wt. %* of at least one cationic guar blend comprising: (a) 1 to 99 *wt. %* of at least one modified cationic guar; and (b) 1 to 99 *wt. %* of at least one unmodified cationic guar; and (II) 0.1 to 99.0 *wt. %* of at least one cosmetic functional ingredient; wherein: the modified cationic guar has a weight average molecular weight range of 800 to 1200 KDa, and low degree of substitution (0.01 to 0.10); and the unmodified cationic guar has a: (i) weight average molecular weight range of 800-1200 KDa; and (ii) (a) low degree of substitution (0.01 to 0.10), (b) medium degree of substitution (0.10 to 0.20), or combination of (ii) (a) and (ii) (b).

[0068] In another non-limiting embodiment, the present application provides a method of protecting hair from the heat of hot flat ironing up to 450°F comprising contacting the hair with a

hair care composition of multi-modal guar blends comprising: (I) 0.1 to 99.0 wt. % of at least one cationic guar blend comprising: (a) 1 to 99 wt. % of at least one modified cationic guar; and (b) 1 to 99 wt. % of at least one unmodified cationic guar; and (II) 0.1 to 99.0 wt. % of at least one cosmetic functional ingredient; wherein: the modified cationic guar has a weight average molecular weight range of 800 to 1200 KDa, and low degree of substitution (0.01 to 0.10); and the unmodified cationic guar has a: (i) weight average molecular weight range of 800-1200 KDa; and (ii) (a) low degree of substitution (0.01 to 0.10), (b) medium degree of substitution (0.10 to 0.20), or combination of (ii) (a) and (ii) (b).

[0069] *Further*, certain aspects of the present application are illustrated in detail by way of the following examples. The examples are given herein for illustration of the application and are not intended to be limiting thereof.

[0070] **EXAMPLES**

[0071] The hair care composition prepared using cationically modified guar polymer blends were effectively subjected to tests to compare and analyze the performance of present polymer blends with that of commercially available synthetic polymers. The present composition is compared against commercial synthetic polymers.

[0072] **COMPARATIVE EXAMPLES**

[0073] Control samples prepared using cationic guar polymers and different combinations are tabulated below.

Table 1

Ingredients	Ex. 9	Ex. 10	Ex. 19	Ex. 20	Ex. 21	Ex. 26	Ex. 23	Ex. 24	Ex. 25
Guar hydroxypropyltrimonium chloride [Mol. wt. 800 -1200 KDa; DS: 0.13 -0.16]		1				0.2	2		2
Guar hydroxypropyltrimonium chloride [Mol. wt. 800 -1200 KDa; DS: 0.17 -0.20]	1		1.3	1.4	1.5	0.2		2	
Guar hydroxypropyltrimonium chloride [Mol. wt. 200 -500 KDa; DS: 0.14 - 0.16]	1	1	0.7	0.6	0.5	1.6			2

[0074] EXAMPLES 1to 8: BI-MODAL CATIONIC GUAR BLENDS

[0075] A hair care composition comprising bimodal cationic guar blends were prepared and the cationic guar blend combinations are tabulated below.

Table 2

Ingredients	Ex. 1	Ex. 2	Ex. 3	Ex. 4	Ex. 5	Ex. 6	Ex. 7	Ex. 8
Hydroxypropyl Guar	1	1.2	1.6	1.8	1	1.2	1.6	1.8
Hydroxypropyltrimonium Chloride [Mol. wt. 800 -1200 KDa; DS: 0.08 - 0.15]								
Guar hydroxypropyltrimonium chloride [Mol. wt. 800 -1200 KDa; DS: 0.13 -0.16]					1	0.8	0.4	0.2
Guar hydroxypropyltrimonium chloride [Mol. wt. 800 -1200 KDa; DS: 0.17 -0.20]	1	0.8	0.4	0.2				

[0076] Examples 11 to 18: BI-MODAL CATIONIC GUAR BLENDS

[0077] A hair care composition comprising bimodal cationic guar blends were prepared and the cationic guar blend combinations thereof are tabulated below.

