US 20240373902A1

(19) **United States**

(12) **Patent Application Publication** (10) **Pub. No.: US 2024/0373902 A1**

ABI AOUN et al. (43) **Pub. Date: Nov. 14, 2024**

(54) **AEROSOL-GENERATING MATERIAL COMPRISING GUAR GUM AND STARCH OR MODIFIED STARCH**

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(21) Appl. No.: **18/293,924**

(22) PCT Filed: **Aug. 4, 2022**

(86) PCT No.: **PCT/EP2022/072005**

§ 371 (c)(1),
(2) Date: **Jan. 31, 2024**

(30) **Foreign Application Priority Data**

Aug. 4, 2021 (CN) 202110891659.0

Publication Classification

(51) **Int. Cl.**

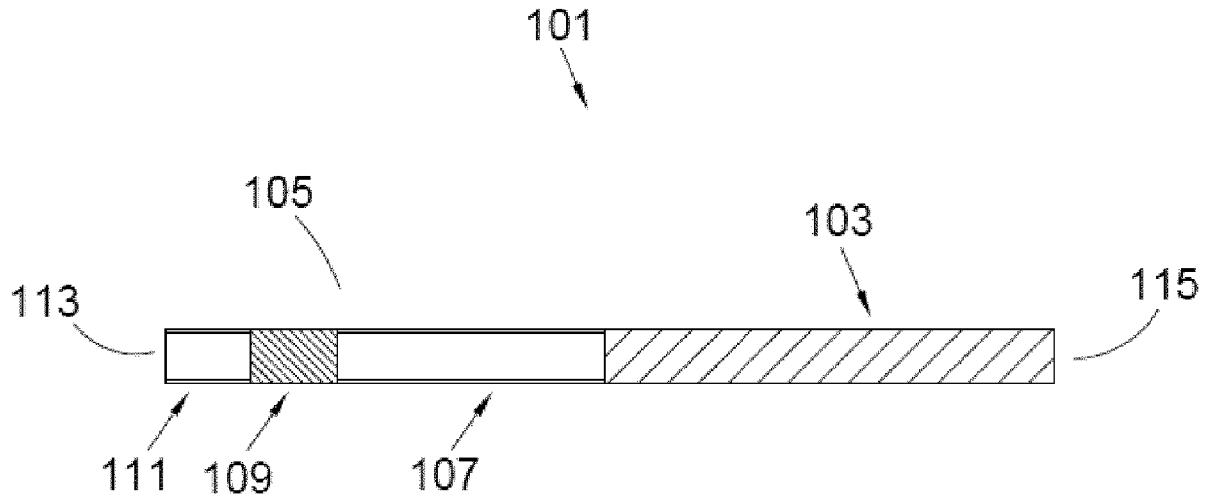
A24B 15/40	(2006.01)
A24B 15/14	(2006.01)
A24B 15/30	(2006.01)
A24D 1/20	(2006.01)
A24F 40/20	(2006.01)

(52) **U.S. Cl.**

CPC ***A24B 15/403*** (2013.01); ***A24B 15/14*** (2013.01); ***A24B 15/302*** (2013.01); ***A24D 1/20*** (2020.01); ***A24F 40/20*** (2020.01)

(57) **ABSTRACT**

The invention provides an aerosol-generating material comprising: (a) aerosol-former material, (b) a first binder which is guar gum, (c) a second binder which is starch or modified starch, and (d) filler. The invention also provides a method of forming the aerosol-generating material. The invention also provides a consumable for use in a non-combustible aerosol provision device, the consumable comprising an aerosol-generating composition wherein the aerosol generating composition comprises the aerosol-generating material of the invention. The invention also provides a method of generating an aerosol using the non-combustible aerosol provision system and the use of an aerosol-generating composition in a consumable for use with a non-combustible aerosol provision device.



