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(71) Applicant: JT INTERNATIONAL SA [CH/CH]; 8 Rue
Kazem-Radjavi, 1202 Geneva (CH).

(72) Inventors: MASTALERZ, Remigius; Küferweg 2, 54329
Konz (DE). SPIELES, Sandra; Am Bildstock 56, 54294
Trier (DE).

(74) Agent: APPLEYARD LEES IP LLP; 15 Clare Road, Hal-
ifax Yorkshire HX1 2HY (GB).

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(54) Title: METHOD

(57) Abstract: A method of producing a granular composition for use in an aerosol generating device, wherein the granular composition comprises tobacco particles, a humectant, a gelling agent, a binder and water, and wherein the method comprises steps: (i) combining the gelling agent and the humectant substantially in the absence of water to form a first suspension; (ii) admixing the tobacco particles, the binder and the water with the first suspension to form a second suspension; and (iii) producing the granular composition from the second suspension.



Method

Field

- 5 The present invention relates to a granular composition that comprises tobacco particles and that is for use in an aerosol generating device. In particular, the present invention relates to a method of producing such a granular composition. The present invention also relates to a shaped substrate that is formed from the granular composition, to a method of producing the shaped substrate and to an aerosol generating article comprising the shaped substrate.
- 10 Furthermore, the present invention relates to an aerosol generating system that comprises the aerosol generating article and to the use of the aerosol generating article to generate an inhalable aerosol.

Background

- 15 Various devices and systems that heat, but do not burn, tobacco for inhalation by a consumer are known. These devices and systems may be referred to as "heat-not-burn" tobacco products. These systems comprise a heating chamber in which a tobacco containing article or consumable may be received. The tobacco containing article or consumable comprises suitable components
- 20 to form an inhalable aerosol (i.e. vapour) upon heating, which aerosol may be inhaled by a consumer. The tobacco containing article or consumable comprises tobacco in any suitable form, which may for example be in the form of a substrate comprised of a granular tobacco containing composition.
- 25 Methods for forming suitable granular tobacco containing compositions are known, but there is a need to provide alternative, or improved, such methods, for example that can be conducted with a range of composition components and that can be scaled up for commercial use.
- It is one aim of the present invention, amongst others, to provide a method for producing a granular tobacco containing composition that addresses at least one disadvantage of the prior art, whether identified here or elsewhere, or to provide an alternative to existing such methods.
- 30

Summary of the Invention

- 35 According to aspects of the present invention, there are provided a method of producing a granular composition for use in an aerosol generating device and a granular composition obtained or obtainable according to the method. There are also provided a shaped substrate that is formed from the granular composition, a method of producing the shaped substrate and an aerosol generating article comprising the shaped substrate. Furthermore, there are provided

an aerosol generating system that comprises the aerosol generating article and the use of the aerosol generating article to generate an inhalable aerosol. Other features of the invention will be apparent from the dependent claims, and from the description which follows.

5 According to a first aspect of the present invention, there is provided a method of producing a granular composition for use in an aerosol generating device, wherein the granular composition comprises tobacco particles, a humectant, a gelling agent, a binder and water, and wherein the method comprises steps:

10 (i) combining the gelling agent and the humectant substantially in the absence of water to form a first suspension;

(ii) admixing the tobacco particles, the binder and the water with the first suspension to form a second suspension; and

(iii) producing the granular composition from the second suspension.

15 According to a second aspect of the present invention, there is provided a method of producing a granular composition for use in an aerosol generating device, wherein the granular composition comprises tobacco particles, a humectant, a gelling agent, a binder and water, and wherein the method comprises steps:

20 (i) combining the gelling agent, the binder and the humectant substantially in the absence of water to form a first suspension;

(ii) admixing the tobacco particles and the water with the first suspension to form a second suspension; and

(iii) producing the granular composition from the second suspension.

25 According to a third aspect of the present invention, there is provided a granular composition obtained or obtainable according to the method of the first or second aspect of the invention.

30 According to a fourth aspect of the present invention, there is provided a shaped substrate for use in an aerosol generating device, wherein the shaped substrate is formed from a granular composition obtained or obtainable by the method of the first or second aspect of the invention.

35 According to a fifth aspect of the present invention, there is provided a method of producing a shaped substrate according to the fourth aspect of the invention, wherein the method comprises placing the granular composition into a shaped mould and applying heat and/or pressure to form the shaped substrate.

According to a sixth aspect of the present invention, there is provided an aerosol generating article for use in an aerosol generating device, wherein the aerosol generating article comprises a shaped substrate according to the fourth aspect of the invention.

According to a seventh aspect of the present invention, there is provided an aerosol generating system comprising:

- an aerosol generating article according to the sixth aspect of the invention; and
- an aerosol generating device comprising a heating chamber for receiving the aerosol generating article.

According to an eighth aspect of the present invention, there is provided a use of an aerosol generating article according to the sixth aspect of the invention to generate an inhalable aerosol in an aerosol generating device.

According to a ninth aspect of the present invention, there is provided a method of generating an inhalable aerosol, the method comprising providing an aerosol generating system according to a seventh aspect of the invention; and forming an inhalable aerosol by heating the aerosol generating article within the heating chamber.

Features described in relation to the second to ninth aspects of the invention may have any of the suitable features and advantages described in relation to the first aspect of the invention.

Detailed Description of the Invention

Unless otherwise stated, the following terms used in the specification and claims have the meanings set out below.