Table 3

Example #	11	12	13	14	15	16	17	18
Hydroxypropyl Guar	1.3	1.4	2.1	1.5	1.3	1.4	2.1	1.5
Hydroxypropyltrimonium Chloride [Mol. wt. 800 -1200 KDa; DS: 0.08 - 0.15]								
Guar hydroxypropyl trimonium chloride [Mol. wt. 800 -1200 KDa; DS: 0.13 -0.16]					0.7	0.6	0.9	0.5
Guar hydroxypropyl trimonium chloride [Mol. wt. 800 -1200 KDa; DS: 0.17 -0.20]	0.7	0.6	0.9	0.5				

[0078] Examples 29 to 32: BI-MODAL CATIONIC GUAR BLENDS

[0079] A hair care composition comprising bimodal cationic guar blends were prepared and the cationic guar blend combinations thereof are tabulated below.

Table 4

Example #	29	30	31	32
Ingredients	wt. %	wt. %	wt. %	wt. %
Hydroxypropyl Guar	2.4	2.7	2.4	2.7
Hydroxypropyltrimonium Chloride [Mol. wt. 800 -1200 KDa; DS: 0.08 - 0.15]				
Guar hydroxypropyltrimonium chloride [Mol. wt. 800 -1200 KDa; DS: 0.13 -0.16]			0.6	0.3
Guar hydroxypropyltrimonium chloride [Mol. wt. 800 -1200 KDa; DS: 0.17 -0.20]	0.6	0.3		

[0080] Example 36: TRI-MODAL CATIONIC GUAR BLENDS

[0081] A hair care composition comprising tri-modal cationic guar blends were prepared and the cationic guar blend combinations of tabulated below.

Table 5

Example #	36
Ingredients	wt. %
Hydroxypropyl Guar	2.4
Hydroxypropyltrimonium Chloride [Mol. wt. 800 -1200 KDa; DS: 0.08 - 0.15]	
Guar hydroxypropyltrimonium chloride [Mol. wt. 800 -1200 KDa; DS: 0.13 -0.16]	0.3
Guar hydroxypropyltrimonium chloride [Mol. wt. 800 -1200 KDa; DS: 0.17 -0.20]	0.3

[0082] HAIR CHARACTERISTICS

[0083] 0.50 g test prototype applied to clean damp tress (International Hair Importers; Black Indian/Asian, 3.5 g, 2.5 cm wide, 25 cm length) and rolled on 2.5 cm roller, dried in oven set @ 48°C for 1 hour and kept @ 50 RH, 22°C +/- 2°C overnight. Roller was removed, and the tress was hung on evaluation board and clips removed. Tress evaluated on a scale of 1 to 10 for initial hold, hold after 5th compression and hold after 10th compression, comb drag, frizz control and static. Stiffness, comb drag, frizz control and static of 8.0 +/- 1.0 and stiffness after 5th & 10th compressions 7.0 +/- 1.0 rated as pass. The results are illustrated in Figure 1.

[0084] HIGH HUMIDITY CURL RETENTION

[0085] 0.50 g test prototype applied to clean damp tress (International Hair Importers; Black Indian/Asian, 3.5 g, 2.5 cm wide, 25 cm length) and rolled on 2.5 cm roller, dried in oven set @ 48°C for 1 hour and kept @ 50 RH, 22°C +/- 2°C overnight. Roller was removed, and the tress was hung on a horizontally lined board marked in 1.00 cm delineations and placed in high humidity environment (90%RH, 27°C). Humidity resistance at 24 hours calculated by the following equation:

$$(L_o - L_t) / (L_o - L_i) \times 100 \text{ at time } t$$

Where: L_o = length of fully extended hair.

L_i = length of hair before exposure (initial)

L_t = length of hair after exposure time (t)

[0086] The results are tabulated below.