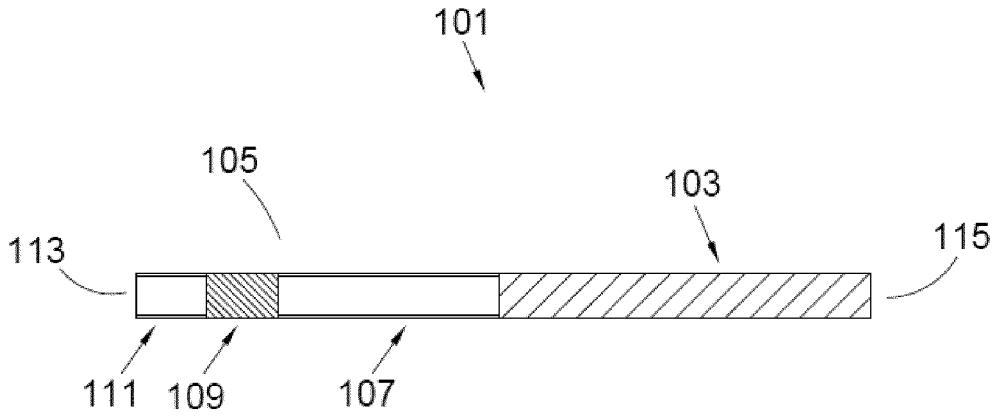


Figure 1

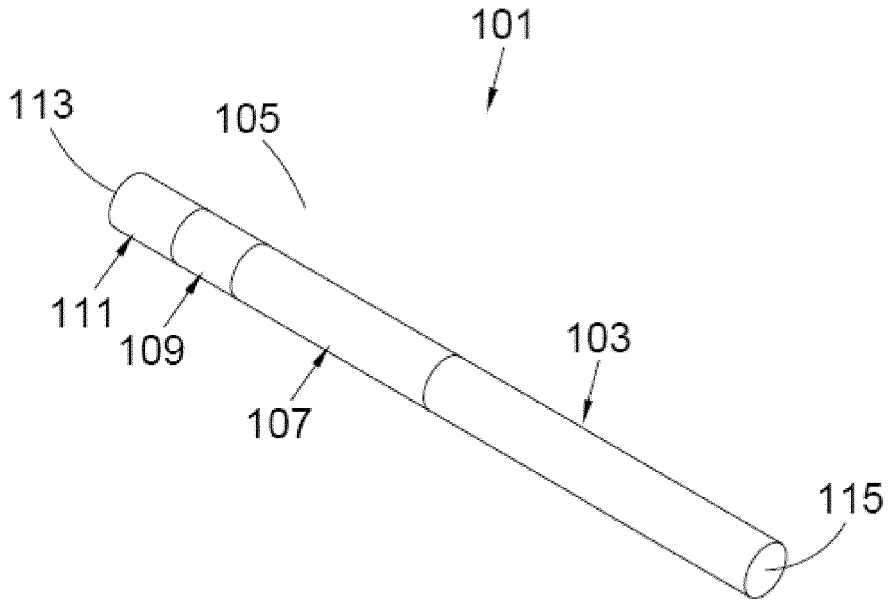


Figure 2

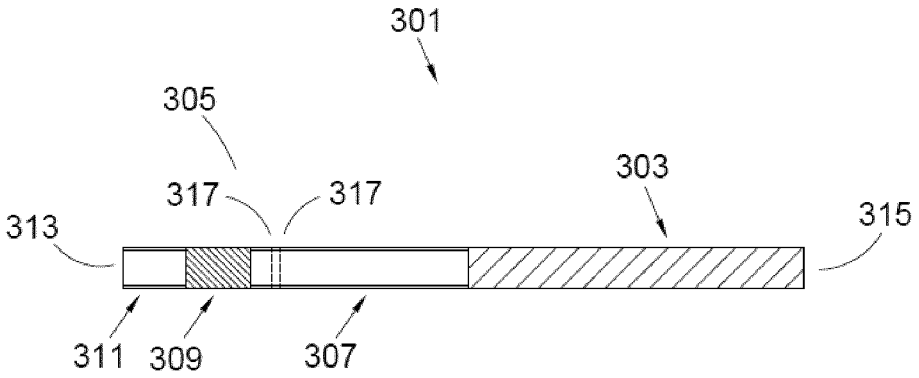


Figure 3

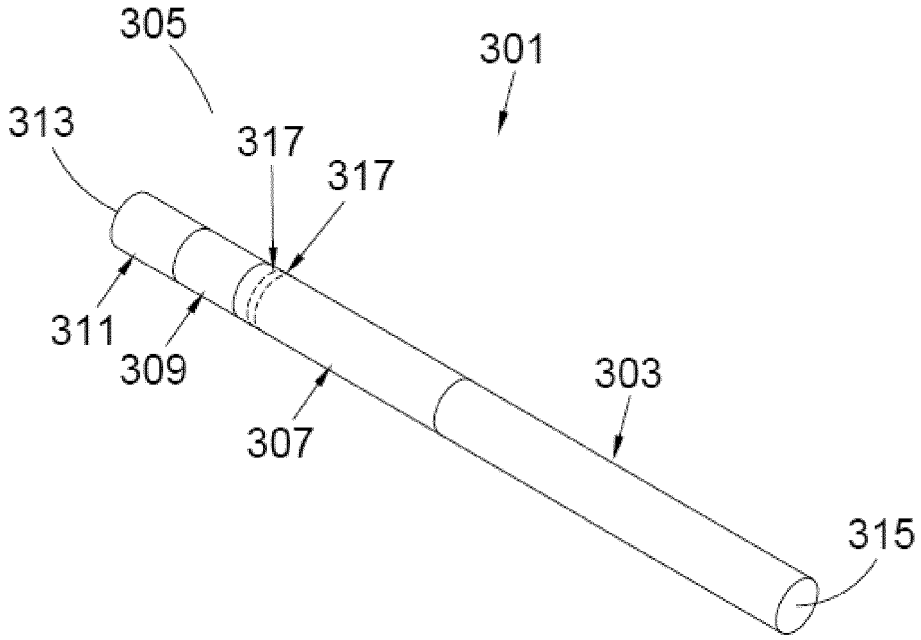


Figure 4

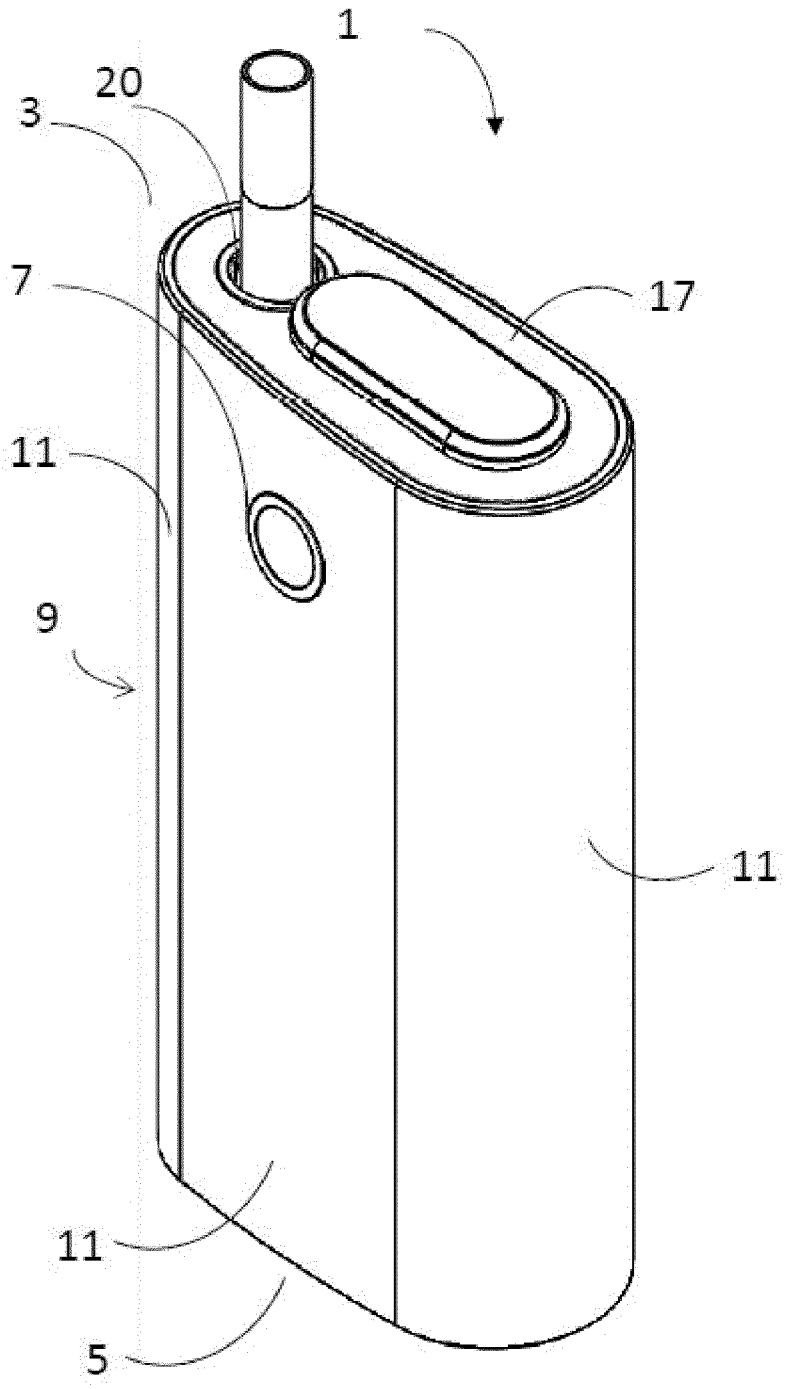


Figure 5

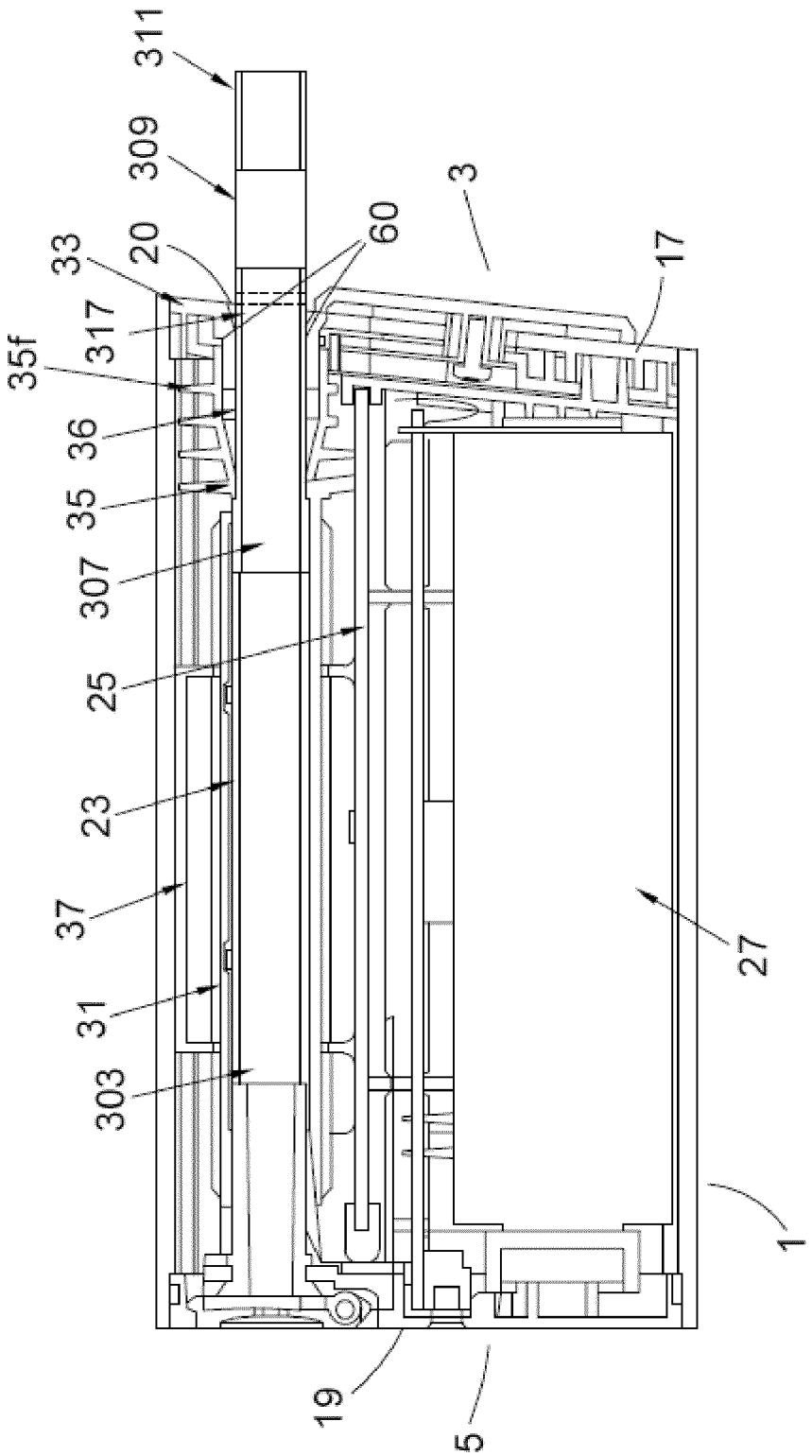


Figure 6

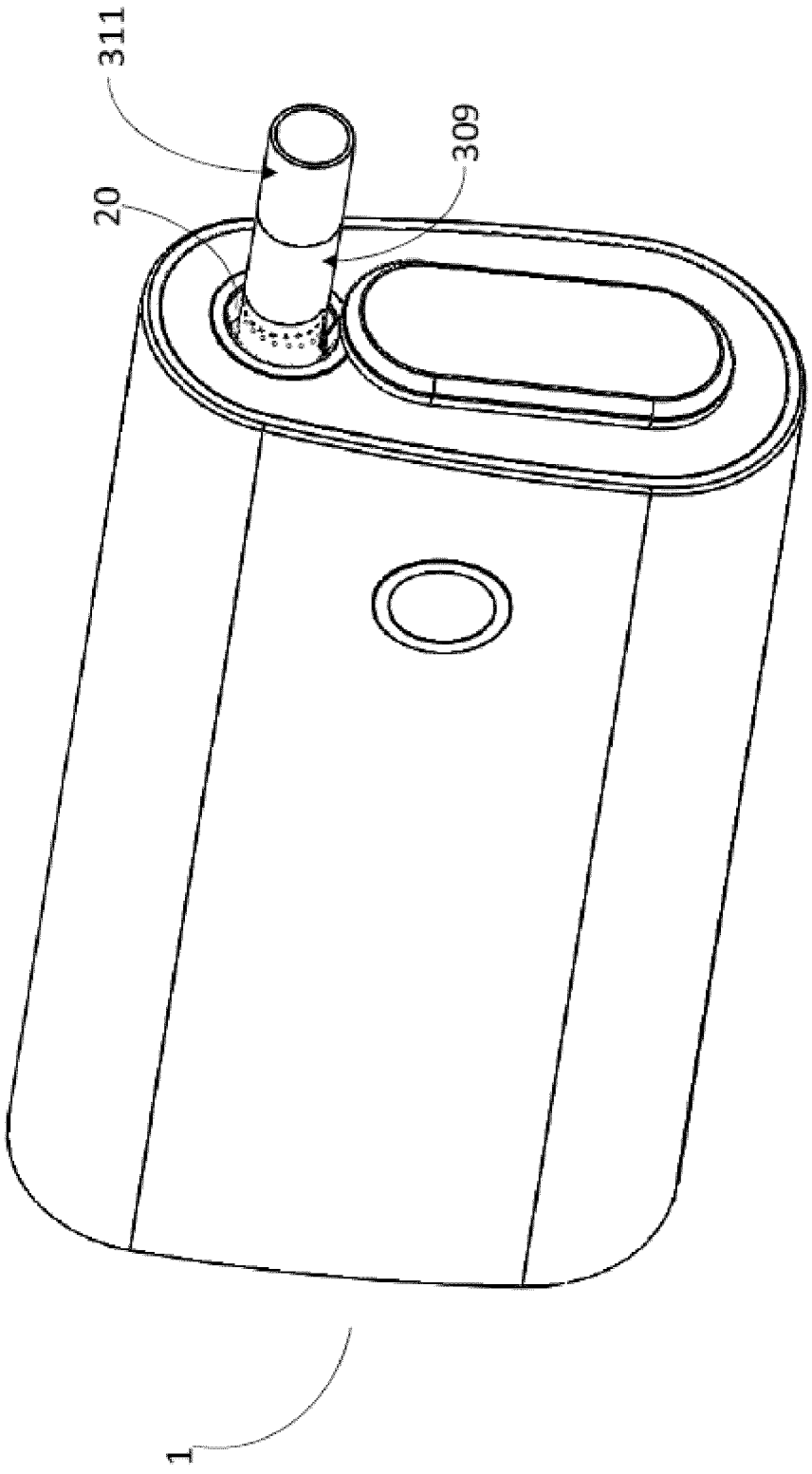


Figure 7

AEROSOL-GENERATING MATERIAL COMPRISING GUAR GUM AND STARCH OR MODIFIED STARCH

TECHNICAL FIELD

[0001] The present invention relates to aerosol generation. In particular, the present invention relates to an aerosol-generating material, an aerosol-generating composition, a consumable, a non-combustible aerosol provision system, a method of generating aerosol and a method of forming an aerosol-generating material.

BACKGROUND

[0002] Smoking articles such as cigarettes, cigars and the like burn tobacco during use to create tobacco smoke. Alternatives to these types of articles release an inhalable aerosol or vapour by releasing compounds from a substrate material by heating without burning. These may be referred to as non-combustible smoking articles, aerosol generating assemblies or non-combustible aerosol provision systems.

[0003] One example of such a product is a heating device which release compounds by heating, but not burning, a solid aerosolisable material. This solid aerosolisable material may, in some cases, contain a tobacco material. The heating volatilises at least one component of the material, typically forming an inhalable aerosol. These products may be referred to as heat-not-burn devices, tobacco heating devices or tobacco heating products (THP). Various different arrangements for volatilising at least one component of the solid aerosolisable material are known.

[0004] As another example, there are e-cigarette/tobacco heating product hybrid devices, also known as electronic tobacco hybrid devices. These hybrid devices contain a liquid source (which may or may not contain nicotine) which is vaporised by heating to produce an inhalable vapour or aerosol. The device additionally contains a solid aerosolisable material (which may or may not contain a tobacco material) and components of this material are entrained in the inhalable vapour or aerosol to produce the inhaled medium.

SUMMARY

[0005] In a first aspect, there is provided an aerosol-generating material comprising:

[0006] (a) aerosol-former material;

[0007] (b) a first binder which is guar gum;

[0008] (c) a second binder which is starch or a modified starch; and

[0009] (d) filler.

[0010] In a second aspect, there is provided an aerosol-generating composition comprising the aerosol-generating material of the first aspect.

[0011] In a third aspect, there is provided a consumable for use in a non-combustible aerosol provision device, the consumable comprising the aerosol-generating composition of the second aspect.

[0012] In a fourth aspect, there is a provided a non-combustible aerosol provision system comprising the consumable of the third aspect and a non-combustible aerosol provision device.

[0013] In a fifth aspect, there is provided a method of generating an aerosol using the non-combustible aerosol provision system of the fourth aspect, the method comprising heating the aerosol-generating material to a temperature of less than 350° C.

[0014] In a sixth aspect, there is provided use of the non-combustible aerosol provision system of the fourth aspect to generate an inhalable aerosol.

[0015] In a seventh aspect, there is provided a method of making an aerosol-generating material comprising

[0016] (i) providing a slurry comprising the aerosol-former material, first binder which is guar gum, the second binder which is starch or a modified starch, the filler, a solvent and any optional further components of the aerosol-generating material;

[0017] (ii) forming a layer of the slurry; and

[0018] (iii) drying the slurry to form the aerosol-generating material.

[0019] A further aspect provides, a method for making an aerosol-generating material as described herein using a paper-making process, such as an air-laid paper-making process.

[0020] To the extent that they are combinable, features described herein in relation to one aspect of the invention are explicitly disclosed in combination with each and every other aspect.

[0021] Further features and advantages of the invention will become apparent from the following description, given by way of example only, and with reference to the accompanying figures.

BRIEF DESCRIPTION OF THE FIGURES

[0022] FIG. **1** shows a section view of an example of a consumable.

[0023] FIG. **2** shows a perspective view of the consumable of FIG. **1**.

[0024] FIG. **3** shows a sectional elevation of an example of a consumable.

[0025] FIG. **4** shows a perspective view of the consumable of FIG. **3**.

[0026] FIG. **5** shows a perspective view of an example of a non-combustible aerosol provision system.

[0027] FIG. **6** shows a section view of an example of a non-combustible aerosol provision system.

[0028] FIG. **7** shows a perspective view of an example of a non-combustible aerosol provision system.

DETAILED DESCRIPTION

[0029] As noted above, provided is an aerosol-generating material comprising:

[0030] (a) aerosol-former material;

[0031] (b) a first binder which is guar gum;

[0032] (c) a second binder which is starch or a modified starch; and

[0033] (d) filler.

[0034] The aerosol-generating material may form part of an aerosol-generating composition. An aerosol-generating composition is a composition that is capable of generating aerosol, for example when heated, irradiated or energized in any other way.

[0035] The aerosol-generating material may be an "amorphous solid". In some embodiments, the aerosol-generating material comprises an aerosol-generating film that is an amorphous solid. In some embodiments, the amorphous solid is a "monolithic solid". The aerosol-generating mate-

rial may be non-fibrous or fibrous. For example, the aerosol-generating material may be substantially non-fibrous. In some embodiments, the aerosol-generating material may be a dried gel. The aerosol-generating material is a solid material that may retain some fluid, such as liquid, within it. In some embodiments the retained fluid may be water (such as water absorbed from the surroundings of the aerosol-generating material) or the retained fluid may be solvent (such as when the aerosol-generating material is formed from a slurry). In some embodiments, the solvent may be water.

[0036] In some embodiments, the aerosol-generating material is a film.

[0037] In some embodiments, the aerosol-generating material consists essentially of, or consists of, aerosol-former material; the first and second binders; optionally chitosan; solvent, such as water; and filler.

[0038] In some embodiments, the aerosol-generating material consists essentially of, or consists of, aerosol-former material; the first and second binders; optionally chitosan; water; and filler.

[0039] In some embodiments, the aerosol-generating material is a hydrogel and comprises less than about 20 wt % of water calculated on a wet weight basis. In some cases, the hydrogel may comprise less than about 15 wt %, 12 wt % or 10 wt % of water calculated on a wet weight basis (WWB).

[0040] In some embodiments, the aerosol-generating material may contain less than about 20 wt %, such as less than about 15 wt %, 12 wt % or 10 wt % of water calculated on a wet weight basis (WWB). For example, the aerosol-generating material may contain about 1-15 wt % of water, such as 3-12 wt % of water (WWB).

First and Second Binder

[0041] The aerosol-generating material comprises a first binder which is guar gum and a second binder which is starch or modified starch.

[0042] The term "gelling agent" may also be used herein in place of "binder".

[0043] It is advantageous for an aerosol-generating material to have an area density of about 80 to about 120 g/m^2, such as about 100 g/m^2, so that mixtures of aerosol-generating material and tobacco (such as cut rag tobacco) do not readily separate. It is also desirable for aerosol-generating material to have sufficient tensile strength for the aerosol-generating material to be wound (e.g. in sheet form) onto a bobbin and unwound without breakages. It has been found that aerosol-generating materials having the required area density (such as about 100 g/m^2) and sufficient tensile strength to be wound onto and unwound from a bobbin (such as greater than or equal to about 250 N/m) can be produced using guar gum binder in combination with filler and aerosol-former material. However, the viscosity of liquids (such as a slurry) containing guar gum binder can be relatively high. It has been found that replacing part of the guar gum binder with a second binder that is starch or modified starch can reduce the viscosity of the resultant mixture, thereby facilitating handling, whilst still allowing an aerosol-generating material having a suitable area density (such as about 100 g/m^2) and sufficient tensile strength to be produced.

[0044] In some embodiments, the second binder is modified starch. The terms "modified starch" and "starch derivative" may be used interchangeably in this disclosure, and are intended to be equivalents.

[0045] Suitable modified starches (which may also be referred to as starch derivatives) include, but are not limited to, hydroxypropyl starch, carboxymethyl starch sodium, carboxymethyl starch, octenylsuccinic anhydride-modified starch, starch acetate, monostarch phosphate, distarch phosphate, distarch adipate, hydroxypropyl distarch phosphate, phosphated distarch phosphate, acetylated distarch phosphate and acetylated distarch adipate. In particular embodiments, the modified starch comprises (or is) one or more of hydroxypropyl starch, carboxymethyl starch and carboxymethyl starch sodium. In particular embodiments, the modified starch comprises (or is) one or more of hydroxypropyl starch and carboxymethyl starch sodium.

[0046] In some embodiments, aerosol-generating material comprises the first binder (guar gum) in an amount of from about 3 wt %, 5 wt %, 7 wt % or 10 wt % to about 35 wt %, 30 wt %, 25 wt % or 20 wt % of the aerosol-generating material on a dry weight basis. For example, in some embodiments the aerosol-generating material comprises the first binder in an amount of about 3-35 wt %, about 5-30 wt %, about 7-25 wt % or about 10-20 wt % of the aerosol-generating material.

[0047] In some embodiments, aerosol-generating material comprises the second binder (starch or modified starch) in a total amount of from about 1 wt %, 2 wt % or 3 wt % to about 20 wt %, 15 wt %, or 10 wt % of the aerosol generating material on a dry weight basis. For example, in some embodiments, the aerosol-generating material comprises the second binder in a total amount of about 1-20 wt %, about 2-15 wt % or about 3-10 wt % of the aerosol-generating material.