The first and second aspects of the invention provide a method of producing a granular composition for use in an aerosol generating device, wherein the granular composition comprises tobacco particles, a humectant, a gelling agent, a binder and water.

The first aspect of the invention provides a method of producing a granular composition for use in an aerosol generating device, wherein the granular composition comprises tobacco particles, a humectant, a gelling agent, a binder and water, and wherein the method comprises steps:

- (i) combining the gelling agent and the humectant substantially in the absence of water to form a first suspension;
- (ii) admixing the tobacco particles, the binder and the water with the first suspension to form a second suspension; and
- (iii) producing the granular composition from the second suspension.

The second aspect of the invention provides a method of producing a granular composition for use in an aerosol generating device, wherein the granular composition comprises tobacco

particles, a humectant, a gelling agent, a binder and water, and wherein the method comprises steps:

(i) combining the gelling agent, the binder and the humectant substantially in the absence of water to form a first suspension;

5 (ii) admixing the tobacco particles and the water with the first suspension to form a second suspension; and

(iii) producing the granular composition from the second suspension.

10 By "granular composition", it should be understood that the components are present in the composition as granules. Typically, upon measurement of particle size distribution of a component in granular form by sieve analysis, the median particle size (i.e. D50) is from 0.2 to 1 mm, such as from 0.5 to 1 mm, or from 0.5 to 0.7 mm.

15 Granules may be formed by any suitable granulation process, such as wet or dry granulation, during which single discrete particles such as powder particles agglomerate to form larger entities, i.e., granules. Granules are therefore to be physically distinguished from powders.

The term "humectant" as used herein refers to a hygroscopic compound capable of releasing an aerosol on heating. Herein, water is not considered to be a humectant.

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The granular composition may alternatively be referred to as crumbed tobacco.

25 The method of the first aspect of the invention produces a granular composition which is suitable for use in an aerosol generating device. The granular composition may form an inhalable aerosol upon heating to a suitable temperature, such as a temperature ranging from 150°C to 450°C, preferably ranging from 200°C to 400°C, more preferably ranging from 250°C to 350°C, even more preferably ranging from 290°C to 350°C. For example, the suitable temperature may be of about 230°C, 250°C, 270°C, 290°C, 300°C, 310°C, 330°C, or 350°C. The inhalable aerosol comprises the tobacco particles.

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In the methods of the first and second aspects of the invention, step (i) is conducted first, followed by step (ii) and then by step (iii). Thus, step (i) produces a first suspension, which first suspension is converted into the second suspension in step (ii), which second suspension is converted into a granular composition in step (iii).

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The granular composition produced in the methods of the first and second aspects of the invention comprises tobacco particles, a humectant, a gelling agent, a binder and water.

References to tobacco include any part, including leaves, flowers or stems, of any member of the genus *Nicotiana*, and reconstituted material thereof. Preferably, the tobacco particles may comprise a blend of at least two different sorts of tobacco. The use of a blend allows for adjustment of the taste to suit the consumer.

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The tobacco particles may typically have a particle size (Dv90) greater than 100 μm , such as greater than 200 μm , greater than 400 μm or equal to or greater than 500 μm . The tobacco particles may typically have a particle size of less than 1000 μm , such as less than 900 μm , less than 800 μm , less than 700 μm or equal to or less than 600 μm . For example, the tobacco particles may comprise a mixture of tobacco particles having different particle sizes, such as a mixture in which a proportion of the tobacco particles have a size smaller than another proportion of the tobacco particles. For example, the tobacco particles may comprise a mixture of tobacco particles having particle sizes greater than 600 μm and tobacco particles less than 400 μm .

15 The granular composition may comprise the tobacco particles in any suitable amount, such as for example from 25 to 60 wt%, such as from 35 to 55 wt%, based on the total weight of the composition.

20 The granular composition may comprise any suitable humectant. The term "humectant" as used herein refers to a hygroscopic compound capable of releasing an aerosol on heating. Herein, water is not considered to be a humectant.

Suitably, the granular composition may comprise two or more humectants. Examples of suitable humectants include, but are not limited to, glycerol, propylene glycol, isopropanol, ethanol, butane-diol (including all isomers thereof), butane-triol (including all isomers thereof), butanol (including all isomers thereof) and sebacate esters (such as di-2-ethylhexyl sebacate) as well as combinations thereof. Preferred examples of suitable humectants include, but are not limited to, glycerol, propylene glycol, isopropanol, ethanol, butane-diol (including all isomers thereof), butane-triol (including all isomers thereof) and butanol (including all isomers thereof), as well as combinations thereof. Preferred humectants are glycerol and/or propylene glycol, and combinations thereof. Suitably, the humectant may comprise a combination of two or more humectants, such as a combination of glycerol and propylene glycol. A preferred ratio (by weight) of propylene glycol to glycerol may be from 1:1.5 to 1:2. Suitably, the humectant may comprise glycerol only (i.e. the humectant may consist of glycerol). Suitably, the humectant may comprise propylene glycol only (i.e. the humectant may consist of propylene glycol).

The granular composition may comprise the humectant in any suitable amount, such as for example from 8 to 45 wt%, preferably from 10 to 40 wt%, even more preferably from 15 to 35 wt%, most preferably from 20 to 30 wt%, based on the total weight of the composition. For

example, the granular composition may comprise from 8 to 12 wt% of polyethylene glycol and from 17 to 23 wt% of glycerol.

5 The humectant acts to vaporise when the granular composition is heated, to form an aerosol which typically carries flavour components of the tobacco for inhalation. In other words, the humectant acts as an aerosol forming agent.