Table 6

High Humidity Curl Retention							
Example #	Time (hrs)						
	0	0.5	1	2	3	5	24
1	100%	100%	99%	99%	98%	98%	98%
2	100%	97%	96%	95%	92%	91%	90%
3	100%	99%	95%	91%	91%	91%	90%
4	100%	100%	98%	98%	96%	96%	95%
5	100%	100%	98%	98%	98%	97%	97%
6	100%	100%	95%	95%	94%	94%	93%
7	100%	100%	100%	98%	97%	97%	95%
8	100%	100%	100%	97%	97%	97%	96%
9	100%	100%	99%	98%	98%	98%	98%
10	100%	99%	95%	95%	95%	95%	95%
11	100%	98%	98%	98%	98%	98%	90%
12	100%	98%	98%	98%	98%	98%	98%
13	100%	98%	98%	95%	95%	95%	93%
14	100%	98%	98%	95%	95%	95%	93%
15	100%	100%	100%	100%	100%	100%	98%
16	100%	100%	100%	100%	98%	98%	98%
17	100%	98%	98%	98%	98%	98%	95%
18	100%	100%	100%	100%	100%	100%	98%
19	100%	100%	93%	93%	93%	93%	93%
20	100%	100%	99%	96%	95%	94%	91%

21	100%	100%	99%	96%	96%	95%	92%
22	100%	100%	100%	98%	98%	96%	91%
23	100%	100%	100%	96%	96%	93%	90%
24	100%	100%	99%	96%	96%	95%	92%
25	100%	100%	100%	99%	99%	99%	99%
26	100%	100%	99%	99%	99%	99%	99%
12	100%	100%	100%	100%	100%	100%	96%
13	100%	100%	100%	100%	100%	100%	98%
16	100%	100%	100%	100%	99%	99%	98%
17	100%	100%	100%	100%	100%	100%	98%

[0087] It was observed that hair curls were retained for more than 98% for 24 hours using inventive samples comprising cationic guar blends and are illustrated in Figure 2.

[0088] CURL COMPRESSION

[0089] 0.50 g test prototype applied to clean damp tress (International Hair Importers; Black Indian/Asian, 3.5 g, 2.5 cm wide, 25 cm length) and rolled on 2.5 cm roller, dried in oven set @ 48°C for 1 hour and kept @ 50 RH, 22°C +/- 2°C overnight. Roller was removed, and the tress was fixed on the curl compression accessory of Diastron MTT 175. Total maximum gram force was measured over 5 cycles in triplicates for each test sample. The higher the gram force, the stiffer the hair. The results are illustrated in Fig. 3. The values are tabulated below.

Table 7

Example #	Avg
1	271.33
2	241.90
3	241.37
4	266.36
5	141.72
6	244.73
7	213.13
8	270.47
9	243.17
10	254.95
12	270.82
16	228.07
22	170.33
23	233.53
24	232.03
25	266.40
26	240.97

29	271.15
30	270.95
31	270.62
32	255.43
13	236.25
17	244.33
33	268.75
34	206.43
35	266.45
36	230.23

[0090] It was observed that curl compression average was more than 270.

[0091] 3-POINT BEND TEST

[0092] 0.35 g test prototype applied to clean damp tress (International Hair Importers; Black Indian/Asian, 2.5 g, 2.5 cm wide, 16 cm length) and placed on a flat steel plate, dried in oven set @ 48°C for 1 hour and kept @ 50 RH, 22°C +/- 2°C overnight. Next day, dried ribbon shaped tress was placed gently on the 3 point bend accessory of Diastron MTT 175. Total maximum gram force was measured over 5 cycles in triplicates for each test sample. Higher the gramforce, better is the stiffness. The results are illustrated in Figure 4 and are tabulated below.

Table 8

Example #	Avg
1	24.63
2	30.62
3	31.90
4	26.17
5	23.27
6	25.73
7	28.57
8	26.52
9	24.42
10	28.70
12	27.52
16	29.38
22	18.83
23	30.57
24	24.05
25	19.57
13	30.10
17	27.15

33	28.47
34	28.30
35	34.42
36	29.93

[0093] Therefore, we observed that, the cationic guar blends with high weight average molecular weights exhibit wide range of tribological behavior as compared to the individual samples as well as offer the ability to optimize use levels, weight ratios and mw/ds to deliver improved resilient hair characteristics over commercial controls. *Further*, inventive composition comprising high weight average molecular weight cationic guar blends are advantageous over the prior art compositions in that the composition:

- (i) helps in improving on hair styling characteristics such as comb drag, frizz control, and stiffness as illustrated in figure 1,
- (ii) shows higher Gram force indicating better stiffness in styled hair as illustrated in figures 3 and 4, and
- (iii) provides better defined resilient curls.