[0048] In some embodiments, the aerosol-generating material comprises the first and the second binder in a total amount of from about 5 wt %, 10 wt %, 15 wt %, 17 wt % or 20 wt % to about 50 wt %, 45 wt %, 40 wt %, 35 wt %, 30 wt % or 25 wt % of the aerosol-generating material on a dry weight basis. In some such embodiments, the total amount of first and the second binders in the aerosol-generating material is about 5 to 50 wt %, 10 to 40 wt %, 15 to 30 wt %, 15 to 25 wt %, or 17 to 25 wt %. In particular embodiments, the total amount of first and the second binders in the aerosol-generating material is from about 15 to about 25 wt %.

Additional Binder

[0049] As well as the first and second binders, the aerosol-generating material may further comprise one or more additional binders other than guar gum, starch or modified starch.

[0050] In some embodiments, the additional binder comprises a hydrocolloid.

[0051] In some embodiments, the additional binder comprises (or is) one or more compounds selected from polysaccharide binders, such as alginate, pectin, cellulose or a derivative thereof, pullulan, carrageenan, agar and agarose; gelatin and chitosan; gums, such as xanthan gum, and acacia gum; silica or silicone compounds, such as PDMS and sodium silicate; clays, such as kaolin; and polyvinyl alcohol.

[0052] In some embodiments the additional binder comprises (or is) one or more polysaccharide binders. In some

embodiments, the polysaccharide binder is selected from alginate, pectin, cellulose or a derivative thereof and chitosan.

[0053] Examples of cellulosic binders (also referred to herein as cellulose derivatives) include, but are not limited to, hydroxymethyl cellulose, hydroxyethyl cellulose, hydroxypropyl cellulose, carboxymethylcellulose (CMC), hydroxypropyl methylcellulose (HPMC), methyl cellulose, ethyl cellulose, cellulose acetate (CA), cellulose acetate butyrate (CAB), and cellulose acetate propionate (CAP). In some embodiments the cellulose or derivative thereof is selected from hydroxymethyl cellulose, hydroxyethyl cellulose, hydroxypropyl cellulose, carboxymethylcellulose (CMC), hydroxypropyl methylcellulose (HPMC), methyl cellulose, ethyl cellulose, cellulose acetate (CA), cellulose acetate butyrate (CAB), and cellulose acetate propionate (CAP). In particular embodiments, the cellulose derivative is CMC.

[0054] In some embodiments, the additional binder is chitosan, which may improve the retention rate of certain effective compounds in the aerosol-generating material. For example, the use of chitosan may aid retention of glycerol within the aerosol-generating material. This may help to reduce the tackiness of the surface of the aerosol-generating material, such as when it contains high concentrations of aerosol-former material, and so may facilitate processing and/or handling of the aerosol-generating material (during its manufacture and/or subsequent processing).

[0055] The use of chitosan may also improve the tensile strength of the aerosol-generating material.

[0056] Chitosan is a copolymer of D-glucosamine and N-acetyl-D-glucosamine. Typically, chitosan is produced by N-deacetylation of chitin through alkaline hydrolysis.

[0057] In some embodiments, the aerosol-generating material comprises chitosan in an amount of from about 0.01 wt %, 0.025 wt %, 0.05 wt % or 0.1 wt % to about 10 wt %, 5 wt %, 4 wt %, 3 wt % 2 wt %, 1 wt % or 0.7 wt % of the aerosol-generating material on a dry weight basis. For example, the aerosol-generating material may comprise chitosan in an amount of about 0.01-10 wt %, such as 0.025-5 wt %, 0.05-2 wt %, 0.1-1 wt % or 0.1-0.7 wt %.

[0058] In some embodiments, the only binders are the first and second binders (i.e. guar gum and starch or a starch derivative).

Aerosol-Former Material

[0059] The aerosol-former material may comprise one or more constituents capable of forming an aerosol. In some embodiments, the aerosol-former material comprises (or is) one or more of glycerol, propylene glycol, diethylene glycol, triethylene glycol, tetraethylene glycol, 1,3-butylene glycol, erythritol, meso-Erythritol, ethyl vanillate, ethyl laurate, a diethyl suberate, triethyl citrate, triacetin, a diacetin mixture, benzyl benzoate, benzyl phenyl acetate, tributyrin, lauryl acetate, lauric acid, myristic acid, and propylene carbonate.

[0060] In some embodiments, the aerosol-former material comprises (or is) one or more polyhydric alcohols, such as propylene glycol, triethylene glycol, 1,3-butanediol and glycerin; esters of polyhydric alcohols, such as glycerol mono-, di- or triacetate; and/or aliphatic esters of mono-, di- or polycarboxylic acids, such as dimethyl dodecanedioate and dimethyl tetradecanedioate.

[0061] In particular embodiments, the aerosol-former material comprises (or is) glycerol, optionally in combination with propylene glycol.

[0062] The aerosol-generating material may comprise aerosol-former material in a total amount of from about 1 wt % to about 80 wt % of the aerosol-generating material on a dry weight basis. In some embodiments, the aerosol-generating material may comprise aerosol-former material in a total amount of from about 1 wt %, 10 wt %, 20 wt %, 30 wt %, 35 wt %, 40 wt % or 45 wt % to about 80 wt %, 70 wt %, 65 wt %, 60 wt % or 55 wt % of the aerosol-generating material such as about 50 wt %. In particular embodiments, the aerosol-generating material comprises aerosol-former material in a total amount of about 35-65 wt %, about 40-60 wt % or about 45-55 wt %, such as about 50 wt %.

Filler

[0063] The aerosol-generating material comprises filler. Use of a filler may help to reduce tackiness of the aerosol-generating material, for example if high levels of aerosol-former material are present.

[0064] In some embodiments, the aerosol-generating material comprises filler in a total amount of at least 15 wt % of the aerosol-generating material on a dry weight basis, such as about 15 to 40 wt %. For example in some embodiments, the aerosol-generating material comprises filler in a total amount of about 20 to 40 wt %, or about 25 to 35 wt %.

[0065] In some embodiments, the filler comprises (or is) one or more inorganic filler materials, such as calcium carbonate, perlite, vermiculite, diatomaceous earth, colloidal silica, magnesium oxide, magnesium sulphate, magnesium carbonate, and suitable inorganic sorbents, such as molecular sieves.

[0066] In some embodiments, the filler comprises (or is) one or more organic filler materials such as wood pulp; tobacco pulp; hemp fibre; cellulose and cellulose derivatives, such as microcrystalline cellulose and/or nanocrystalline cellulose.

[0067] As would be well understood by the skilled person, microcrystalline cellulose may be formed by depolymerising cellulose by a chemical process (e.g. using an acid or enzyme). One example method for forming microcrystalline cellulose involves acid hydrolysis of cellulose, using an acid such as HCl. The cellulose produced after this treatment is crystalline (i.e. no amorphous regions remain). Suitable methods and conditions for forming microcrystalline cellulose are well-known in the art.

[0068] In some embodiments, the aerosol-generating material does not comprise inorganic filler. In some embodiments, the aerosol-generating composition does not comprise inorganic filler.

[0069] In some embodiments, the aerosol-generating material does not comprise calcium carbonate, such as chalk.

[0070] In some embodiments, the aerosol-generating composition does not comprise calcium carbonate, such as chalk.

[0071] In particular embodiments, the aerosol-generating material comprises filler and the filler is fibrous. For example, the filler may be a fibrous organic filler material such as wood pulp, tobacco pulp, hemp fibre, cellulose or cellulose derivatives. In some embodiments, the fibrous organic filler material may be wood pulp, hemp fibre, cellulose or cellulose derivatives. In particular embodi-

ments, the fibrous filler is wood pulp. Without wishing to be bound by theory, it is believed that including fibrous filler in an aerosol-generating material may increase the tensile strength of the material. This may be particularly advantageous in examples wherein the aerosol-generating material is provided as a sheet, such as when an aerosol-generating material sheet circumscribes a rod of aerosolisable material.

[0072] In particular embodiments, the filler comprises (or is) wood pulp.

Optional Active Substance

[0073] The aerosol-generating material or aerosol-generating composition may comprise active substance.

[0074] In some cases, the aerosol-generating material may comprise from about 1 wt %, 5 wt %, 10 wt %, 15 wt %, 20 wt % or 25 wt % to about 65 wt %, 60 wt %, 50 wt %, 45 wt %, 40 wt %, 35 wt %, or 30 wt % (calculated on a dry weight basis) of active substance.

[0075] In some cases, the active substance is nicotine. In some cases, the aerosol-generating material may comprise from about 1 wt %, 2 wt %, 3 wt %, 4 wt % or 5 wt % to about 20 wt %, 18 wt %, 15 wt %, 12 wt % or 10 wt % (calculated on a dry weight basis) of nicotine. For example, the aerosol-generating material may comprise about 1-20 wt %, 2-18 wt % or 3-12 wt % of nicotine.

[0076] The active substance as used herein may be a physiologically active material, which is a material intended to achieve or enhance a physiological response. The active substance may for example be selected from nutraceuticals, nootropics, psychoactives. The active substance may be naturally occurring or synthetically obtained. The active substance may comprise for example nicotine, caffeine, taurine, theine, vitamins such as B6 or B12 or C, melatonin, cannabinoids, or constituents, derivatives, or combinations thereof. The active substance may comprise one or more constituents, derivatives or extracts of tobacco, *cannabis* or another botanical.

[0077] In some embodiments, the active substance comprises nicotine. In some embodiments, the active substance comprises caffeine, melatonin or vitamin B12.

[0078] As noted herein, the active substance may comprise one or more constituents, derivatives or extracts of *cannabis*, such as one or more cannabinoids or terpenes.

[0079] In some embodiments, the active substance comprises one or more cannabinoid compounds selected from the group consisting of: cannabidiol (CBD), tetrahydrocannabinol (THC), tetrahydrocannabinolic acid (THCA), cannabidiolic acid (CBDA), cannabinol (CBN), cannabigerol (CBG), cannabichromene (CBC), cannabicyclol (CBL), cannabivarin (CBV), tetrahydrocannabivarin (THCV), cannabidivarin (CBDV), cannabichromevarin (CBCV), cannabigerovarin (CBGV), cannabigerol monomethyl ether (CBGM) and cannabielsoin (CBE), cannabicitran (CBT).

[0080] The active substance may comprise one or more cannabinoid compounds selected from the group consisting of cannabidiol (CBD) and THC (tetrahydrocannabinol).

[0081] The active substance may comprise cannabidiol (CBD).

[0082] The active substance may comprise nicotine and cannabidiol (CBD).

[0083] The active substance may comprise nicotine, cannabidiol (CBD), and THC (tetrahydrocannabinol).

[0084] As noted herein, the active substance may comprise or be derived from one or more botanicals or constituents, derivatives or extracts thereof. As used herein, the term "botanical" includes any material derived from plants including, but not limited to, extracts, leaves, bark, fibres, stems, roots, seeds, flowers, fruits, pollen, husk, shells or the like. Alternatively, the material may comprise an active compound naturally existing in a botanical, obtained synthetically. The material may be in the form of liquid, gas, solid, powder, dust, crushed particles, granules, pellets, shreds, strips, sheets, or the like. Example botanicals are tobacco, *eucalyptus*, star anise, hemp, cocoa, *cannabis*, fennel, lemongrass, peppermint, spearmint, rooibos, chamomile, flax, ginger, *Ginkgo biloba*, hazel, hibiscus, laurel, licorice (liquorice), matcha, mate, orange skin, *papaya*, rose, sage, tea such as green tea or black tea, thyme, clove, cinnamon, coffee, aniseed (anise), basil, bay leaves, cardamom, coriander, cumin, nutmeg, oregano, paprika, rosemary, saffron, lavender, lemon peel, mint, juniper, elderflower, vanilla, wintergreen, beefsteak plant, *curcuma*, turmeric, sandalwood, cilantro, bergamot, orange blossom, myrtle, cassis, valerian, pimento, mace, damien, marjoram, olive, lemon balm, lemon basil, chive, *carvi, verbena*, tarragon, geranium, mulberry, *ginseng*, theanine, theacrine, maca, ashwagandha, damiana, guarana, chlorophyll, baobab or any combination thereof. The mint may be chosen from the following mint varieties: *Mentha Arventis, Mentha* c.v., *Mentha niliaca, Mentha piperita, Mentha piperita citrata* c.v., *Mentha piperita* c.v, *Mentha spicata crispa, Mentha cardifolia, Mentha longifolia, Mentha suaveolens variegata, Mentha pulegium, Mentha spicata* c.v. and *Mentha suaveolens.*

[0085] In some embodiments, the active substance comprises or is derived from one or more botanicals or constituents, derivatives or extracts thereof and the botanical is tobacco.

[0086] In some embodiments, the active substance comprises or is derived from one or more botanicals or constituents, derivatives or extracts thereof and the botanical is selected from *eucalyptus*, star anise, cocoa and hemp.

[0087] In some embodiments, the active substance comprises or is derived from one or more botanicals or constituents, derivatives or extracts thereof and the botanical is selected from rooibos and fennel.

[0088] In some embodiments, the aerosol-generating material does not comprise tobacco fibers.

[0089] In some embodiments, the aerosol-generating material does not comprise tobacco material.

[0090] In some embodiments the aerosol-generating material is substantially free of tobacco material.

[0091] In some embodiments, the aerosol-generating material does not comprise active substance.

Flavour

[0092] In some embodiments, the aerosol-generating material or aerosol-generating composition comprises a flavour.

[0093] In some cases, the aerosol-generating material may comprise from about 1 wt %, 5 wt %, 10 wt %, 15 wt %, 20 wt % or 25 wt % to about 65 wt %, 60 wt %, 50 wt %, 45 wt %, 40 wt %, 35 wt %, or 30 wt % (calculated on a dry weight basis) of flavour.

[0094] As used herein, the terms "flavour" and "flavourant" refer to materials which, where local regulations permit, may be used to create a desired taste, aroma or other somatosensorial sensation in a product for adult consumers.

They may include naturally occurring flavour materials, botanicals, extracts of botanicals, synthetically obtained materials, or combinations thereof (e.g., tobacco, *cannabis*, licorice (liquorice), *hydrangea*, eugenol, Japanese white bark *magnolia* leaf, chamomile, fenugreek, clove, maple, matcha, menthol, Japanese mint, aniseed (anise), cinnamon, turmeric, Indian spices, Asian spices, herb, wintergreen, cherry, berry, red berry, cranberry, peach, apple, orange, mango, clementine, lemon, lime, tropical fruit, *papaya*, rhubarb, grape, durian, dragon fruit, cucumber, blueberry, mulberry, citrus fruits, Drambuie, bourbon, scotch, whiskey, gin, tequila, rum, spearmint, peppermint, lavender, aloe vera, cardamom, celery, cascarilla, nutmeg, sandalwood, bergamot, geranium, khat, naswar, *betel*, shisha, pine, honey essence, rose oil, vanilla, lemon oil, orange oil, orange blossom, cherry blossom, *cassia*, caraway, cognac, jasmine, ylang-ylang, sage, fennel, wasabi, piment, ginger, coriander, coffee, hemp, a mint oil from any species of the genus *Mentha, eucalyptus*, star anise, cocoa, lemongrass, rooibos, flax, *Ginkgo biloba*, hazel, hibiscus, laurel, mate, orange skin, rose, tea such as green tea or black tea, thyme, juniper, elderflower, basil, bay leaves, cumin, oregano, paprika, rosemary, saffron, lemon peel, mint, beefsteak plant, *curcuma*, cilantro, myrtle, cassis, valerian, pimento, mace, damien, marjoram, olive, lemon balm, lemon basil, chive, *carvi, verbena*, tarragon, limonene, thymol, camphene), flavour enhancers, bitterness receptor site blockers, sensorial receptor site activators or stimulators, sugars and/or sugar substitutes (e.g., sucralose, acesulfame potassium, aspartame, saccharine, cyclamates, lactose, sucrose, glucose, fructose, sorbitol, or mannitol), and other additives such as charcoal, chlorophyll, minerals, botanicals, or breath freshening agents. They may be imitation, synthetic or natural ingredients or blends thereof. They may be in any suitable form, for example, liquid such as an oil, solid such as a powder, or gas.