10 The gelling agent and/or the binder may act to gel or bind the components of the granular composition so as to retain the desired granular composition and to provide a crumbly, soft granular composition. The term "gelling agent" as used herein refers to a compound providing viscoelasticity to the substrate, i.e. producing a non-flowable gel. The term "binder" as used herein refers to a compound used to increase the viscosity of the substrate while retaining flowability.

15 The granular composition may comprise any suitable gelling agent. Examples of suitable gelling agents include, but are not limited to, gellan gum, gum arabic, agar, gelatine, pectin, carrageenan, locust bean gum, alginates, lecithin, starch, modified starch derivatives, guar gum, tamarind gum, xanthan gum, tara gum, konjak glucomannan, cassia gum, and psyllium seed gum, as well as combinations thereof. Preferred examples of suitable gelling agents include, but
20 are not limited to, gellan gum, gum arabic, gelatine, pectin, carrageenan, locust bean gum, alginates, lecithin and agar, as well as combinations thereof. Suitably, the gelling agents may be selected from gellan gum, lecithin, agar and/or combinations thereof. More suitably, the gelling agents may be selected from gellan gum and lecithin, and/or combinations thereof. More suitably, the gelling agent may be selected from gellan gum and agar, as well as combinations
25 thereof. Preferably the gelling agent may comprise gellan gum.

The granular composition may comprise the gelling agent in any suitable amount, such as for example from 1 to 12 wt%, preferably such as from 2 to 10 wt%, more preferably such as from 3 to 8 wt%, even more preferably such as from 4 to 6 wt%, based on the total weight of the
30 composition.

The granular composition may comprise any suitable binder. Suitable binders include cellulose derivatives. Examples of suitable binders include, but are not limited to, cellulose ethers (such as carboxymethylcellulose), modified starch, and hydroxy-alkylated carbohydrates (such as
35 hydroxy-alkylated cellulose, such as hydroxypropylcellulose), as well as combinations thereof. Suitably, the binder may be selected from carboxymethylcellulose, hydroxypropylcellulose, modified starch, agar, gellan gum and xanthan gum and/or combinations thereof. More suitably, the binder may be selected from carboxymethylcellulose, hydroxypropylcellulose and agar, and/or combinations thereof. Suitably, the binder may be selected from carboxymethylcellulose

and hydroxypropylcellulose, as well as combinations thereof. Preferably the binder may comprise purified carboxymethylcellulose, such as Ceroga 4550 C or CEKOL® 2000 (available from C.E. Roeper GmbH).

- 5 The granular composition may comprise the binder in any suitable amount, such as for example from 5 to 25 wt%, preferably such as 8 to 20 wt%, more preferably such as 10 to 15 wt% based on the total weight of the composition.

- 10 The granular composition may comprise any suitable amount of water, such as for example from 2 to 20 wt%, such as from 2 to 8 wt% or from 3 to 5 wt%, based on the total weight of the composition.

- 15 The granular composition may further comprise one or more additives. Suitable additives would be well known to persons skilled in the art and the additives may be included in the granular compositions in any suitable amounts. Suitably, the granular composition may further comprise one or more additives selected from the group consisting of a flavourant, a stimulant, an active ingredient and a stabiliser.

- 20 The term "flavourant" as used herein refers to a compound (or mixture of compounds) that provides a flavour, i.e. to provide a flavour to an aerosol that is generated from the granular composition. A "flavourant" may alternatively be referred to as a flavour or flavouring.

- 25 Examples of suitable flavourants include, but are not limited to, menthol, natural and/or artificial plant flavours, saccharides, animal flavours, other flavourings known for use in conventional products or e-cigarettes, as well as combinations thereof. Suitable examples of flavourants include but are not limited to cinnamon, sage, chamomile, kudzu (*Pueraria lobata*), *Hydrangeae dulcis* folium, clove, lavender, cardamom, caryophyllus, nutmeg, bergamot, geranium, honey essence, rose oil, lemon, orange, cassia bark, caraway, jasmine, ginger, coriander, vanilla extract, spearmint, peppermint, cassia, coffee, celery, cascarilla, sandalwood, cocoa, ylang ylang, fennel, anise, liquorice, St John's bread, prune extract, peach extract, saccharides (e.g. glucose, fructose, isomerized saccharide, and caramel), cocoa (e.g. powder and extract), esters (e.g. isoamyl acetate, linalyl acetate, isoamyl propionate, and linalyl butyrate), ketones (e.g. menthone, ionone, damascenone, and ethyl maltol), alcohols (e.g. geraniol, linalool, anethole, and eugenol), aldehydes (e.g. vanillin, benzaldehyde, and anisaldehyde), lactones (e.g. γ -undecalactone and γ -nonalactone), animal flavours (e.g. musk, ambergris, civet, and castoreum), and hydrocarbons (e.g. limonene and pinene), as well as combinations thereof. Preferably, the flavourant may be substantially free, or completely free, of tobacco or a derivative thereof.
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As used herein, the term "substantially free" means that the material being discussed is present in the composition, if at all, as an incidental impurity. In other words, the material does not affect the properties of the composition. As used herein, the term "completely free" means that the material being discussed is not present in the composition at all.

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The term "stimulant" as used herein refers to compound (or mixture of compounds) that provides a sensory effect but not a flavour, i.e. to provide a sensory effect (but not a flavour) to an aerosol that is generated from the granular composition. An example of a sensory effect may be a cooling sensation.