[0094] While the compositions and methods of the disclosed and/or claimed inventive concept(s) have been described in terms of particular aspects, it will be apparent to those of ordinary skill in the art that variations may be applied to the compositions and/or methods and in the steps or in the sequence of steps of the method described herein without departing from the concept, spirit and scope of the disclosed and/or claimed inventive concept(s). All such similar substitutes and modifications apparent to those skilled in the art are deemed to be within the spirit, scope, and concept of the disclosed and/or claimed inventive concept(s).

What is claimed is:

1. A hair care composition of multi-modal guar blend comprising:
 - (I) 0.1 to 99.0 wt. % of at least one cationic guar blend comprising: (a) 1 to 99 wt. % of at least one modified cationic guar; and (b) 1 to 99 wt. % of at least one unmodified cationic guar; and
 - (II) 0.1 to 99.0 wt. % of at least one cosmetic functional ingredient;wherein:
 - the modified cationic guar has a weight average molecular weight range of 800 to 1200 KDa, and low degree of substitution (0.01 to 0.10); and
 - the unmodified cationic guar has a:
 - (i) weight average molecular weight range of 800-1200 KDa; and
 - (ii) (a) low degree of substitution (0.01 to 0.10), (b) medium degree of substitution (0.10 to 0.20), or combination of (ii)(a) and (ii) (b).
2. The hair care composition according to claim 1, wherein the weight average molecular weight of cationic guar blend (I) (a) and (I) (b) are present in weight ratio of 90:10, 92:8, 80:20, 75:25, 60:40, and 50:50.
3. The hair care composition according to claim 1, wherein the hair care composition is a bi-modal, a tri-modal, a quadra-modal or a penta-modal blend of cationic guar.
4. The hair care composition according to claim 1(I)(a), wherein the modified cationic guar blend is selected from the group consisting of cationic Hydroxy propyl (HP) guar, Guar hydroxypropyltrimonium chloride, and cassia hydroxypropyltrimonium chloride.
5. The hair care composition according to claim 1(i)(b), wherein the unmodified cationic guar blend is guar hydroxypropyl trimonium chloride.
6. The hair care composition according to claim 1, wherein the cationic guar blend is selected from the group comprising:
 - (i) blend of (a) guar hydroxypropyltrimonium chloride having low DS below 0.13, and (b) guar hydroxypropyltrimonium chloride having medium DS in the range of 0.13 to 0.16, and

(ii) blend of (a) guar hydroxypropyltrimonium chloride, and (b) cationic hydroxypropyl guar.

7. The hair care composition according to claim 1, wherein the at least one cosmetic functional ingredient is selected from the group consisting of acids, amino acids, antidandruff agents, anti-statics, antioxidants, anti-inflammatory agents, anti-microbial agents, acidifying agents, basifying agents, bodying agents, buffers, bleaches, cationic surfactants, cleansing agents, chelating agents, collagen, conditioning ingredients, compressed gases, dyes, de-ionized water, defoamers, emollients, emulsifiers, flexibility enhancers, fatty substances, fragrances, fillers, foam stabilizers, functional polymers, gel formers, humectants, α -hydroxycarboxylic acids, hydrophilic active agent, hair conditioning ingredients, hydrotropes, keratin hydrolyzates, light protection agents, lipophilic active agent, lipids, moisturizers, neutralizing agents, oxidizing agents, organosilicones, protein hydrolyzates, hydrotropes, perfumes, pigments, preservatives, propellants, proteins, pH modifier, polysaccharides, polyalkylene glycols, reducing agents, rheology modifiers, solvents, solubilizers, suspension agents, silicones, silicone-containing polymers, split modifiers, shine enhancers, softeners, sequestering agents, surfactants, styling polymers, thickeners, texturizing agents, tinting agents, tanning agents, UV-A or UV-B blocker/filters, UV protectants, viscosifiers, vitamins, water proofing agents, water softening agents, wetting agents, and blends thereof.