[0095] In some embodiments, the flavour comprises menthol, spearmint and/or peppermint. In some embodiments, the flavour comprises flavour components of cucumber, blueberry, citrus fruits and/or redberry. In some embodiments, the flavour comprises eugenol. In some embodiments, the flavour comprises flavour components extracted from tobacco. In some embodiments, the flavour comprises flavour components extracted from *cannabis*.

[0096] In some embodiments, the flavour may comprise a sensate, which is intended to achieve a somatosensorial sensation which are usually chemically induced and perceived by the stimulation of the fifth cranial nerve (trigeminal nerve), in addition to or in place of aroma or taste nerves, and these may include agents providing heating, cooling, tingling, numbing effect. A suitable heat effect agent may be, but is not limited to, vanillyl ethyl ether and a suitable cooling agent may be, but not limited to eucolyptol, WS-3.

Other Functional Materials

[0097] In some embodiments, the aerosol-generating material or aerosol-generating composition may further comprise one or more other functional materials. The one or more other functional materials may comprise one or more of pH regulators, colouring agents, preservatives, stabilizers, and/or antioxidants.

[0098] The aerosol-generating material may comprise an acid. The acid may be an organic acid. In some of these embodiments, the acid may be at least one of a monoprotic acid, a diprotic acid and a triprotic acid. In some such embodiments, the acid may contain at least one carboxyl functional group. In some such embodiments, the acid may be at least one of an alpha-hydroxy acid, carboxylic acid, dicarboxylic acid, tricarboxylic acid and keto acid. In some such embodiments, the acid may be an alpha-keto acid.

[0099] In some such embodiments, the acid may be at least one of succinic acid, lactic acid, benzoic acid, citric acid, tartaric acid, fumaric acid, levulinic acid, acetic acid, malic acid, formic acid, sorbic acid, benzoic acid, propanoic and pyruvic acid.

[0100] Suitably the acid is lactic acid. In other embodiments, the acid is benzoic acid. In other embodiments the acid may be an inorganic acid. In some of these embodiments the acid may be a mineral acid. In some such embodiments, the acid may be at least one of sulphuric acid, hydrochloric acid, boric acid and phosphoric acid. In some embodiments, the acid is levulinic acid.

[0101] The inclusion of an acid is particularly preferred in embodiments in which the aerosol-generating material comprises nicotine. In such embodiments, the presence of an acid may stabilise dissolved species in the slurry from which the aerosol-generating material is formed. The presence of the acid may reduce or substantially prevent evaporation of nicotine during drying of the slurry, thereby reducing loss of nicotine during manufacturing.

[0102] The aerosol-generating material may comprise a colourant. The addition of a colourant may alter the visual appearance of the aerosol-generating material. The presence of colourant in the aerosol-generating material may enhance the visual appearance of the aerosol-generating material and the aerosol-generating composition. By adding a colourant to the aerosol-generating material, the aerosol-generating material may be colour-matched to other components of the aerosol-generating composition or to other components of a consumable comprising the aerosol-generating material.

[0103] A variety of colourants may be used depending on the desired colour of the aerosol-generating material. The colour of aerosol-generating material may be, for example, white, green, red, purple, blue, brown or black. Other colours are also envisaged. Natural or synthetic colourants, such as natural or synthetic dyes, food-grade colourants and pharmaceutical-grade colourants may be used. In certain embodiments, the colourant is caramel, which may confer the aerosol-generating material with a brown appearance. In such embodiments, the colour of the aerosol-generating material may be similar to the colour of other components (such as tobacco material) in an aerosol-generating composition comprising the aerosol-generating material. In some embodiments, the addition of a colourant to the aerosol-generating material renders it visually indistinguishable from other components in the aerosol-generating composition.

[0104] The colourant may be incorporated during the formation of the aerosol-generating material (e.g. when forming a slurry comprising the materials that form the aerosol-generating material) or it may be applied to the aerosol-generating material after its formation (e.g. by spraying it onto the aerosol-generating material).

[0105] In some embodiments, the aerosol-generating material is formed as a sheet. In some cases, the aerosol-generating material sheet may be incorporated into the non-combustible aerosol provision system or consumable in sheet form. The aerosol-generating material sheet may be

incorporated as a planar sheet, as a gathered or bunched sheet, as a crimped sheet, or as a rolled sheet (i.e. in the form of a tube). In some such cases, the aerosol-generating material of these embodiments may be included in the system/consumable as a sheet, such as a sheet circumscribing a rod of aerosolisable material (e.g. tobacco). For example, the aerosol-generating material sheet may be formed on a wrapping paper which circumscribes an aerosolisable material such as tobacco. In other cases, the sheet may be shredded and then incorporated into the assembly, suitably mixed into an aerosolisable material such as cut rag tobacco.

[0106] In some cases, the aerosol-generating material may be in the form of a sheet or layer having a thickness of about 0.015 mm to about 1.0 mm. Suitably, the thickness may be in the range of about 0.05 mm, 0.1 mm or 0.15 mm to about 0.5 mm or 0.3 mm, for example 0.1-3 mm or 0.15-3 mm. A material having a thickness of 0.2 mm may be particularly suitable. The aerosol-generating material may comprise more than one layer, and the thickness described herein refers to the aggregate thickness of those layers.

[0107] If the aerosol-generating material is too thick, then heating efficiency may be compromised. This adversely affects the power consumption in use. Conversely, if the aerosol-generating material is too thin, it may be difficult to manufacture and handle; a very thin material is harder to cast and may be fragile, compromising aerosol formation in use.

[0108] The thickness stipulated herein is a mean thickness for the material. In some cases, the aerosol-generating material thickness may vary by no more than 25%, 20%, 15%, 10%, 5% or 1%.

[0109] In some embodiments, the aerosol-generating material in sheet form may have sufficient tensile strength such that it can be wound onto, or unwound from, a bobbin without breakages. In some examples, the aerosol-generating material in sheet form has a tensile strength of greater than or equal to about 250 N/m.

[0110] The aerosol-generating material may have any suitable area density, such as from 30 g/m^2 to 120 g/m^2. In some cases, the aerosol-generating material may have a mass per unit area of from about 80 to 120 g/m^2, or from about 70 to 110 g/m^2, or particularly from about 90 to 110 g/m^2, or suitably about 100 g/m^2 (so that it will not readily separate when mixed with tobacco, such as cut rag tobacco). Such area densities may be particularly suitable where the aerosol-generating material is included in the consumable/system in sheet form, or as a shredded sheet (described further herein below).

Aerosol-Generating Composition

[0111] An aspect provides an aerosol-generating composition comprising an aerosol-generating material as defined herein.

[0112] In some embodiments, the aerosol-generating composition further comprises tobacco material. In these embodiments, the tobacco material does not form part of the aerosol-generating material. That is, it is present in the aerosol-generating composition separately to the aerosol-generating material.

[0113] As used herein, the term "tobacco material" refers to any material comprising tobacco or derivatives therefore. The term "tobacco material" may include one or more of tobacco, tobacco derivatives, expanded tobacco, reconstituted tobacco or tobacco substitutes. The tobacco material may comprise one or more of ground tobacco, tobacco fibre, cut tobacco, extruded tobacco, tobacco stem, reconstituted tobacco and/or tobacco extract.

[0114] The tobacco used to produce tobacco material may be any suitable tobacco, such as single grades or blends, cut rag or whole leaf, including Virginia and/or Burley and/or Oriental. It may also be tobacco particle 'fines' or dust, expanded tobacco, stems, expanded stems, and other processed stem materials, such as cut rolled stems. The tobacco material may be a ground tobacco or a reconstituted tobacco material. The reconstituted tobacco material may comprise tobacco fibres, and may be formed by casting, a Fourdrinier-based paper making-type approach with back addition of tobacco extract, or by extrusion.

[0115] In some embodiments, the amount of aerosol-former material in the aerosol-generating composition is from about 5 to about 30 wt % of the aerosol-generating composition on a dry weight basis. For example, in some embodiments the aerosol-generating composition comprises aerosol-former material in an amount of from about 10 to about 20 wt %, or about 13 to about 17 wt %. In some embodiments, the aerosol-generating composition comprises aerosol-former material in an amount of about 15 wt %. This amount includes any aerosol-former material present in the aerosol-generating composition, such as aerosol-former material provided in the aerosol-generating material and any aerosol-former material loaded on to the tobacco material.

[0116] A cut rag tobacco blend which might typically be used alone in a conventional combustible smoking article such as a cigarette has been found to be unsuitable for use in a non-combustible aerosol provision device. Without wishing to be bound be theory, it is believed that a cut rag tobacco blend for use in a cigarette typically cannot be loaded with sufficient aerosol-former material to provide a desirable inhalable aerosol when heated by a non-combustible aerosol provision device.

[0117] Previous attempts to address this problem have included replacing some or all of the cut rag tobacco of a typical combustible tobacco blend with reconstituted tobacco, such as paper reconstituted tobacco. Paper reconstituted tobacco can typically contain a greater proportion of aerosol-former material. However, a tobacco blend which comprises a high proportion of paper reconstituted tobacco may have undesirable sensory characteristics when heated by a non-combustible aerosol provision device.

[0118] By providing an aerosol-generating material having a high aerosol-former material content in combination with tobacco material, it is possible to generate an acceptable aerosol without requiring the presence of a large amount of reconstituted tobacco (thereby reducing the undesirable sensory characteristics associated with reconstituted tobacco).

[0119] In some embodiments, the tobacco material comprises or consists of lamina tobacco (such as cut rag tobacco), which provides desirable sensory characteristics.

[0120] In some embodiments, the tobacco material comprises reconstituted tobacco in an amount less than about 50 wt %, 30 wt %, 10 wt %, 5 wt %, or 1 wt % by dry weight of the tobacco material. In some embodiments, the tobacco material substantially does not comprise reconstituted tobacco.

[0121] The tobacco material may be present in any format, but is typically fine-cut (e.g. cut into narrow shreds). Fine-

cut tobacco material may advantageously be blended with the aerosol-generating material to provide an aerosol-generating composition which has an even dispersion of tobacco material and aerosol-generating material throughout the aerosol-generating composition.

[0122] In some embodiments, the tobacco material comprises one or more of ground tobacco, tobacco fibre, cut tobacco, extruded tobacco, tobacco stem, reconstituted tobacco and/or tobacco extract. It is possible to use a relatively large amount of lamina tobacco in the aerosol-generating composition and still provide an acceptable aerosol when heated by a non-combustible aerosol provision system. Lamina tobacco typically provides superior sensory characteristics. In examples, the tobacco material comprises lamina tobacco in an amount of at least about 50 wt %, 60 wt %, 70 wt %, 80 wt %, 85 wt %, 90 wt %, or 95 wt % of the tobacco material. In particular examples, the tobacco material comprises cut tobacco in an amount of at least about 50 wt %, 60 wt %, 70 wt %, 80 wt %, 85 wt %, 90 wt %, or 95 wt % of the tobacco material.

[0123] The tobacco used to produce tobacco material may be any suitable tobacco, such as single grades or blends, cut rag or whole leaf, including Virginia and/or Burley and/or Oriental.

[0124] The tobacco material may typically be present in the aerosol-generating composition in an amount of from about 50 to 95 wt %, or about 60 to 95 wt %, or about 70 to 90 wt %, or about 80 to 90 wt % of the aerosol generating composition.

[0125] In some embodiments, the aerosol-generating material is present in the aerosol-generating composition in an amount of about 5 to 40 wt %, 5 to 30 wt %, 5 to 25 wt %, or 10 to 25 wt % or 10 to 20 wt %. Surprisingly, by configuring the aerosol-generating material to have a relatively high aerosol-former material content, a relatively small amount of aerosol-generating material (e.g. around 10 to 20 wt %) can be employed in the aerosol-generating composition while still achieving a desirable aerosol in use with a non-combustible aerosol provision system.

[0126] In some embodiments, the aerosol-generating composition consists of, or consists essentially of the aerosol-generating material and the tobacco material.

[0127] In some embodiments, the tobacco material itself comprises aerosol-former material. Typically, the tobacco material comprises tobacco which is fine-cut, and aerosol-former material is loaded onto the shreds of tobacco. In examples, the tobacco material comprises aerosol-former material in an amount of from about 1 to 10 wt % of the tobacco material, such as about 3 to 6 wt %. The aerosol-former material defined above in relation to the aerosol-generating material are also suitable for use in the tobacco material.

[0128] The aerosol-generating material may be present in the aerosol-generating composition in any suitable form. In examples, the aerosol-generating material is present in sheet form. In examples, the aerosol-generating material is present as a shredded sheet (e.g. the aerosol-generating composition comprises shreds of aerosol-generating material). In examples, the aerosol-generating material is present as a shredded sheet and is blended with tobacco material which is fine-cut and/or shredded, e.g. the aerosol-generating material and tobacco material are in a similar form. Advantageously, providing both the aerosol-generating material and tobacco material as shreds/fine-cut portions allows for an aerosol-generating composition blend which has an even dispersion of aerosol-generating material and tobacco material throughout the aerosol-generating composition.

[0129] In examples, the aerosol-generating material has an area density which is from about 90 to 110% of the area density of any tobacco material in the aerosol generating composition. That is, the aerosol-generating material and the tobacco material have similar area densities. Configuring the aerosol-generating material and tobacco material to have similar area densities allows for better blending of the aerosol-generating material and tobacco material, typically when provided as shredded sheet. For example, aerosol-generated material in the form of a shredded sheet and cut rag tobacco which have similar area densities can be blended to provide a more homogenous aerosol-generating composition (e.g. better distribution of each component throughout the aerosol-generating composition).