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Examples of suitable stimulants include, but are not limited to, caffeine, cooling agents or TRPM8 agonists selected from the derivatives of carboxamide or cyclohexanecarboxamide.

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An example of a suitable active ingredient is nicotine, which may be in the form of a nicotine salt, free-base nicotine (otherwise referred to as unprotonated nicotine), stabilised nicotine, and combinations thereof. Examples of suitable nicotine salts include, but are not limited to, nicotine hydrochloride, nicotine dihydrochloride, nicotine monotartrate, nicotine bitartrate, nicotine bitartrate dihydrate, nicotine sulphate, nicotine zinc chloride monohydrate and nicotine salicylate, and mixtures thereof. Stabilised nicotine refers to nicotine bound to, adsorbed to, absorbed into, enclosed into or forming a complex or any other non-covalent binding with another component(s). A number of stabilised nicotine combinations are well known in the art. Examples of stabilised nicotine include, but are not limited to, nicotine bound to an ion exchange resin such as a cation exchange resin, for example, Amberlite IRP 64 derived from a copolymer of methacrylic acid and divinylbenzene; nicotine bound to a zeolite; nicotine bound to cellulose and cellulose derivatives (such as microcrystalline cellulose), as well as nicotine bound to starch microspheres and beta-cyclodextrin inclusion complexes.

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Examples of suitable stabilisers include, but are not limited to, maltodextrin, sorbitol, maltitol, polydextrose, rice flour, and combinations thereof.

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The granular composition may comprise the additives (when present) in any suitable amount, as would be understood by persons skilled in the art.

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For example, the granular composition may comprise a flavourant in any suitable amount, such as for example in an amount up to 20 wt%, preferably up to 15 wt%, more preferably up to 10 wt% and even more preferably up to 5 wt%, up to 1 wt% or up to 0.5 wt%, based on the total weight of the composition. For example, the granular composition may comprise a flavourant in any suitable amount, such as for example in an amount up to 20 wt%, preferably up to 15 wt%,

more preferably up to 10 wt% and even more preferably up to 5 wt% based on the total weight of the composition.

5 For example, the granular composition may comprise a flavourant in a suitable amount to provide a delivery of an average of at least about 1.5 µg of the flavourant in a 35 mL puff, preferably no more than 100 µg of the flavourant in a 35 mL puff.

10 Suitably, the granular composition produced by the methods of the invention comprises less than 20 wt%, such as less than 15 wt%, less than 10 wt% or less than 6 wt% of water. By using such a low amount of water, it is possible to directly obtain from the method of the present invention a granular composition without providing a further drying step at the end of such a method. Avoiding such a drying step also allows the preservation of all the tobacco taste and aroma of the obtained substrate.

15 Step (i) of the method of the first aspect of the invention comprises combining the gelling agent and the humectant substantially in the absence of water to form a first suspension.

Step (i) of the second aspect of the invention comprises combining the gelling agent, the binder and the humectant substantially in the absence of water to form a first suspension.

20 As used herein, the term "substantially in the absence of water" means that the components are combined in step (i) in such a way that any water that is present, if any, is present as an incidental impurity. For example the gelling agent and/or the humectant may comprise water as an impurity.

25 Suitably, step (i) of the methods of the first and second aspects of the invention is conducted in the absence of water, i.e. such that no water is present when the gelling agent and the humectant are combined.

30 Conducting step (i) of the method of the invention substantially in the absence of (or in the absence of) water provides advantages in use, for example this reduces or prevents activation of the gelling agent and, when present, binder by water such that aggregation or clumping of the gelling agent and, when present, the binder is reduced or prevented and a suspension may be formed in step (i).

35 The term "suspension" would be well understood by persons skilled in the art to mean that the components comprise a finely distributed solid in a liquid.

Suitably, the granular composition may comprise two or more humectants and step (i) of the method of the first aspect of the invention may further comprise pre-mixing the two or more humectants prior to combining with the gelling agent to form the first suspension.

- 5 Suitably, the granular composition may comprise two or more humectants and step (i) of the method of the second aspect of the invention may further comprise pre-mixing the two or more humectants prior to combining with the gelling agent and the binder to form the first suspension.

10 In step (i) of the first and second aspects of the invention, the components that form the first suspension are combined in any suitable manner, such as by addition to a suitable vessel and mixing by means of a suitable mixer. A suitable mixer may contain a dispersing and mixing tool. Step (i) is conducted at a suitable temperature and pressure. A suitable temperature is above 5°C, such as above 10°C or above 15°C, and below 100°C, such as below 60°C or below 50°C. preferably the temperature is from 18 to 40°C, such as from 20 to 30°C, such as at ambient
15 temperature. A suitable pressure is ambient pressure. Suitably, the components are mixed at a suitable speed and for a suitable length of time to provide the first suspension. The mixture may be mechanically or otherwise aerated (such as by injection of air) during mixing. Aerating the mixture may contribute to providing a smooth appearance of the mixture.

- 20 Step (ii) of the first aspect of the invention comprises admixing the tobacco particles, the binder and the water with the first suspension to form a second suspension.

Step (ii) of the second aspect of the invention comprises admixing the tobacco particles and the water with the first suspension to form a second suspension.