8. The hair care composition according to claim 1, wherein the composition is used for (i) hair styling, (ii) hair straightening, (iii) hair split end mending, (iv) hair cuticular smoothing, (v) hair conditioning, (vi) protecting hair from thermal and mechanical damage, and (vii) protecting hair from thermal damage from heat styling tools up to 450°F.

9. The hair care composition according to claim 1, wherein the pH of the hair care composition is in the range of from about 3 to about 13.

10. The hair care composition according to claim 1, wherein the composition is formulated as an aerosol, a cream, an emulsion, a gel, a lotion, a mousse, a powder, a paste, a solution, a spray, a shampoo, a vesicle dispersion, or a wax.

11. The hair care composition according to claim 1, wherein the hair care composition used in a hair care formulation is in the range of about 0.01 *wt. %* to about 10.0 *wt. %*, or from about 0.01 to about 5.0 *wt. %* based on the total weight of the hair care formulation.

12. The hair care composition according to claim 7, wherein the surfactant is selected from the group consisting of amphoteric surfactants, cationic surfactants, anionic surfactants, nonionic surfactants, zwitterionic surfactants, and mixtures thereof.

13. The hair care composition according to claim 13, wherein the cationic surfactant is selected from the group consisting of cetrimonium chloride, cetrimonium bromide, dicytyldimonium chloride, and palmitamidopropyl trimonium chloride.

14. The hair care composition according to claim 1, wherein the composition exhibits a high humidity curl retention of about 80% to about 100% over a 24-hour period at 90% humidity and at 80° F.

15. The hair care composition according to claim 1, wherein the composition delivers a wide range of tribological behavior; exhibits improved humidity resistance, stiffness, durability of hold, low slip, foam enhancement and curl maintenance; is nature derived and is biodegradable.

16. A hair styling composition of multi-modal guar blends comprising:

(I) 0.1 to 99.0 *wt. %* of at least one cationic guar blend comprising: (a) 1 to 99 *wt. %* of at least one modified cationic guar; and (b) 1 to 99 *wt. %* of at least one unmodified cationic guar; and

(II) 0.1 to 99.0 *wt. %* of at least one cosmetic functional ingredient;

wherein:

the modified cationic guar has a weight average molecular weight range of 800 to 1200 KDa, and low degree of substitution (0.01 to 0.10); and

the unmodified cationic guar has a:

(i) weight average molecular weight range of 800-1200 KDa; and

(ii) (a) low degree of substitution (0.01 to 0.10), (b) medium degree of substitution (0.10 to 0.20), or combination of (ii)(a) and (ii) (b).

17. The hair styling composition according to claim 16, wherein the hair styling composition is a bi-modal hair styling composition.

18. The hair styling composition according to claim 18, wherein the hair styling composition comprises Guar hydroxypropyltrimonium chloride and Hydroxypropyl Guar Hydroxypropyl trimonium Chloride blend.

19. A hair care composition for mending split ends, the composition comprising:

(I) 0.1 to 99.0 *wt. %* of at least one cationic guar blend comprising: (a) 1 to 99 *wt. %* of at least one modified cationic guar; and (b) 1 to 99 *wt. %* of at least one unmodified cationic guar; and

(II) 0.1 to 99.0 *wt. %* of at least one cosmetic functional ingredient;

wherein:

the modified cationic guar has a weight average molecular weight range of 800 to 1200 KDa, and low degree of substitution (0.01 to 0.10); and

the unmodified cationic guar has a:

(i) weight average molecular weight range of 800-1200 KDa; and

(ii) (a) low degree of substitution (0.01 to 0.10), (b) medium degree of substitution (0.10 to 0.20), or combination of (ii)(a) and (ii) (b).

20. The hair care composition according to claim 19, wherein the hair care composition is a leave-in composition.

21. The hair care composition according to claim 19, wherein the hair care composition is a bi-modal hair care composition.

22. The hair care composition according to claim 19, wherein the hair care composition comprises Guar hydroxypropyltrimonium chloride and Hydroxypropyl Guar Hydroxypropyl trimonium Chloride blend.