[0130] Fine cut tobacco (such as cut rag tobacco) has a cut width, typically represented as CPI (cuts per inch), and refers to the width of a shred of tobacco. In some examples where the tobacco material is fine cut (e.g. where the tobacco material comprises cut rag tobacco) and the aerosol-generating material is a shredded sheet, the cut width of the aerosol-generating material is from about 90 to 110% of the cut width of the cut rag tobacco. That is, the aerosol-generating material and the tobacco material have similar cut widths, or shred widths. Configuring the aerosol-generating material and tobacco material to have similar cut widths allows for better blending of the aerosol-generating material and tobacco material. For example, shredded aerosol-generating material sheet and cut rag tobacco which have similar cut widths can be blended to provide a more homogenous aerosol-generating composition (e.g. better distribution of each component throughout the aerosol-generating composition). The tobacco material may have a length of 1-4 cm.

Support

[0131] The aerosol-generating material for use in aerosol generation may be present on or in a support, to form a substrate. The support may, for example, be or comprise paper, card, paperboard, cardboard, reconstituted material, a plastics material, a ceramic material, a composite material, glass, a metal, or a metal alloy. In some embodiments, the support comprises a susceptor. In some embodiments, the susceptor is embedded within the material. In some alternative embodiments, the susceptor is on one or either side of the material.

[0132] The aerosol-generating composition may comprise a carrier on which the aerosol-generating material is provided. The carrier functions as a support on which the aerosol-generating material layer forms, easing manufacture. The carrier may provide tensile strength to the aerosol-generating material layer, easing handling.

[0133] In some cases, the carrier may be formed from materials selected from metal foil, paper, carbon paper, greaseproof paper, ceramic, carbon allotropes such as graphite and graphene, plastic, cardboard, wood or combinations thereof. In some cases, the carrier may comprise or consist of a tobacco material, such as a sheet of reconstituted tobacco. In some cases, the carrier may be formed from materials selected from metal foil, paper, cardboard, wood or combinations thereof. In some cases, the carrier itself be a laminate structure comprising layers of materials selected

from the preceding lists. In some cases, the carrier may also function as a flavour carrier. For example, the carrier may be impregnated with a flavour or with tobacco extract.

[0134] In some cases, the carrier may be magnetic. This functionality may be used to fasten the carrier to the non-combustible aerosol provision device in use, or may be used to generate particular aerosol-generating material shapes. In some cases, the aerosol-generating composition may comprise one or more magnets which can be used to fasten the material to an induction heater in use.

[0135] In some cases, the carrier may be substantially or wholly impermeable to gas and/or aerosol. This prevents aerosol or gas passage through the carrier layer, thereby controlling the flow and ensuring it is delivered to the user. This can also be used to prevent condensation or other deposition of the gas/aerosol in use on, for example, the surface of a heater provided in an aerosol generating assembly. Thus, consumption efficiency and hygiene can be improved in some cases.

[0136] In some cases, the surface of the carrier that abuts the aerosol-generating material may be porous. For example, in one case, the carrier comprises paper. A porous carrier such as paper has been found to be particularly suitable; the porous (e.g. paper) layer abuts the aerosol-generating material layer and forms a strong bond. The aerosol-generating material may be formed by drying a slurry and, without being limited by theory, it is thought that the slurry partially impregnates the porous carrier (e.g. paper) so that the carrier is partially bound into the aerosol-generating material. This provides a strong binding between the aerosol-generating material and the carrier.

[0137] In some embodiments, the aerosol-generating material may be laminated to a carrier, such as a paper sheet.

[0138] In some embodiments, when the aerosol-generating material is formed from a slurry as described herein, the layer of slurry may be formed on a carrier, such as a paper sheet.

[0139] Additionally, surface roughness may contribute to the strength of bond between the aerosol-generating material and the carrier. The paper roughness (for the surface abutting the carrier) may suitably be in the range of 50-1000 Bekk seconds, suitably 50-150 Bekk seconds, suitably 100 Bekk seconds (measured over an air pressure interval of 50.66-48.00 kPa). (A Bekk smoothness tester is an instrument used to determine the smoothness of a paper surface, in which air at a specified pressure is leaked between a smooth glass surface and a paper sample, and the time (in seconds) for a fixed volume of air to seep between these surfaces is the "Bekk smoothness".)

[0140] Conversely, the surface of the carrier facing away from the aerosol-generating material may be arranged in contact with the heater, and a smoother surface may provide more efficient heat transfer. Thus, in some cases, the carrier is disposed so as to have a rougher side abutting the aerosol-generating material and a smoother side facing away from the aerosol-generating material.

[0141] In one particular case, the carrier may be a paper-backed foil; the paper layer abuts the aerosol-generating material and the properties discussed in the previous paragraphs are afforded by this abutment. The foil backing is substantially impermeable, providing control of the aerosol flow path. A metal foil backing may also serve to conduct heat to the aerosol-generating material.

[0142] In another case, the foil layer of the paper-backed foil abuts the aerosol-generating material. The foil is substantially impermeable, thereby preventing water provided in the aerosol-generating material from being absorbed into the paper which could weaken its structural integrity.

[0143] In some cases, the carrier is formed from or comprises metal foil, such as aluminium foil. A metallic carrier may allow for better conduction of thermal energy to the aerosol-generating material. Additionally, or alternatively, a metal foil may function as a susceptor in an induction heating system. In particular embodiments, the carrier comprises a metal foil layer and a support layer, such as cardboard. In these embodiments, the metal foil layer may have a thickness of less than 20 μm, such as from about 1 μm to about 10 μm, suitably about 5 μm.

[0144] In some cases, the carrier may have a thickness of between about 0.010 mm and about 2.0 mm, suitably from about 0.015 mm, 0.02 mm, 0.05 mm or 0.1 mm to about 1.5 mm, 1.0 mm, or 0.5 mm.

Consumable

[0145] In another aspect of the disclosure, there is provided a consumable for use in a non-combustible aerosol provision device, the consumable comprising an aerosol-generating composition, wherein the aerosol-generating composition comprises an aerosol-generating material as defined herein.

[0146] In some embodiments, the disclosure relates to consumables comprising aerosol-generating composition and configured to be used with non-combustible aerosol provision devices. These consumables are sometimes referred to as articles throughout the disclosure.

[0147] The consumable may be used with any suitable non-combustible aerosol provision device.

[0148] A consumable is an article comprising or consisting of aerosol-generating composition, part or all of which is intended to be consumed during use by a user. A consumable may comprise one or more other components, such as an aerosol-generating composition storage area, an aerosol-generating composition transfer component, an aerosol generation area, a housing, a wrapper, a mouthpiece, a filter and/or an aerosol-modifying agent. A consumable may also comprise an aerosol generator, such as a heater, that emits heat to cause the aerosol-generating composition to generate aerosol in use. The heater may, for example, comprise combustible material, a material heatable by electrical conduction, or a susceptor.

[0149] A susceptor is a material that is heatable by penetration with a varying magnetic field, such as an alternating magnetic field. The susceptor may be an electrically-conductive material, so that penetration thereof with a varying magnetic field causes induction heating of the heating material. The heating material may be magnetic material, so that penetration thereof with a varying magnetic field causes magnetic hysteresis heating of the heating material. The susceptor may be both electrically-conductive and magnetic, so that the susceptor is heatable by both heating mechanisms. The device that is configured to generate the varying magnetic field is referred to as a magnetic field generator, herein.

[0150] An aerosol-modifying agent is a substance, typically located downstream of the aerosol generation area, that is configured to modify the aerosol generated, for example by changing the taste, flavour, acidity or another character-

istic of the aerosol. The aerosol-modifying agent may be provided in an aerosol-modifying agent release component, that is operable to selectively release the aerosol-modifying agent.

[0151] The aerosol-modifying agent may, for example, be an additive or a sorbent. The aerosol-modifying agent may, for example, comprise one or more of a flavourant, a colourant, water, and a carbon adsorbent. The aerosol-modifying agent may, for example, be a solid, a liquid, or a gel. The aerosol-modifying agent may be in powder, thread or granule form. The aerosol-modifying agent may be free from filtration material.

[0152] An aerosol generator is an apparatus configured to cause aerosol to be generated from the aerosol-generating composition. In some embodiments, the aerosol generator is a heater configured to subject the aerosol-generating composition to heat energy, so as to release one or more volatiles from the aerosol-generating composition to form an aerosol. In some embodiments, the aerosol generator is configured to cause an aerosol to be generated from the aerosol-generating composition without heating. For example, the aerosol generator may be configured to subject the aerosol-generating composition to one or more of vibration, increased pressure, or electrostatic energy.

Non-Combustible Aerosol Provision System

[0153] In another aspect of the disclosure, there is provided a non-combustible aerosol provision system comprising the consumable described herein and a non-combustible aerosol provision device.

[0154] According to the present disclosure, a "non-combustible" aerosol provision system is one where a constituent aerosol-generating composition of the aerosol provision system (or component thereof) is not combusted or burned in order to facilitate delivery of at least one substance to a user.

[0155] In some embodiments, the delivery system is a non-combustible aerosol provision system, such as a powered non-combustible aerosol provision system.

[0156] In some embodiments, the non-combustible aerosol provision system is an aerosol-generating composition heating system, also known as a heat-not-burn system. An example of such a system is a tobacco heating system.

[0157] In some embodiments, the non-combustible aerosol provision device is a heat-not-burn device.

[0158] In some embodiments, the non-combustible aerosol provision system is a hybrid system to generate aerosol using a combination of aerosol-generating compositions, one or a plurality of which may be heated. In some embodiments, the hybrid system comprises the aerosol-generating composition described herein comprising or consisting of the aerosol-generating material and an additional liquid or gel aerosol-generating composition.

[0159] In some embodiments, the non-combustible aerosol provision device is an electronic tobacco hybrid device.

[0160] Typically, the non-combustible aerosol provision system may comprise a non-combustible aerosol provision device and a consumable for use with the non-combustible aerosol provision device.

[0161] In some embodiments, the non-combustible aerosol provision system, such as a non-combustible aerosol provision device thereof, may comprise a power source and a controller. The power source may, for example, be an electric power source or an exothermic power source. In some embodiments, the exothermic power source comprises a carbon substrate which may be energised so as to distribute power in the form of heat to an aerosol-generating composition or to a heat transfer material in proximity to the exothermic power source.

[0162] In some embodiments, the non-combustible aerosol provision system, such as a non-combustible aerosol provision device thereof, may comprise an area for receiving the consumable, an aerosol generator, an aerosol generation area, a housing, a mouthpiece, a filter and/or an aerosol-modifying agent.

[0163] The non-combustible aerosol provision system or device may comprise a heater configured to heat but not burn the aerosol-generating composition/aerosol-generating material. The heater may be, in some cases, a thin film, electrically resistive heater. In other cases, the heater may comprise an induction heater or the like. In yet further cases, the heater may be a combustible heat source or a chemical heat source which undergoes an exothermic reaction to produce heat in use.

[0164] In some cases, the heater may heat but not burn the aerosolisable material(s) to between 120° C. and 350° C. in use. In some cases, the heater may heat but not burn the aerosolisable material(s) to between 140° C. and 250° C. in use. In some cases in use, substantially all of the aerosol-generating material is less than about 4 mm, 3 mm, 2 mm or 1 mm from the heater. In some cases, the solid is disposed between about 0.017 mm and 2.0 mm from the heater, suitably between about 0.1 mm and 1.0 mm. These minimum distances may, in some cases, reflect the thickness of a carrier that supports the aerosol-generating material. In some cases, a surface of the aerosol-generating material may directly abut the heater.

[0165] In some cases, the heater may be embedded in the aerosol-generating composition/the aerosol-generating material. In some such cases, the heater may be an electrically resistive heater (with exposed contacts for connection to an electrical circuit). In other such cases, the heater may be a susceptor embedded in the aerosol-generating composition, which is heated by induction.

[0166] The non-combustible aerosol provision system may additionally comprise a cooling element and/or a filter. The cooling element, if present, may act or function to cool gaseous or aerosol components. In some cases, it may act to cool gaseous components such that they condense to form an aerosol. It may also act to space the very hot parts of the apparatus from the user. The filter, if present, may comprise any suitable filter known in the art such as a cellulose acetate plug.

[0167] In some cases, the non-combustible aerosol provision system may be a heat-not-burn system. That is, it may contain a solid material (and no liquid aerosolisable material). A heat-not-burn device is disclosed in WO 2015/062983 A2, which is incorporated by reference in its entirety.

[0168] In some cases, the non-combustible aerosol provision system may comprise an electronic tobacco hybrid device. That is, it may contain a solid aerosolisable material and a liquid aerosolisable material. The separate aerosolisable materials may be heated by separate heaters, the same heater or, in one case, a downstream aerosolisable material may be heated by a hot aerosol which is generated from the upstream aerosolisable material. An electronic tobacco

hybrid device is disclosed in WO 2016/135331 A1, which is incorporated by reference in its entirety.

[0169] The consumable may alternatively be referred to herein as a cartridge. The consumable may be adapted for use in a THP, an electronic tobacco hybrid device or another aerosol generating device. In some cases, the consumable may additionally comprise a filter and/or cooling element, as described previously. In some cases, the consumable may be circumscribed by a wrapping material such as paper.

[0170] The consumable may additionally comprise ventilation apertures. These may be provided in the sidewall of the article. In some cases, the ventilation apertures may be provided in the filter and/or cooling element. These apertures may allow cool air to be drawn into the article during use, which can mix with the heated volatilised components thereby cooling the aerosol.

[0171] The ventilation enhances the generation of visible heated volatilised components from the article when it is heated in use. The heated volatilised components are made visible by the process of cooling the heated volatilised components such that supersaturation of the heated volatilised components occurs. The heated volatilised components then undergo droplet formation, otherwise known as nucleation, and eventually the size of the aerosol particles of the heated volatilised components increases by further condensation of the heated volatilised components and by coagulation of newly formed droplets from the heated volatilised components.

[0172] In some cases, the ratio of the cool air to the sum of the heated volatilised components and the cool air, known as the ventilation ratio, is at least 15%. A ventilation ratio of 15% enables the heated volatilised components to be made visible by the method described above. The visibility of the heated volatilised components enables the user to identify that the volatilised components have been generated and adds to the sensory experience of the smoking experience.

[0173] In another example, the ventilation ratio is between 50% and 85% to provide additional cooling to the heated volatilised components. In some cases, the ventilation ratio may be at least 60% or 65%.

[0174] Referring to FIGS. **1** and **2**, there are shown a partially cut-away section view and a perspective view of an example of article consumable **101** ("article"). The article **101** is adapted for use with a device having a power source and a heater. The article **101** of this embodiment is particularly suitable for use with the device **51** shown in FIGS. **5** to **7**, described below. In use, the article **101** may be removably inserted into the device shown in FIG. **5** at an insertion point **20** of the device **51**.

[0175] The article **101** of one example is in the form of a substantially cylindrical rod that includes a body of aerosol-generating composition **103** and a filter assembly **105** in the form of a rod. The aerosol-generating composition comprises the aerosol-generating material described herein. In some embodiments, it may be included in sheet form. In some embodiments it may be included in the form of a shredded sheet. In some embodiments, the aerosol-generating composition described herein may be incorporated in sheet form and in shredded form.