- 25 In step (ii) of the first and second aspects of the invention, the additional components that form the second suspension may be admixed with the first suspension in any suitable manner, such as by addition to a suitable vessel and mixing by any suitable means (such as using a BEBA mixer). Step (i) is conducted at a suitable temperature and pressure. A suitable temperature is above 5°C, such as above 10°C or above 15°C, and below 100°C, such as below 60°C or below
30 50°C. preferably the temperature is from 18 to 40°C, such as from 20 to 30°C, such as at ambient temperature. A suitable pressure is ambient pressure. Suitably, the components are mixed at a suitable speed and for a suitable length of time to provide the second suspension. The mixture may be mechanically or otherwise aerated (such as by injection of air) during mixing. Aerating
35 the mixture may contribute to providing a smooth appearance of the mixture.

Suitably, steps (i) and (ii) of the methods of the invention may be conducted in separate vessels, such that step (i) is conducted in a first vessel and step (ii) is conducted in a second vessel. The first and second vessels may have different capacities. For example, the first vessel may have

a smaller capacity than the second vessel. The first suspension may be transferred from the first vessel to the second vessel for step (ii) to occur. For example, step (i) may be carried out in a first vessel and step (ii) may be carried out in a second vessel, wherein the first vessel has a smaller capacity than the second vessel.

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When the first suspension is transferred from the first vessel to the second vessel (i.e. for step (ii) to occur) in the first aspect of the invention, the first suspension may be added to the second vessel wherein the second vessel contains one or more of the tobacco particles, the binder and the water. Alternatively, the first suspension may be added to an empty second vessel and then the tobacco particles, the binder and the water may be added to the first suspension in any suitable order. For example, in step (ii) the tobacco particles, the binder and the water may be each separately admixed with the first suspension in any suitable order.

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For example, in the first aspect of the invention, in step (ii) the water may be added to the first suspension, followed by the tobacco particles and the binder in any suitable order. For example, in the first aspect of the invention, in step (ii) the water may be added to the first suspension, followed by the tobacco particles, and then followed by the binder.

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For example, in the second aspect of the invention, in step (ii) the water may be added to the first suspension, followed by the tobacco particles.

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For example, in the first aspect of the invention, in step (ii) the tobacco particles may be added to the first suspension, followed by the binder and the water. For example, in the first aspect of the invention, in step (ii) the tobacco particles may be added to the first suspension, followed by the binder, and then followed by the water.

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When the first suspension is transferred from the first vessel to the second vessel (i.e. for step (ii) to occur) in the second aspect of the invention, the first suspension may be added to the second vessel wherein the second vessel contains one or more of the tobacco particles and the water. Alternatively, the first suspension may be added to an empty second vessel and then the tobacco particles and the water may be added to the first suspension in any suitable order. For example, in step (ii) the tobacco particles and the water may be each separately admixed with the first suspension, such as in any suitable order.

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For example, in the second aspect of the invention, in step (ii) the tobacco particles may be added to the first suspension, followed by the water.

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In step (ii) of the method of the first aspect of the invention, the binder may be added to the first suspension such that the binder is added continuously. Continuous and/or separate addition of the binder provides an even distribution of the binder and avoids aggregation of the binder.

- 5 Step (iii) of the first and second aspects of the invention comprises producing the granular composition from the second suspension. The granular composition is typically produced *in situ* upon production of the second suspension in step (ii). In other words, typically in step (iii) the granular composition forms from the second suspension without the need for any further processing of the suspension. This is advantageous as it reduces the number of steps required
10 in the method as well as the related manufacturing cost.

The method of the first and second aspects of the invention may comprise an additional step (iv) by which the size and/or shape of the granules formed in step (iii) may be modified. For example, step (iv) may comprise sieving and/or extruding the granules formed in step (iii) so as to obtain
15 the desired size and/or shape. Such steps would be well known to persons skilled in the art.

Preferably, the method of the first and second aspects of the invention is a batch method. Preferably, the method is a batch method which produces the granular composition in an amount of at least 10 kg per batch, for example of at least 15 kg per batch. The inventors have found
20 that aggregation and clumping are particularly problematic at larger batch sizes, and therefore the present invention is especially beneficial in such circumstances.

The method of the first and second aspects of the invention may provide a granular composition that further comprises one or more additives selected from the group consisting of a flavourant, a stimulant, an active ingredient and a stabiliser. Thus, the method of the first and second
25 aspects of the invention may include a step of admixing one or more additives selected from the group consisting of a flavourant, a stimulant, an active ingredient and a stabiliser in step (i) and/or step (ii). Suitably, when one or more additives are present, the one or more additives may be admixed with the first suspension in step (ii) of the method.

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The third aspect of the present invention provides a granular composition obtained or obtainable according to the method of any preceding claim.

The fourth aspect of the present invention provides a shaped substrate for use in an aerosol
35 generating device, wherein the shaped substrate is formed from a granular composition obtained or obtainable by the method of the first or second aspect of the invention.

The fifth aspect of the present invention provides a method of producing a shaped substrate according to the fourth aspect of the invention, wherein the method comprises placing the

granular composition into a shaped mould and applying heat and/or pressure to form the shaped substrate.

5 The shaped substrate may have any suitable shape, such as a rod shape or a flat shape (such as a sheet). A specific shape may be desirable to fit the aerosol generating article. The shaped substrate may be in the form of a flat shape consumable. The shaped substrate may comprise grooves and/or recesses on at least one side thereof. The grooves and/or recesses may extend from a first edge to a second edge of the substrate. The shaped substrate may be air permeable. The shaped substrate may be referred to as an aerosol generating substrate and may provide
10 an inhalable aerosol upon heating to a suitable temperature, such as a temperature ranging from 150°C to 450°C, preferably ranging from 200°C to 400°C, more preferably ranging from 250°C to 350°C, even more preferably from 290°C to 350°C or between 290°C to 350°C. For example, the suitable temperature may be of about 230°C, 250°C, 270°C, 290°C, 300°C, 310°C, 330°C or 350°C. Thus, the shaped substrate may be referred to as an aerosol releasing substrate or a
15 granular aerosol releasing substrate. The inhalable aerosol comprises the tobacco particles for inhalation by a consumer in use. The shaped substrate can be easily filled into a chamber, such as a heating chamber, of an aerosol generating device.