23. An aqueous hair styling composition comprising:

(i) 0.1 to 10 *wt. %* of hair care composition of claim 1;

(ii) 1.0 to 60 *wt. %* of at least one solvent;

(iii) 0.1 to 10 *wt. %* of at least one cosmetic functional ingredient; and

(iv) 0.1 to 95 *wt. %* of water.

24. The hair styling composition according to claim 23, wherein the at least one cosmetic functional ingredient is selected from the group consisting of acids, amino acids, antidandruff agents, anti-statics, antioxidants, anti-inflammatory agents, anti-microbial agents, acidifying agents, basifying agents, bodying agents, buffers, bleaches, cationic surfactants, cleansing agents, chelating agents, collagen, conditioning ingredients, compressed gases, dyes, de-ionized water, defoamers, emollients, emulsifiers, flexibility enhancers, fatty substances, fragrances, fillers, foam stabilizers, functional polymers, gel formers, humectants, α -hydroxycarboxylic acids, hydrophilic active agent, hair conditioning ingredients, hydrotropes, keratin hydrolyzates, light protection agents, lipophilic active agent, lipids, moisturizers, neutralizing agents, oxidizing agents, organosilicones, protein hydrolyzates, hydrotropes, perfumes, pigments, preservatives, propellants, proteins, pH modifier, polysaccharides, polyalkylene glycols, reducing agents, rheology modifiers, solvents, solubilizers, suspension agents, silicones, silicone-containing polymers, split modifiers, shine enhancers, softeners, sequestering agents, surfactants, styling polymers, thickeners, texturizing agents, tinting agents, tanning agents, UV-A or UV-B blocker/filters, UV protectants, viscosifiers, vitamins, water proofing agents, water softening agents, wetting agents, and blends thereof.

25. A method for repairing split ends of hair comprising contacting hair with split ends with a multi-modal hair care composition comprising:

(I) 0.1 to 99.0 *wt.* % of at least one cationic guar blend comprising: (a) 1 to 99 *wt.* % of at least one modified cationic guar; and (b) 1 to 99 *wt.* % of at least one unmodified cationic guar; and

(II) 0.1 to 99.0 *wt.* % of at least one cosmetic functional ingredient;

wherein:

the modified cationic guar has a weight average molecular weight range of 800 to 1200 KDa, and low degree of substitution (0.01 to 0.10); and

the unmodified cationic guar has a:

(i) weight average molecular weight range of 800-1200 KDa; and

(ii) (a) low degree of substitution (0.01 to 0.10), (b) medium degree of substitution (0.10 to 0.20), or combination of (ii)(a) and (ii) (b),

followed by rinsing the hair with water.

26. A method for thermal and mechanical protection from brush and blow drying, comprising contacting the hair with a multi-modal hair care composition comprising:

(I) 0.1 to 99.0 *wt. %* of at least one cationic guar blend comprising: (a) 1 to 99 *wt. %* of at least one modified cationic guar; and (b) 1 to 99 *wt. %* of at least one unmodified cationic guar; and

(II) 0.1 to 99.0 *wt. %* of at least one cosmetic functional ingredient;

wherein:

the modified cationic guar has a weight average molecular weight range of 800 to 1200 KDa, and low degree of substitution (0.01 to 0.10); and

the unmodified cationic guar has a:

(i) weight average molecular weight range of 800-1200 KDa; and

(ii) (a) low degree of substitution (0.01 to 0.10), (b) medium degree of substitution (0.10 to 0.20), or combination of (ii)(a) and (ii) (b).

27. A method of protecting hair from the heat of hot flat ironing up to 450⁰F comprising contacting the hair with a multi-modal hair care composition comprising:

(I) 0.1 to 99.0 *wt. %* of at least one cationic guar blend comprising: (a) 1 to 99 *wt. %* of at least one modified cationic guar; and (b) 1 to 99 *wt. %* of at least one unmodified cationic guar; and

(II) 0.1 to 99.0 *wt. %* of at least one cosmetic functional ingredient;

wherein:

the modified cationic guar has a weight average molecular weight range of 800 to 1200 KDa, and low degree of substitution (0.01 to 0.10); and

the unmodified cationic guar has a:

(i) weight average molecular weight range of 800-1200 KDa; and

(ii) (a) low degree of substitution (0.01 to 0.10), (b) medium degree of substitution (0.10 to 0.20), or combination of (ii)(a) and (ii) (b).