[0176] The filter assembly **105** includes three segments, a cooling segment **107**, a filter segment **109** and a mouth end segment **111**. The article **101** has a first end **113**, also known as a mouth end or a proximal end and a second end **115**, also known as a distal end. The body of aerosol-generating composition **103** is located towards the distal end **115** of the article **101**. In one example, the cooling segment **107** is located adjacent the body of aerosol-generating composition **103** between the body of aerosol-generating composition **103** and the filter segment **109**, such that the cooling segment **107** is in an abutting relationship with the aerosol-generating composition **103** and the filter segment **103**. In other examples, there may be a separation between the body of aerosol-generating composition **103** and the cooling segment **107** and between the body of aerosol-generating composition **103** and the filter segment **109**. The filter segment **109** is located in between the cooling segment **107** and the mouth end segment **111**. The mouth end segment **111** is located towards the proximal end **113** of the article **101**, adjacent the filter segment **109**. In one example, the filter segment **109** is in an abutting relationship with the mouth end segment **111**. In one embodiment, the total length of the filter assembly **105** is between 37 mm and 45 mm, more preferably, the total length of the filter assembly **105** is 41 mm.

[0177] In one example, the rod of aerosol-generating composition **103** is between 34 mm and 50 mm in length, suitably between 38 mm and 46 mm in length, suitably 42 mm in length.

[0178] In one example, the total length of the article **101** is between 71 mm and 95 mm, suitably between 79 mm and 87 mm, suitably 83 mm.

[0179] An axial end of the body of aerosol-generating composition **103** is visible at the distal end **115** of the article **101**. However, in other embodiments, the distal end **115** of the article **101** may comprise an end member (not shown) covering the axial end of the body of aerosol-generating composition **103**.

[0180] The body of aerosol-generating composition **103** is joined to the filter assembly **105** by annular tipping paper (not shown), which is located substantially around the circumference of the filter assembly **105** to surround the filter assembly **105** and extends partially along the length of the body of aerosol-generating composition **103**. In one example, the tipping paper is made of 58GSM standard tipping base paper. In one example the tipping paper has a length of between 42 mm and 50 mm, suitably of 46 mm.

[0181] In one example, the cooling segment **107** is an annular tube and is located around and defines an air gap within the cooling segment. The air gap provides a chamber for heated volatilised components generated from the body of aerosol-generating composition **103** to flow. The cooling segment **107** is hollow to provide a chamber for aerosol accumulation yet rigid enough to withstand axial compressive forces and bending moments that might arise during manufacture and whilst the article **101** is in use during insertion into the device **51**. In one example, the thickness of the wall of the cooling segment **107** is approximately 0.29 mm.

[0182] The cooling segment **107** provides a physical displacement between the aerosol-generating composition **103** and the filter segment **109**. The physical displacement provided by the cooling segment **107** will provide a thermal gradient across the length of the cooling segment **107**. In one example the cooling segment **107** is configured to provide a temperature differential of at least 40 degrees Celsius between a heated volatilised component entering a first end of the cooling segment **107** and a heated volatilised component exiting a second end of the cooling segment **107**. In

one example the cooling segment **107** is configured to provide a temperature differential of at least 60 degrees Celsius between a heated volatilised component entering a first end of the cooling segment **107** and a heated volatilised component exiting a second end of the cooling segment **107**. This temperature differential across the length of the cooling element **107** protects the temperature sensitive filter segment **109** from the high temperatures of the aerosol-generating composition **103** when it is heated by the device **51**. If the physical displacement was not provided between the filter segment **109** and the body of aerosol-generating composition **103** and the heating elements of the device **51**, then the temperature sensitive filter segment may **109** become damaged in use, so it would not perform its required functions as effectively.

[0183] In one example the length of the cooling segment **107** is at least 15 mm. In one example, the length of the cooling segment **107** is between 20 mm and 30 mm, more particularly 23 mm to 27 mm, more particularly 25 mm to 27 mm, suitably 25 mm.

[0184] The cooling segment **107** is made of paper, which means that it is comprised of a material that does not generate compounds of concern, for example, toxic compounds when in use adjacent to the heater of the device **51**. In one example, the cooling segment **107** is manufactured from a spirally wound paper tube which provides a hollow internal chamber yet maintains mechanical rigidity. Spirally wound paper tubes are able to meet the tight dimensional accuracy requirements of high-speed manufacturing processes with respect to tube length, outer diameter, roundness and straightness.

[0185] In another example, the cooling segment **107** is a recess created from stiff plug wrap or tipping paper. The stiff plug wrap or tipping paper is manufactured to have a rigidity that is sufficient to withstand the axial compressive forces and bending moments that might arise during manufacture and whilst the article **101** is in use during insertion into the device **51**.

[0186] The filter segment **109** may be formed of any filter material sufficient to remove one or more volatilised compounds from heated volatilised components from the aerosol-generating composition. In one example the filter segment **109** is made of a mono-acetate material, such as cellulose acetate. The filter segment **109** provides cooling and irritation-reduction from the heated volatilised components without depleting the quantity of the heated volatilised components to an unsatisfactory level for a user.

[0187] In some embodiments, a capsule (not illustrated) may be provided in filter segment **109**. It may be disposed substantially centrally in the filter segment **109**, both across the filter segment **109** diameter and along the filter segment **109** length. In other cases, it may be offset in one or more dimension. The capsule may in some cases, where present, contain a volatile component such as a flavour or aerosol-former material.

[0188] The density of the cellulose acetate tow material of the filter segment **109** controls the pressure drop across the filter segment **109**, which in turn controls the draw resistance of the article **101**. Therefore the selection of the material of the filter segment **109** is important in controlling the resistance to draw of the article **101**. In addition, the filter segment performs a filtration function in the article **101**.

[0189] In one example, the filter segment **109** is made of a 8Y15 grade of filter tow material, which provides a filtration effect on the heated volatilised material, whilst also reducing the size of condensed aerosol droplets which result from the heated volatilised material.

[0190] The presence of the filter segment **109** provides an insulating effect by providing further cooling to the heated volatilised components that exit the cooling segment **107**. This further cooling effect reduces the contact temperature of the user's lips on the surface of the filter segment **109**.

[0191] In one example, the filter segment **109** is between 6 mm to 10 mm in length, suitably 8 mm.

[0192] The mouth end segment **111** is an annular tube and is located around and defines an air gap within the mouth end segment **111**. The air gap provides a chamber for heated volatilised components that flow from the filter segment **109**. The mouth end segment **111** is hollow to provide a chamber for aerosol accumulation yet rigid enough to withstand axial compressive forces and bending moments that might arise during manufacture and whilst the article is in use during insertion into the device **51**. In one example, the thickness of the wall of the mouth end segment **111** is approximately 0.29 mm. In one example, the length of the mouth end segment **111** is between 6 mm to 10 mm, suitably 8 mm.

[0193] The mouth end segment **111** may be manufactured from a spirally wound paper tube which provides a hollow internal chamber yet maintains critical mechanical rigidity. Spirally wound paper tubes are able to meet the tight dimensional accuracy requirements of high-speed manufacturing processes with respect to tube length, outer diameter, roundness and straightness.

[0194] The mouth end segment **111** provides the function of preventing any liquid condensate that accumulates at the exit of the filter segment **109** from coming into direct contact with a user.

[0195] It should be appreciated that, in one example, the mouth end segment **111** and the cooling segment **107** may be formed of a single tube and the filter segment **109** is located within that tube separating the mouth end segment **111** and the cooling segment **107**.

[0196] Referring to FIGS. **3** and **4**, there are shown a partially cut-away section and perspective views of an example of an article **301**. The reference signs shown in FIGS. **3** and **4** are equivalent to the reference signs shown in FIGS. **1** and **2**, but with an increment of 200.

[0197] In the example of the article **301** shown in FIGS. **3** and **4**, a ventilation region **317** is provided in the article **301** to enable air to flow into the interior of the article **301** from the exterior of the article **301**. In one example the ventilation region **317** takes the form of one or more ventilation holes **317** formed through the outer layer of the article **301**. The ventilation holes may be located in the cooling segment **307** to aid with the cooling of the article **301**. In one example, the ventilation region **317** comprises one or more rows of holes, and preferably, each row of holes is arranged circumferentially around the article **301** in a cross-section that is substantially perpendicular to a longitudinal axis of the article **301**.

[0198] In one example, there are between one to four rows of ventilation holes to provide ventilation for the article **301**. Each row of ventilation holes may have between 12 to 36 ventilation holes **317**. The ventilation holes **317** may, for example, be between 100 to 500 μm in diameter. In one

example, an axial separation between rows of ventilation holes **317** is between 0.25 mm and 0.75 mm, suitably 0.5 mm.

[0199] In one example, the ventilation holes **317** are of uniform size. In another example, the ventilation holes **317** vary in size. The ventilation holes can be made using any suitable technique, for example, one or more of the following techniques: laser technology, mechanical perforation of the cooling segment **307** or pre-perforation of the cooling segment **307** before it is formed into the article **301**. The ventilation holes **317** are positioned so as to provide effective cooling to the article **301**.

[0200] In one example, the rows of ventilation holes **317** are located at least 11 mm from the proximal end **313** of the article, suitably between 17 mm and 20 mm from the proximal end **313** of the article **301**. The location of the ventilation holes **317** is positioned such that user does not block the ventilation holes **317** when the article **301** is in use.

[0201] Providing the rows of ventilation holes between 17 mm and 20 mm from the proximal end **313** of the article **301** enables the ventilation holes **317** to be located outside of the device **51**, when the article **301** is fully inserted in the device **51**, as can be seen in FIGS. **6** and **7**. By locating the ventilation holes outside of the device, non-heated air is able to enter the article **301** through the ventilation holes from outside the device **51** to aid with the cooling of the article **301**.

[0202] The length of the cooling segment **307** is such that the cooling segment **307** will be partially inserted into the device **51**, when the article **301** is fully inserted into the device **51**. The length of the cooling segment **307** provides a first function of providing a physical gap between the heater arrangement of the device **51** and the heat sensitive filter arrangement **309**, and a second function of enabling the ventilation holes **317** to be located in the cooling segment, whilst also being located outside of the device **51**, when the article **301** is fully inserted into the device **51**. As can be seen from FIGS. **6** and **7**, the majority of the cooling element **307** is located within the device **51**. However, there is a portion of the cooling element **307** that extends out of the device **51**. It is in this portion of the cooling element **307** that extends out of the device **51** in which the ventilation holes **317** are located.

[0203] Referring now to FIGS. **5** to **7** in more detail, there is shown an example of a device **51** arranged to heat aerosol-generating composition to volatilise at least one component of said aerosol-generating composition, typically to form an aerosol which can be inhaled. The device **51** is a heating device which releases compounds by heating, but not burning, the aerosol-generating composition.

[0204] A first end **53** is sometimes referred to herein as the mouth or proximal end **53** of the device **51** and a second end **55** is sometimes referred to herein as the distal end **55** of the device **51**. The device **51** has an on/off button **57** to allow the device **51** as a whole to be switched on and off as desired by a user.

[0205] The device **51** comprises a housing **59** for locating and protecting various internal components of the device **51**. In the example shown, the housing **59** comprises a uni-body sleeve **11** that encompasses the perimeter of the device **51**, capped with a top panel **17** which defines generally the 'top' of the device **51** and a bottom panel **19** which defines generally the 'bottom' of the device **51**. In another example the housing comprises a front panel, a rear panel and a pair of opposite side panels in addition to the top panel **17** and the bottom panel **19**.

[0206] The top panel **17** and/or the bottom panel **19** may be removably fixed to the uni-body sleeve **11**, to permit easy access to the interior of the device **51**, or may be "permanently" fixed to the uni-body sleeve **11**, for example to deter a user from accessing the interior of the device **51**. In an example, the panels **17** and **19** are made of a plastics material, including for example glass-filled nylon formed by injection moulding, and the uni-body sleeve **11** is made of aluminium, though other materials and other manufacturing processes may be used.

[0207] The top panel **17** of the device **51** has an opening **20** at the mouth end **53** of the device **51** through which, in use, the article **101**, **301** including the aerosol-generating composition may be inserted into the device **51** and removed from the device **51** by a user.

[0208] The housing **59** has located or fixed therein a heater arrangement **23**, control circuitry **25** and a power source **27**. In this example, the heater arrangement **23**, the control circuitry **25** and the power source **27** are laterally adjacent (that is, adjacent when viewed from an end), with the control circuitry **25** being located generally between the heater arrangement **23** and the power source **27**, though other locations are possible.

[0209] The control circuitry **25** may include a controller, such as a microprocessor arrangement, configured and arranged to control the heating of the aerosol-generating composition in the article **101**, **301** as discussed further below.

[0210] The power source **27** may be for example a battery, which may be a rechargeable battery or a non-rechargeable battery. Examples of suitable batteries include for example a lithium-ion battery, a nickel battery (such as a nickel-cadmium battery), an alkaline battery and/or the like. The battery **27** is electrically coupled to the heater arrangement **23** to supply electrical power when required and under control of the control circuitry **25** to heat the aerosol-generating composition in the article (as discussed, to volatilise the aerosol-generating composition without causing the aerosol-generating composition to burn).

[0211] An advantage of locating the power source **27** laterally adjacent to the heater arrangement **23** is that a physically large power source **25** may be used without causing the device **51** as a whole to be unduly lengthy. As will be understood, in general a physically large power source **25** has a higher capacity (that is, the total electrical energy that can be supplied, often measured in Amp-hours or the like) and thus the battery life for the device **51** can be longer.

[0212] In one example, the heater arrangement **23** is generally in the form of a hollow cylindrical tube, having a hollow interior heating chamber **29** into which the article **101**, **301** comprising the aerosol-generating composition is inserted for heating in use. Different arrangements for the heater arrangement **23** are possible. For example, the heater arrangement **23** may comprise a single heating element or may be formed of plural heating elements aligned along the longitudinal axis of the heater arrangement **23**. The or each heating element may be annular or tubular, or at least part-annular or part-tubular around its circumference. In an example, the or each heating element may be a thin film heater. In another example, the or each heating element may

be made of a ceramics material. Examples of suitable ceramics materials include alumina and aluminium nitride and silicon nitride ceramics, which may be laminated and sintered. Other heating arrangements are possible, including for example inductive heating, infrared heater elements, which heat by emitting infrared radiation, or resistive heating elements formed by for example a resistive electrical winding.

[0213] In one particular example, the heater arrangement **23** is supported by a stainless steel support tube and comprises a polyimide heating element. The heater arrangement **23** is dimensioned so that substantially the whole of the body of aerosol-generating composition **103**, **303** of the article **101**, **301** is inserted into the heater arrangement **23** when the article **101**, **301** is inserted into the device **51**.

[0214] The or each heating element may be arranged so that selected zones of the aerosol-generating composition can be independently heated, for example in turn (over time, as discussed above) or together (simultaneously) as desired.