The substrate may be pressed into a mould of a desired shape by press forming at a suitable
20 temperature and/or pressure. A suitable pressure for forming the shaped substrate may be from 1 bar to 50 bar, or between 1 bar and 50 bar. This pressure range may form the substrate whilst maintaining pores which are necessary to release aerosol. A suitable pressure may be greater than 1 bar, for example greater than 3 bar, typically greater than 5 bar. A suitable pressure may be less than 50 bar, for example less than 30 bar, typically less than 20 bar. A suitable
25 temperature for forming the shaped substrate may be from 60°C to 200°C, or between 60°C and 200°C. Such a temperature is high enough to soften the substrate, but low enough to prevent premature loss of aerosol. A suitable temperature may be above 60°C, for example above 80°C, typically above 90°C. A suitable temperature may be below 200°C, for example below 160°C, typically below 130°C. Suitably, the temperature used may be from 100°C to 110°C or between
30 100°C and 110°C.

The granular composition may alternatively be used to form a reconstituted tobacco paper sheet or tobacco cast sheet. The obtained tobacco paper sheet or the tobacco cast sheet may then be shredded. The obtained shredded tobacco may then be used to prepare a tobacco rod
35 substrate or a tobacco flat shape substrate.

The sixth aspect of the invention provides an aerosol generating article for use in an aerosol generating device, wherein the aerosol generating article comprises a shaped substrate according to the fourth aspect of the invention.

The aerosol generating article may be any article suitable to be used in an aerosol generating device. The aerosol generating article may house the shaped substrate according to the fourth aspect of the invention. The aerosol generating article may be replaceable.

5

The aerosol generating article may extend between a distal end (also referred to as the upstream end) and a proximal end (also referred to as the downstream end). The aerosol generating article may comprise an upstream segment that comprises the shaped substrate according to the fourth aspect of the invention located at an upstream end of the aerosol generating article and a downstream segment located at a downstream end of the aerosol generating article. The downstream segment may comprise a support unit, a cooling segment, a filter element, or a combination thereof. The upstream segment and the downstream segment may be wrapped together with a least one wrapping element. The wrapping element may be air permeable. The wrapping element may further comprise at least one ventilation zone to improve the air permeability of the wrapping element if necessary. Suitably, the wrapping element is a paper wrapper. The aerosol generating article may be inserted into an aerosol generating device.

References herein to an aerosol generating device may include any type of aerosol generating device known to a person skilled in the art. In general, the term “aerosol generating device”, “electronic cigarette”, “e-cigarette” or “low temperature vaporization device”, refers to an electronic inhaler that generates an aerosol from a substrate. An aerosol generating device comprises a body and a rechargeable battery. The body comprises a heating chamber for receiving an aerosol generating article during use. Depending on the structure of the aerosol generating article, the body may further comprise a mouthpiece element.

25

The seventh aspect of the invention provides an aerosol generating system comprising an aerosol generating article according to the sixth aspect of the invention; and an aerosol generating device comprising a heating chamber for receiving (for example in use) the aerosol generating article.

30

The heating chamber may comprise any suitable heater for heating the aerosol generating article (and substrate) and to produce an inhalable aerosol. The heating chamber acts to heat, but not burn, the tobacco particles in the aerosol generating article or substrate. The aerosol generating device may be an electronic cigarette, particularly a “heat-not-burn” system or product.

35

The heating chamber may comprise a resistive or inductive heater. The heating chamber may further comprise a heat transfer element that absorbs heat from the heater and transfers it to the substrate.

The aerosol generating device may further comprise one or more components selected from a battery, a mouthpiece, a microcontroller, a pressure/flow sensitive switch and/or combinations thereof.

- 5 The eighth aspect of the invention provides a use of an aerosol generating article according to the sixth aspect of the invention to generate an inhalable aerosol in an aerosol generating device.

10 The ninth aspect of the invention provides a method of generating an inhalable aerosol, the method comprising:

- providing an aerosol generating system according to the seventh aspect of the invention; and
- forming an inhalable aerosol by heating the aerosol generating article within the heating chamber.

15

The aerosol generating article may be heated to any suitable temperature to generate the inhalable aerosol, such as a temperature ranging from 150°C to 450°C, preferably ranging from 200°C to 400°C, more preferably ranging from 250°C to 350°C, even more preferably ranging from 290°C to 350°C. For example, a suitable temperature may be of about 230°C, 250°C, 20 270°C, 290°C, 300°C, 310°C, 330°C, or 350°C.

For a better understanding of the invention, and to show how exemplary embodiments of the same may be brought into effect, reference will be made to the following non-limiting examples.

25 **Examples**

The following examples were prepared on a 15 kg scale.

30 A reference suspension comprising humectant, gelling agent and water was prepared based on a reference process, in which the humectant and water were first mixed, followed by the addition of gelling agent. The weight ratio [humectant:gelling agent] in the reference suspension was from 4:1 to 7:1. The weight ratio [gelling agent:water] in the reference suspension was ranging from 2:1 to 1:1.