HAIR CHARACTERISTICS

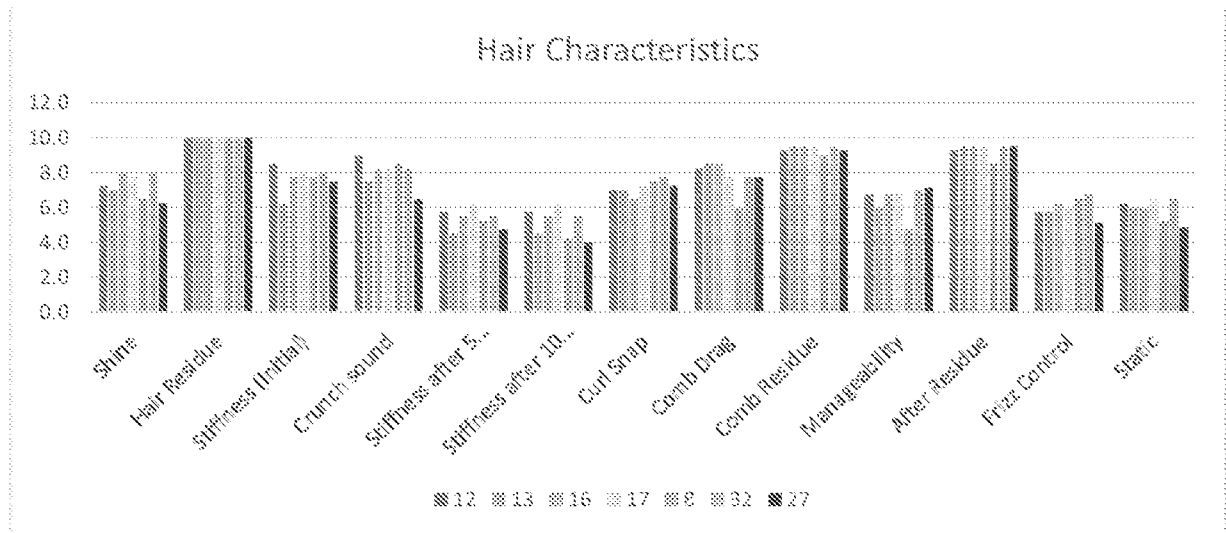
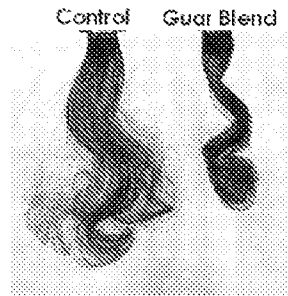