[0215] The heater arrangement **23** in this example is surrounded along at least part of its length by a thermal insulator **31**. The insulator **31** helps to reduce heat passing from the heater arrangement **23** to the exterior of the device **51**. This helps to keep down the power requirements for the heater arrangement **23** as it reduces heat losses generally. The insulator **31** also helps to keep the exterior of the device **51** cool during operation of the heater arrangement **23**. In one example, the insulator **31** may be a double-walled sleeve which provides a low pressure region between the two walls of the sleeve. That is, the insulator **31** may be for example a "vacuum" tube, i.e. a tube that has been at least partially evacuated so as to minimise heat transfer by conduction and/or convection. Other arrangements for the insulator **31** are possible, including using heat insulating materials, including for example a suitable foam-type material, in addition to or instead of a double-walled sleeve.

[0216] The housing **59** may further comprises various internal support structures **37** for supporting all internal components, as well as the heating arrangement **23**.

[0217] The device **51** further comprises a collar **33** which extends around and projects from the opening **20** into the interior of the housing **59** and a generally tubular chamber **35** which is located between the collar **33** and one end of the vacuum sleeve **31**. The chamber **35** further comprises a cooling structure **35***f*, which in this example, comprises a plurality of cooling fins **35***f* spaced apart along the outer surface of the chamber **35**, and each arranged circumferentially around outer surface of the chamber **35**. There is an air gap **36** between the hollow chamber **35** and the article **101**, **301** when it is inserted in the device **51** over at least part of the length of the hollow chamber **35**. The air gap **36** is around all of the circumference of the article **101**, **301** over at least part of the cooling segment **307**.

[0218] The collar **33** comprises a plurality of ridges **60** arranged circumferentially around the periphery of the opening **20** and which project into the opening **20**. The ridges **60** take up space within the opening **20** such that the open span of the opening **20** at the locations of the ridges **60** is less than the open span of the opening **20** at the locations without the ridges **60**. The ridges **60** are configured to engage with an article **101**, **301** inserted into the device to assist in securing it within the device **51**. Open spaces (not shown in the Figures) defined by adjacent pairs of ridges **60** and the article **101**, **301** form ventilation paths around the exterior of the article **101**, **301**. These ventilation paths allow hot vapours that have escaped from the article **101**, **301** to exit the device **51** and allow cooling air to flow into the device **51** around the article **101**, **301** in the air gap **36**.

[0219] In operation, the article **101**, **301** is removably inserted into an insertion point **20** of the device **51**, as shown in FIGS. **5** to **7**. Referring particularly to FIG. **6**, in one example, the body of aerosol-generating composition **103**, **303**, which is located towards the distal end **115**, **315** of the article **101**, **301**, is entirely received within the heater arrangement **23** of the device **51**. The proximal end **113**, **313** of the article **101**, **301** extends from the device **51** and acts as a mouthpiece assembly for a user.

[0220] In operation, the heater arrangement **23** will heat the article **101**, **301** to volatilise at least one component of the aerosol-generating composition from the body of aerosol-generating composition **103**, **303**.

[0221] The primary flow path for the heated volatilised components from the body of aerosol-generating composition **103**, **303** is axially through the article **101**, **301**, through the chamber inside the cooling segment **107**, **307**, through the filter segment **109**, **309**, through the mouth end segment **111**, **313** to the user. In one example, the temperature of the heated volatilised components that are generated from the body of aerosol-generating composition is between 60° C. and 250° C., which may be above the acceptable inhalation temperature for a user. As the heated volatilised component travels through the cooling segment **107**, **307**, it will cool and some volatilised components will condense on the inner surface of the cooling segment **107**, **307**.

[0222] In the examples of the article **301** shown in FIGS. **3** and **4**, cool air will be able to enter the cooling segment **307** via the ventilation holes **317** formed in the cooling segment **307**. This cool air will mix with the heated volatilised components to provide additional cooling to the heated volatilised components.

Method of Producing Aerosol-Generating Material

[0223] Another aspect of the invention provides a method of making an aerosol-generating material as described herein. The method may comprise:

[0224] (i) providing a slurry comprising the aerosol-former material, first binder which is guar gum, the second binder which is starch or a modified starch, the filler, a solvent and any optional further components of the aerosol-generating material;

[0225] (ii) forming a layer of the slurry; and

[0226] (iii) drying the slurry to form the aerosol-generating material.

[0227] The disclosures herein relating to constituents of the aerosol-generating material apply equally to the slurry. The slurry may comprise these constituents in any of the proportions given herein in relation to the composition of the aerosol-generating material.

[0228] When the aerosol-generating material comprises additional binder that is alginate and/or pectin, the slurry may further comprise a setting agent and/or a setting agent may be applied to the slurry. In this case, the method may further comprise a step of setting the slurry. In some examples, forming the layer of the slurry and/or setting the slurry and/or drying the slurry, at least partially, occur simultaneously (for example, during electrospraying). In some examples, the steps of forming the layer of the slurry,

setting the slurry with any setting agent and drying the slurry occur sequentially, in that order.

[0229] Another aspect of the invention provides a method (referred to below as the second method) of making an aerosol-generating composition comprising an aerosol-generating material as described herein. The method may comprise providing the aerosol-generating material and combining the aerosol-generating material and tobacco material to provide the aerosol-generating composition.

[0230] In some cases, the aerosol-generating composition may comprise aerosol-former material in an amount of about 5 to about 30 wt % of the aerosol-generating composition on a dry weight basis.

[0231] The second method typically comprises providing an aerosol-generating material as described hereinabove, providing tobacco material as described hereinabove, and combining the aerosol-generating material and tobacco material in a ratio such that there is provided an aerosol-generating composition having an aerosol-former material content of from about 5 to 30 wt % of the aerosol-generating composition.

[0232] In examples, the aerosol-generating material is provided as a shredded sheet. In particular examples, the providing the aerosol-generating material comprises shredding a sheet of the aerosol-generating material to provide the aerosol-generating material as a shredded sheet. In examples, the tobacco material is fine-cut, and the combining the aerosol-generating material and tobacco material comprises blending the shredded sheet of aerosol-generating material with the fine-cut tobacco material.

[0233] In examples, the providing the aerosol-generating material comprises (i) forming a slurry comprising components of the aerosol-generating material or precursors thereof, (ii) forming a layer of the slurry, and (iii) drying the slurry to form an aerosol-generating material.

[0234] The (ii) forming a layer of the slurry typically comprises spraying, casting or extruding the slurry. In examples, the slurry layer is formed by electrospraying the slurry. In examples, the slurry layer is formed by casting the slurry.

[0235] In some examples, the slurry is applied to a support. The layer may be formed on a support.

[0236] In examples, the drying (iii) removes from about 50 wt %, 60 wt %, 70 wt %, 80 wt % or 90 wt % to about 80 wt %, 90 wt % or 95 wt % (wet weight basis, WWB) of water in the slurry.

[0237] In examples, the drying (iii) reduces the cast material thickness by at least 80%, suitably 85% or 87%. For instance, if the slurry is cast at a thickness of 2 mm, the resulting dried aerosol-generating material may have a thickness of 0.2 mm.

[0238] In embodiments, the dried aerosol-generating material forms a sheet or layer with a thickness of about 0.015 mm to about 1.0 mm. Suitably, the thickness may be in the range of about 0.05 mm, 0.1 mm or 0.15 mm to about 0.5 mm or 0.3 mm, for example 0.05-0.3 or 0.15-0.3 mm. A material having a thickness of 0.2 mm may be particularly suitable.

[0239] The slurry itself is an aspect of the invention. In some examples, the slurry solvent consists essentially of or consists of water. In some examples, the slurry comprises from about 50 wt %, 60 wt %, 70 wt %, 80 wt % or 90 wt % of solvent (WWB).

[0240] A further aspect provides a method for making an aerosol-generating material as described herein using a paper-making process. In particular embodiments, the paper-making process is an air-laid paper-making process. Use of an air-laid paper-making process reduces water consumption. A suitable air-laid paper-making process is discussed in U.S. Pat. No. 9,901,112B2, the disclosure of which is incorporated herein by reference.

[0241] In an embodiment, the air-laid process comprises:

[0242] (a) optionally mixing the filler with any chitosan,

[0243] (b) forming a layer of the mixture (or the filler) on a surface, such as a moving surface, to form a base layer,

[0244] (c) applying a slurry comprising the aerosol-former material and the first and second binders by spraying the slurry onto the base layer, and

[0245] (d) drying.

[0246] In one aspect, the spraying step (c) and the drying step (d) are repeated, for example 2 or 3 times.

[0247] Further Embodiments of the present invention are set out below.

[0248] 1. The aerosol-generating material of claim **1**, wherein the aerosol-generating material comprises aerosol-former material in a total amount of about 1-80 wt % of the aerosol-generating material on a dry weight basis.

[0249] 2. The aerosol-generating material of Embodiment 1, wherein the aerosol-generating material comprises aerosol-former material in a total amount of about 35-65 wt % of the aerosol-generating material on a dry weight basis.

[0250] 3. The aerosol-generating material of Embodiment 2, wherein the aerosol-generating material comprises aerosol-former material in a total amount of about 40-60 wt % of the aerosol-generating material on a dry weight basis.

[0251] 4. The aerosol-generating material of Embodiment 3, wherein the aerosol-generating material comprises aerosol-former material in a total amount of about 45-55 wt % of the aerosol-generating material on a dry weight basis.

[0252] 5. The aerosol-generating material of claim **1** or any preceding Embodiment, wherein the aerosol-former material comprises (or is) one or more of glycerol, propylene glycol, diethylene glycol, triethylene glycol, tetraethylene glycol, 1,3-butylene glycol, erythritol, meso-Erythritol, ethyl vanillate, ethyl laurate, a diethyl suberate, triethyl citrate, triacetin, a diacetin mixture, benzyl benzoate, benzyl phenyl acetate, tributyrin, lauryl acetate, lauric acid, myristic acid, and propylene carbonate.

[0253] 6. The aerosol-generating material of claim **1** or any preceding Embodiment, wherein the aerosol-former material comprises (or is) glycerol, optionally in combination with propylene glycol.

[0254] 7. The aerosol-generating material of claim **1** or any preceding Embodiment, wherein the second binder is modified starch.

[0255] 8. The aerosol-generating material of claim **1** or any preceding Embodiment, wherein the modified starch is one or more of hydroxypropyl starch, carboxymethyl starch sodium, carboxymethyl starch, octenylsuccinic anhydride-modified starch, starch acetate, monostarch phosphate, distarch phosphate, distarch

adipate, hydroxypropyl distarch phosphate, phosphated distarch phosphate, acetylated distarch phosphate and acetylated distarch adipate.

[0256] 9. The aerosol-generating material of Embodiment 8, wherein the modified starch comprises (or is) one or more of hydroxypropyl starch, carboxymethyl starch, and carboxymethyl starch sodium.

[0257] 9A. The aerosol-generating material of Embodiment 9, wherein the modified starch comprises (or is) one or more of hydroxypropyl starch and carboxymethyl starch sodium.

[0258] 10. The aerosol-generating material of claim **1** or any preceding Embodiment, wherein the aerosol-generating material comprises the first binder in an amount of about 3-35 wt % of the aerosol-generating material on a dry weight basis.

[0259] 11. The aerosol-generating material of Embodiment 10, wherein the aerosol-generating material comprises the first binder in an amount of about 5-30 wt % of the aerosol-generating material on a dry weight basis.

[0260] 12. The aerosol-generating material of Embodiment 11, wherein the aerosol-generating material comprises the first binder in an amount of about 7-25 wt % of the aerosol-generating material on a dry weight basis.

[0261] 13. The aerosol-generating material of Embodiment 12, wherein the aerosol-generating material comprises the first binder in an amount of about 10-20 wt % of the aerosol-generating material on a dry weight basis.

[0262] 14. The aerosol-generating material of claim **1** or any preceding Embodiment, wherein the aerosol-generating material comprises the second binder in a total amount of about 1-20 wt % of the aerosol-generating material on a dry weight basis.

[0263] 15. The aerosol-generating material of Embodiment 14, wherein the aerosol-generating material comprises the second binder in a total amount of about 2-15 wt % of the aerosol-generating material on a dry weight basis.

[0264] 16. The aerosol-generating material of Embodiment 15, wherein aerosol-generating material comprises the second binder in a total amount of about 3-10 wt % of the aerosol-generating material on a dry weight basis.

[0265] 17. The aerosol-generating material of claim **1** or any preceding Embodiment, wherein the aerosol-generating material comprises the first and second binders in a total amount of about 5 to 50 wt % of the aerosol-generating material on a dry weight basis.

[0266] 18. The aerosol-generating material of Embodiment 17, wherein the aerosol-generating material comprises the first and second binders in a total amount of about 10 to 40 wt % of the aerosol-generating material on a dry weight basis.

[0267] 19. The aerosol-generating material of Embodiment 18, wherein the aerosol-generating material comprises the first and second binders in a total amount of about 15 to 30 wt % of the aerosol-generating material on a dry weight basis.

[0268] 20. The aerosol-generating material of Embodiment 19, wherein the aerosol-generating material comprises the first and second binders in a total amount of about 15 to 25 wt % of the aerosol-generating material on a dry weight basis.

[0269] 21. The aerosol-generating material of Embodiment 20, wherein the aerosol-generating material comprises the first and second binders in a total amount of about 17 to 25 wt % of the aerosol-generating material on a dry weight basis.

[0270] 22. The aerosol-generating material of claim **1** or any preceding Embodiment, wherein the aerosol-generating material further comprises one or more additional binders other than guar gum, starch or modified starch.

[0271] 23. The aerosol-generating material of Embodiment 22, wherein the additional binder comprises (or is) one or more compounds selected from: polysaccharide binders; gelatin; gums; silica or silicone compounds; clays; and polyvinyl alcohol.

[0272] 24. The aerosol-generating material of Embodiment 23, wherein the gums are selected from xanthan gum and acacia gum.

[0273] 25. The aerosol-generating material of any of Embodiments 23-24, wherein the silica or silicone compounds are selected from PDMS and sodium silicate

[0274] 26. The aerosol-generating material of any of Embodiments 23-25, wherein the clay is kaolin.

[0275] 27. The aerosol-generating material of Embodiment 22, wherein the additional binder comprises (or is) one or more polysaccharide binders.

[0276] 28. The aerosol-generating material of any of Embodiments 23-27, wherein the polysaccharide binders are selected from alginate, pectin, cellulose or a derivative thereof, pullulan, carrageenan, agar, agarose and chitosan.

[0277] 29. The aerosol-generating material of Embodiment 28, wherein the polysaccharide binders are selected from alginate, pectin, cellulose or a derivative thereof and chitosan.

[0278] 30. The aerosol-generating material of any of Embodiments 28-29, wherein the cellulose derivative is selected from the group consisting of: hydroxymethyl cellulose, hydroxyethyl cellulose, hydroxypropyl cellulose, carboxymethylcellulose (CMC), hydroxypropyl methylcellulose (HPMC), methyl cellulose, ethyl cellulose, cellulose acetate (CA), cellulose acetate butyrate (CAB), and cellulose acetate propionate (CAP).