35 A first suspension comprising humectant and gelling agent was then prepared based on the process of the present invention, i.e. wherein the humectant and gelling agent were mixed in the absence of water. The weight ratio [humectant:gelling agent] in the first suspension was from 4:1 to 7:1. After the first suspension was prepared, water was added. The weight ratio [gelling agent:water] in the reference suspension was from 2:1 to 1:1.

The reference suspension was prepared as follows:

5 (i) humectant and water were added to a mixing bowl of a BEBA mixer and mixed under the following conditions:

- mixing speed dissolver: 1200 rpm
- mixing speed: 120 rpm
- pod speed: step 2
- mixing time: 5 minutes

10

(ii) the gelling agent was then added to the mixture in (i) and mixed under the following conditions:

- mixing speed dissolver: 1200 rpm
- mixing speed: 120 rpm
- 15 • pod speed: step 2
- mixing time: 5 minutes

The gelling agent aggregated/clumped in the mixture and so further processing of the mixture was not possible.

20

The first suspension was prepared as follows:

(i) Humectant was added to a mixing bowl of a BEBA mixer and mixed under the following conditions:

- mixing speed dissolver: 1200 rpm
- 25 • mixing speed: 120 rp
- pod speed: step 2
- mixing time: 5 minutes

30 (ii) The gelling agent was then added to the humectant in (i) and mixed under the following conditions:

- mixing speed dissolver: 1200 rpm
- mixing speed: 120 rpm
- pod speed: step 2
- mixing time: 5 minutes

35

No aggregation or clumping of the gelling agent was observed in the first suspension.

(iii) Water was then added to the mixture in (ii) and mixed under the following conditions:

- mixing speed dissolver: 1200 rpm

- mixing speed: 120 rpm
- pod speed: step 2
- mixing time: 5 minutes

5 No aggregation or clumping of the first suspension mixed with water was observed.

Throughout this specification, the term “comprising” or “comprises” means including the component(s) specified but not to the exclusion of the presence of other components. The term “consisting essentially of” or “consists essentially of” means including the components specified
10 but excluding other components except for materials present as impurities, unavoidable materials present as a result of processes used to provide the components, and components added for a purpose other than achieving the technical effect of the invention. Typically, when referring to compositions, a composition consisting essentially of a set of components will comprise less than 5% by weight, typically less than 3% by weight, more typically less than 1%
15 by weight of non-specified components.

The recitation of numerical ranges by endpoints includes all integer numbers and, where appropriate, fractions subsumed within that range (e.g. 1 to 5 can include 1, 2, 3, 4 when referring to, for example, a number of elements, and can also include 1.5, 2, 2.75 and 3.80, when referring
20 to, for example, measurements). The recitation of end points also includes the end point values themselves (e.g. from 1.0 to 5.0 includes both 1.0 and 5.0). Any numerical range recited herein is intended to include all sub-ranges subsumed therein.

For the avoidance of doubt, wherein amounts of components in a composition are described in
25 wt%, this means the weight percentage of the specified component in relation to the whole composition referred to. For example, “the granular composition may comprise the tobacco particles in an amount of from 25 to 60 wt%” means that 25 wt% to 60 wt% of the granular composition is provided by the tobacco particles.

30 As used in the specification and the appended claims, the singular forms “a”, “an,” and “the” include both singular and plural referents unless the context clearly dictates otherwise.

The optional features set out herein may be used either individually or in combination with each other where appropriate and particularly in the combinations as set out in the accompanying
35 claims. The optional features for each aspect or exemplary embodiment of the invention as set out herein are also to be read as applicable to any other aspect or exemplary embodiments of the invention, where appropriate. In other words, the skilled person reading this specification should consider the optional features for each exemplary embodiment of the invention as interchangeable and combinable between different exemplary embodiments.

Attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated
5 herein by reference.

All of the features disclosed in this specification (including any accompanying claims, and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are
10 mutually exclusive.

Each feature disclosed in this specification (including any accompanying claims, and drawings) may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is
15 one example only of a generic series of equivalent or similar features.

The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any accompanying claims, and drawings), or to any novel one, or any novel
20 combination, of the steps of any method or process so disclosed.

Claims

1. A method of producing a granular composition for use in an aerosol generating device, wherein the granular composition comprises tobacco particles, a humectant, a gelling agent, a
5 binder and water, and wherein the method comprises steps:
 - (i) combining the gelling agent and the humectant substantially in the absence of water to form a first suspension;
 - (ii) admixing the tobacco particles, the binder and the water with the first suspension to form a second suspension; and
10 (iii) producing the granular composition from the second suspension.
2. A method according to claim 1, wherein the granular composition comprises two or more humectants and step (i) further comprises pre-mixing the two or more humectants prior to combining with the gelling agent to form the first suspension.
15
3. A method according to any preceding claim, wherein step (i) is carried out in a first vessel and step (ii) is carried out in a second vessel, and wherein the first vessel has a smaller capacity than the second vessel.
- 20 4. A method according to any preceding claim, wherein in step (ii) the binder is added continuously.
5. A method according to any of claims 1 to 4, wherein in step (ii) the tobacco particles, the binder and the water are each separately admixed with the first suspension.
25
6. A method according to any preceding claim, wherein the granular composition comprises less than 20 wt% of water.
7. A method according to any preceding claim, wherein the method is a batch method which
30 produces the granular composition in an amount of at least 10 kg per batch, for example of at least 15 kg per batch.
8. A method according to any preceding claim, wherein the granular composition further comprises one or more additives selected from the group consisting of a flavourant, a stimulant,
35 an active ingredient and a stabiliser.
9. A granular composition obtained or obtainable according to the method of any preceding claim.