FIG. 1

HIGH HUMUDITY CURL RETENTION

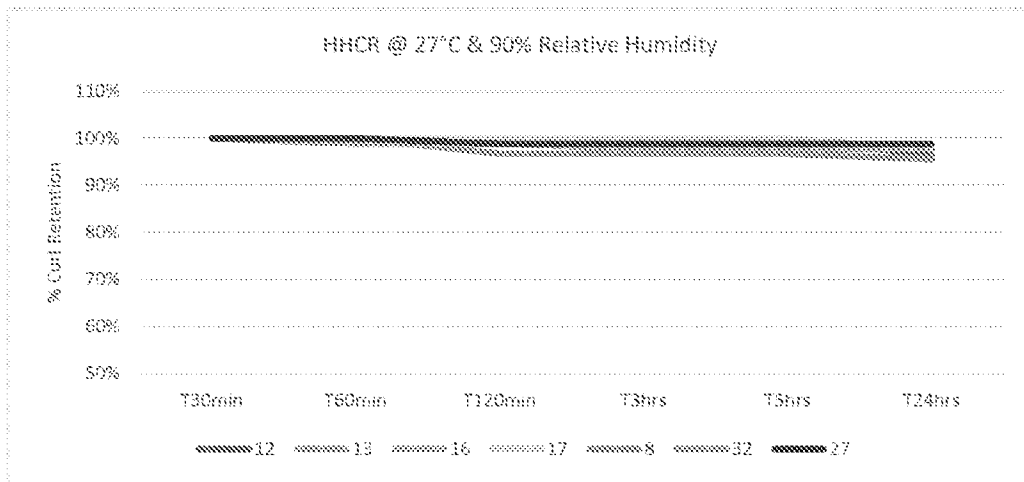


FIG. 2

CURL COMPRESSION

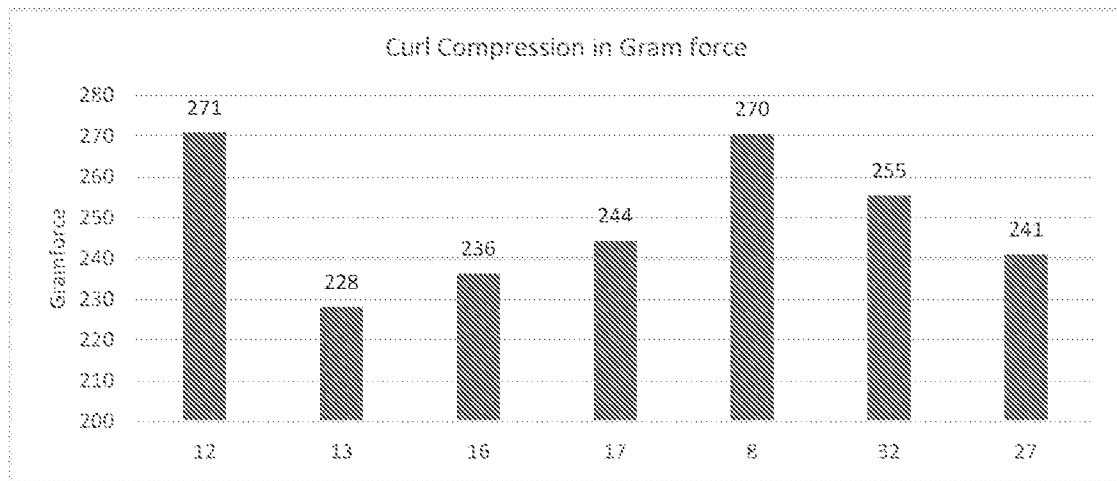


FIG. 3

3-POINT BENDING

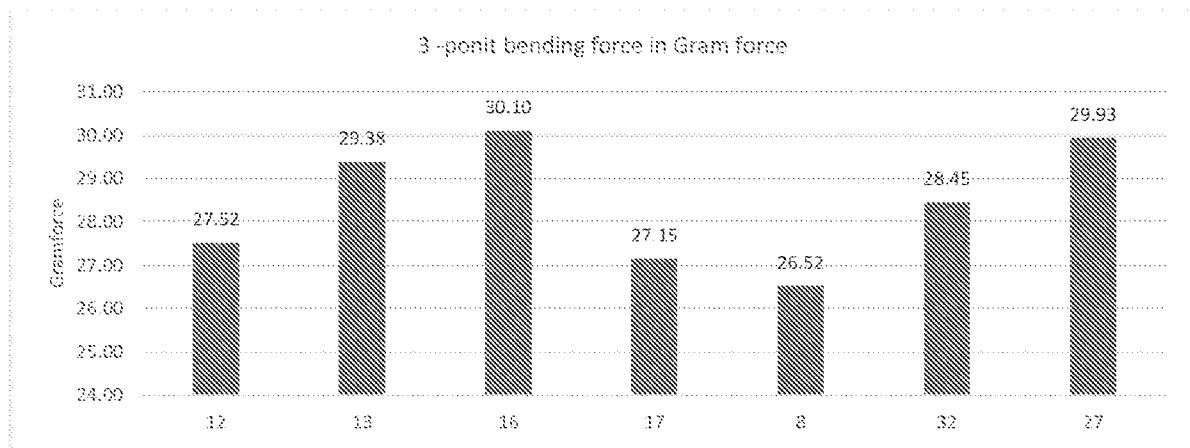


FIG. 4