[0279] 31. The aerosol-generating material of any of Embodiments 22-30, wherein the additional binder (or the polysaccharide binder) comprises (or is) chitosan.

[0280] 32. The aerosol-generating material of Embodiment 31, wherein the aerosol-generating material comprises chitosan in an amount of about 0.01-10 wt % of the aerosol-generating material on a dry weight basis.

[0281] 33. The aerosol-generating material of Embodiment 32, wherein the aerosol-generating material comprises chitosan in an amount of about 0.025-5 wt % of the aerosol-generating material on a dry weight basis.

[0282] 34. The aerosol-generating material of Embodiment 33, wherein the aerosol-generating material comprises chitosan in an amount of about 0.05-2 wt % of the aerosol-generating material on a dry weight basis.

[0283] 35. The aerosol-generating material of Embodiment 34, wherein the aerosol-generating material comprises chitosan in an amount of about 0.1-1 wt % of the aerosol-generating material on a dry weight basis.

[0284] 36. The aerosol-generating material of Embodiment 35, wherein the aerosol-generating material comprises chitosan in an amount of about 0.1-0.7 wt % of the aerosol-generating material on a dry weight basis.

[0285] 37. The aerosol-generating material of claim **1** or any preceding Embodiment, wherein the filler comprises one or more organic filler materials.

[0286] 38. The aerosol-generating material of Embodiment 37, wherein the organic filler materials are selected from wood pulp; tobacco pulp; hemp fibre; starch and starch derivatives, such as maltodextrin; cellulose and cellulose derivatives, such as microcrystalline cellulose and/or nanocrystalline cellulose.

[0287] 39. The aerosol-generating material of claim **1** or any preceding Embodiment, wherein the filler comprises (or is) wood pulp.

[0288] 40. The aerosol-generating material of claim **1** or any preceding Embodiment, wherein the aerosol-generating material comprises filler in a total amount of at least 15 wt % of the aerosol-generating material on a dry weight basis.

[0289] 41. The aerosol-generating material of Embodiment 40, wherein the aerosol-generating material comprises filler in a total amount of about 15 to 40 wt % of the aerosol-generating material on a dry weight basis.

[0290] 42. The aerosol-generating material of Embodiment 41, wherein the aerosol-generating material comprises filler in a total amount of about 20 to 40 wt % of the aerosol-generating material on a dry weight basis.

[0291] 43. The aerosol-generating material of Embodiment 42, wherein the aerosol-generating material comprises filler in a total amount of about 25 to 35 wt % of the aerosol-generating material on a dry weight basis.

[0292] 44. The aerosol-generating material of claim **1** or any preceding Embodiment, wherein the aerosol-generating material does not comprise inorganic filler.

[0293] 45. The aerosol-generating material of claim **1** or any preceding Embodiment, wherein the aerosol-generating material does not comprise calcium carbonate, such as chalk.

[0294] 46. The aerosol-generating material of claim **1** or any preceding Embodiment, wherein the aerosol-generating material does not comprise an active substance.

[0295] 47. The aerosol-generating material of claim **1** or any preceding Embodiment, wherein the aerosol-generating material does not comprise tobacco material.

[0296] 48. An aerosol-generating composition comprising an aerosol-generating material as defined in claim **1** or any preceding Embodiment.

[0297] 49. The aerosol-generating composition of Embodiment 48, further comprising tobacco material.

[0298] 50. The aerosol-generating composition of Embodiment 48 or 49, wherein the amount of aerosol-former material in the aerosol-generating composition is from about 5 to about 30 wt % of the aerosol-generating composition on a dry weight basis.

[0299] 51. The aerosol-generating composition of Embodiment 50, wherein the amount of aerosol-former material in the aerosol-generating composition is from about 10 to about 20 wt % of the aerosol-generating composition on a dry weight basis.

[0300] 52. The aerosol-generating composition of Embodiment 51, wherein the amount of aerosol-former material in the aerosol-generating composition is from about 13 to about 17 wt % of the aerosol-generating composition on a dry weight basis.

[0301] 53. The aerosol-generating composition of any of Embodiments 48-52, wherein the aerosol-generating composition comprises the aerosol-generating material in an amount of about 5 to 40 wt % of the aerosol generating composition on a dry weight basis.

[0302] 54. The aerosol-generating composition of Embodiment 53, wherein the aerosol-generating composition comprises the aerosol-generating material in an amount of about 5 to 30 wt % of the aerosol generating composition on a dry weight basis.

[0303] 55. The aerosol-generating composition of Embodiment 54, wherein the aerosol-generating composition comprises the aerosol-generating material in an amount of about 5 to 25 wt % of the aerosol generating composition on a dry weight basis.

[0304] 56. The aerosol-generating composition of Embodiment 55, wherein the aerosol-generating composition comprises the aerosol-generating material in an amount of about 10 to 25 wt % of the aerosol generating composition on a dry weight basis.

[0305] 57. The aerosol-generating composition of Embodiment 56, wherein the aerosol-generating composition comprises the aerosol-generating material in an amount of about 10-20 wt % of the aerosol generating composition on a dry weight basis.

[0306] 58. The aerosol-generating composition of any of Embodiments 49-57, wherein aerosol-generating composition comprises the tobacco material in an amount of about 50 to 95 wt % of the aerosol generating composition on a dry weight basis.

[0307] 59. The aerosol-generating composition of Embodiment 58, wherein aerosol-generating composition comprises the tobacco material in an amount of or about 60 to 95 wt % of the aerosol generating composition on a dry weight basis.

[0308] 60. The aerosol-generating composition of Embodiment 59, wherein aerosol-generating composition comprises the tobacco material in an amount of about 70 to 90 wt % of the aerosol generating composition on a dry weight basis.

[0309] 61. The aerosol-generating composition of Embodiment 60, wherein aerosol-generating composition comprises the tobacco material in an amount of about 80 to 90 wt % of the aerosol generating composition on a dry weight basis.

[0310] 62. The aerosol-generating composition of any of Embodiments 49-61, wherein the tobacco material comprises aerosol-former material in an amount of from about 1-10 wt % of the tobacco material.

[0311] 63. The aerosol-generating composition of any of Embodiments 49-62, wherein the tobacco material is fine-cut.

[0312] 64. The aerosol-generating composition of any of Embodiments 49-63, wherein the tobacco material comprises lamina tobacco.

[0313] 65. The aerosol-generating composition of any of Embodiments 49-64, wherein the tobacco material comprises cut-rag tobacco.

[0314] 66. The aerosol-generating composition of any of Embodiments 49-65, wherein the aerosol-generating material is in the form of a shredded sheet and is blended with the tobacco material.

[0315] 67. The aerosol-generating composition of any of Embodiments 49-66, wherein the aerosol-generating composition does not comprise inorganic filler.

[0316] 68. The aerosol-generating composition of any of Embodiments 49-67, wherein the aerosol-generating composition does not comprise calcium carbonate, such as chalk.

[0317] The above Embodiments defining features of the aerosol-generating material apply equally to the slurry of the invention.

[0318] Similarly, the above Embodiments apply equally to the consumable, non-combustible aerosol provision system, method of generating aerosol and a method of forming an aerosol-generating material of the invention.

EXAMPLES

[0319] Aerosol-generating materials (AGM) having the following constituents were produced using an air-laid paper-making process. Percentage amounts are quoted on a dry weight basis unless specified otherwise. Thicknesses, area densities, tensile strengths and water contents of the aerosol-generating materials were measured.

[0320] Thicknesses were measured using a L&W Micrometre (A-2 version) with the settings in the following table. Conditions during the measurement were 22±2° C. of temperature and 60±5% of Relative Humidity.

Pressure	100 kPa
Lowering speed	2 mm/s
Contact time	2 s
Area measured	2 cm^2
Standard	ISO 534

[0321] Area densities were determined by cutting a 100 cm^2 sample of aerosol generating material using a 100 cm^2 cutter and then weighing the cut sample on an analytical balance (resolution 0.01 g). Conditions during the measurement were 22±2° C. of temperature and 60±5% of Relative Humidity.

[0322] Samples for tensile strength measurements were prepared as follows:

[0323] cut out from sheet material a sample of width 15 mm*length 140 mm,

[0324] fold over 25 mm of sample at either end to provide a sample with a total length of 90 mm with a 40 mm single thickness section in the centre.

[0325] Water contents were determined by Karl Fischer titration.

AGM-A

[0326]

Ingredient and amount (dry wt. %)	CAS#
wood pulp fiber 30%	—
glycerol 50%	56-81-5
Guar gum 11.76%	9000-30-0
Hydroxy propyl starch 7.84%	9049-76-7
Chitosan. 0.4%	9012-76-4

Sample	Thickness (mm)	Area density (g/m^2)	Tensile Strength (N/m)	Water (%) (WWB)
AGM-A	0.205	103.78	569.85 521.82 491.13	9.13

	Amount (dry wt. %)		
Item	AGM-B	AGM-C	CAS
Fiber (wood pulp fiber)	27	28	—
Propane-1,2,3-triol (glycerol)	50	50	56-81-5
Guar Gum	18	17.8	9000-30-0
Chitosan	0.1	0.2	9012-76-4
Hydroxypropyl Starch	4.9	—	9049-76-7
Carboxymethyl starch sodium	—	4	9063-38-1

Formulation	Wet weight (g/m^2) Average	Tensile Strength (N/m)Average	Water KF (%) Average
AGM-B	109.54	462.76	8.92
AGM-C	105.21	448.61	10.03

[0327] All percentages by weight described herein (denoted wt %) are calculated on a dry weight basis (DWB), unless explicitly stated otherwise. All weight ratios are also calculated on a dry weight basis. A weight quoted on a dry weight basis refers to the whole of the extract or slurry or material, other than the water, and may include components which by themselves are liquid at room temperature and pressure, such as glycerol. Conversely, a weight percentage quoted on a wet weight basis (WWB) refers to all components, including water.

[0328] For the avoidance of doubt, where in this specification the term "comprises" is used in defining the invention or features of the invention, embodiments are also disclosed in which the invention or feature can be defined using the terms "consists essentially of" or "consists of" in place of "comprises". Reference to a material "comprising" certain features means that those features are included in, contained in, or held within the material.

[0329] The above embodiments are to be understood as illustrative examples of the invention. It is to be understood that any feature described in relation to any one embodiment, aspect or example may be used alone, or in combination with other features described, and may also be used in combination with one or more features of any other of the embodiments, aspects or example, or any combination of

any other of the embodiments, aspects or examples. Furthermore, equivalents and modifications not described above may also be employed without departing from the scope of the invention, which is defined in the accompanying claims.

[0330] The various embodiments described herein are presented only to assist in understanding and teaching the claimed features. These embodiments are provided as a representative sample of embodiments only, and are not exhaustive and/or exclusive. It is to be understood that advantages, embodiments, examples, functions, features, structures, and/or other aspects described herein are not to be considered limitations on the scope of the invention as defined by the claims or limitations on equivalents to the claims, and that other embodiments may be utilised and modifications may be made without departing from the scope of the claimed invention. Various embodiments of the invention may suitably comprise, consist of, or consist essentially of, appropriate combinations of the disclosed elements, components, features, parts, steps, means, etc., other than those specifically described herein. In addition, this disclosure may include other inventions not presently claimed, but which may be claimed in future.

1. An aerosol-generating material comprising:
(a) aerosol-former material;
(b) a first binder which is guar gum;
(c) a second binder which is starch or modified starch; and
(d) filler.

2. The aerosol-generating material of claim **1**, wherein the second binder is modified starch.

3. The aerosol-generating material of claim **1**, wherein the modified starch is one or more of hydroxypropyl starch, carboxymethyl starch sodium, carboxymethyl starch, octenylsuccinic anhydride-modified starch, starch acetate, monostarch phosphate, distarch phosphate, distarch adipate, hydroxypropyl distarch phosphate, phosphorylated distarch phosphate, acetylated distarch phosphate and acetylated distarch adipate.

4. The aerosol-generating material of claim **1**, wherein the modified starch comprises (or is) one or more of hydroxypropyl starch, carboxymethyl starch and carboxymethyl starch sodium.

5. The aerosol-generating material of claim **1**, wherein the aerosol-generating material comprises the first binder in an amount of about 3-35 wt % of the aerosol-generating material on a dry weight basis.

6. The aerosol-generating material of claim **1**, wherein the aerosol-generating material comprises the second binder in a total amount of about 1-20 wt % of the aerosol-generating material on a dry weight basis.

7. (canceled)

8. The aerosol-generating material of claim **1**, wherein the aerosol-former material comprises (or is) one or more of: glycerol, propylene glycol, diethylene glycol, triethylene glycol, tetraethylene glycol, 1,3-butylene glycol, erythritol, meso-Erythritol, ethyl vanillate, ethyl laurate, a diethyl suberate, triethyl citrate, triacetin, a diacetin mixture, benzyl benzoate, benzyl phenyl acetate, tributyrin, lauryl acetate, lauric acid, myristic acid, and propylene carbonate.

9. The aerosol-generating material of claim **1**, wherein the aerosol-generating material comprises aerosol-former material in a total amount of about 1-80 wt % of the aerosol-generating material on a dry weight basis.

10. The aerosol-generating material of claim **1**, wherein the aerosol-generating material comprises aerosol-former material in a total amount of about 40-60 wt % of the aerosol-generating material on a dry weight basis.

11. The aerosol-generating material of claim **1**, wherein the filler comprises (or is) wood pulp.

12. The aerosol-generating material of claim **1**, wherein the aerosol-generating material comprises filler in a total amount of at least 15 wt % of the aerosol-generating material on a dry weight basis.

13. The aerosol-generating material of claim **1**, wherein the aerosol-generating material does not comprise active substance.

14. (canceled)

15. An aerosol-generating composition comprising the aerosol-generating material of claim **1**.

16. The aerosol-generating composition of claim **15**, wherein the aerosol-generating composition further comprises tobacco material.

17. (canceled)

18. (canceled)

19. (canceled)

20. The aerosol-generating composition of claim **16**, wherein the aerosol-generating material is in the form of a shredded sheet and is blended with the tobacco material.

21. A consumable for use in a non-combustible aerosol provision device, the consumable comprising an aerosol-generating composition of claim **15**.

22. A non-combustible aerosol provision system comprising the consumable of claim **21** and a non-combustible aerosol provision device, the non-combustible aerosol provision device comprising an aerosol-generation device arranged to generate aerosol from the consumable when the consumable is used with the non-combustible aerosol provision device.

23. A method of generating an aerosol using the non-combustible aerosol provision system of claim **22**, the method comprising heating the aerosol-generating material to a temperature of less than 350° C.

24. (canceled)

25. A method of forming the aerosol-generating material of claim **1**, the method comprising:
(i) providing a slurry comprising the aerosol-former material, first binder which is guar gum, the second binder which is starch or a modified starch, the filler, a solvent and any optional further components of the aerosol-generating material;
(ii) forming a layer of the slurry; and
(iii) drying the slurry to form the aerosol-generating material.

26. (canceled)

27. A method for making the aerosol-generating material of claim **1** using a paper-making process.

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