10. A shaped substrate for use in an aerosol generating device, wherein the shaped substrate is formed from a granular composition obtained or obtainable by the method of any of claims 1 to 8.
- 5 11. A method of producing a shaped substrate according to claim 10, wherein the method comprises placing the granular composition into a shaped mould and applying heat and/or pressure to form the shaped substrate.
- 10 12. An aerosol generating article for use in an aerosol generating device, wherein the aerosol generating article comprises a shaped substrate according to claim 10.
- 15 13. An aerosol generating system comprising an aerosol generating article according to claim 12; and an aerosol generating device comprising a heating chamber for receiving the aerosol generating article.
- 20 14. Use of an aerosol generating article according to claim 12 to generate an inhalable aerosol in an aerosol generating device.
- 15 15. A method of generating an inhalable aerosol, the method comprising:
- 20 - providing an aerosol generating system according to claim 13; and
- forming an inhalable aerosol by heating the aerosol generating article within the heating chamber.

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2024/058356

A. CLASSIFICATION OF SUBJECT MATTER INV. A24B15/14 A24B15/16 A24B15/28 ADD.		
According to International Patent Classification (IPC) or to both national classification and IPC		
B. FIELDS SEARCHED Minimum documentation searched (classification system followed by classification symbols) A24B A24F A24D Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) EPO-Internal, WPI Data		
C. DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 2021/094365 A1 (JT INT SA [CH]) 20 May 2021 (2021-05-20)	1 - 15
Y	page 11, line 1 - line 16; claims 1-22; figure 1; examples 1,2 page 1, line 3 - line 9 page 2, line 25 - page 5 page 7, line 20 - line 26 page 10, line 14 - line 17 -----	1 - 15
X	CN 113 576 020 A (CHINA TOBACCO YUNNAN IND CO LTD) 2 November 2021 (2021-11-02)	1 - 10, 12 - 15
Y	paragraph [0028] - paragraph [0030]; claims 1-10; examples 3, comparative example 1 paragraph [0002] - paragraph [0008] paragraph [0017] - paragraph [0030] ----- - / - -	1 - 15
☒ Further documents are listed in the continuation of Box C. ☒ See patent family annex.		
* Special categories of cited documents : "A" document defining the general state of the art which is not considered to be of particular relevance "E" earlier application or patent but published on or after the international filing date "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified) "O" document referring to an oral disclosure, use, exhibition or other means "P" document published prior to the international filing date but later than the priority date claimed "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention "X" document of particular relevance;; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone "Y" document of particular relevance;; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art "&" document member of the same patent family		
Date of the actual completion of the international search 30 May 2024		Date of mailing of the international search report 14/06/2024
Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016		Authorized officer Kirchhoff, Eva

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2024/058356

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 4 115 747 A1 (JAPAN TOBACCO INC [JP]) 11 January 2023 (2023-01-11) paragraph [0001] paragraph [0006] paragraph [0012] - paragraph [0014] paragraph [0019] paragraph [0021] paragraph [0024] - paragraph [0026] paragraph [0030] - paragraph [0035] paragraph [0041] paragraph [0049] - paragraph [0053] paragraph [0074] - paragraph [0092] paragraph [0103] - paragraph [0104] paragraph [0111] paragraph [0155] - paragraph [0159]; figures 1-8; example 6 -----	1 - 15
A	WO 2021/224603 A1 (NICOVENTURES TRADING LTD [GB]) 11 November 2021 (2021-11-11) the whole document -----	1 - 15
A	US 2023/021974 A1 (MOHSENI FARHANG [CH] ET AL) 26 January 2023 (2023-01-26) paragraph [0215] - paragraph [0222] paragraph [0358] - paragraph [0364] -----	1 - 15

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

PCT/EP2024/058356

Patent document cited in search report			Publication date		Patent family member(s)		Publication date	
WO 2021094365	A1	20-05-2021	CN	114667068	A		24-06-2022	
			EP	4057844	A1		21-09-2022	
			JP	2023501138	A		18-01-2023	
			KR	20220099964	A		14-07-2022	
			TW	202126192	A		16-07-2021	
			US	2022386681	A1		08-12-2022	
			WO	2021094365	A1		20-05-2021	

CN 113576020	A	02-11-2021	CN	113576020	A		02-11-2021	
			WO	2023011003	A1		09-02-2023	

EP 4115747	A1	11-01-2023	EP	4115747	A1		11-01-2023	
			JP	7362891	B2		17-10-2023	
			JP	WO2021177023	A1		10-09-2021	
			WO	2021177023	A1		10-09-2021	

WO 2021224603	A1	11-11-2021	CA	3173500	A1		11-11-2021	
			EP	4146018	A1		15-03-2023	
			JP	2023523911	A		08-06-2023	
			KR	20230005379	A		09-01-2023	
			US	2023165298	A1		01-06-2023	
			WO	2021224603	A1		11-11-2021	

US 2023021974	A1	26-01-2023	BR	112022011580	A2		30-08-2022	
			CN	114845574	A		02-08-2022	
			EP	4076019	A1		26-10-2022	
			JP	2023509362	A		08-03-2023	
			KR	20220116493	A		23-08-2022	
			US	2023021974	A1		26-01-2023	
			WO	2021122451	A1		24-06-2021	
