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

(72) Inventor: **SPIELES, Sandra**; Am Bildstock 56, 54294 Trier (DE).

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

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(54) Title: AEROSOL GENERATING TOBACCO SUBSTRATE

(57) Abstract: An aerosol generating substrate for use in an aerosol generating article, wherein the aerosol generating substrate comprises: a) a first solid composition (a) comprising tobacco or a derivative thereof, a humectant, a first gelling agent, and a first binding agent; and b) a second solid composition (b) comprising a flavourant, a second gelling agent and one or more additives selected from a second binding agent, an emulsifier and a filler, wherein the first solid composition (a) is granular and wherein the second solid composition (b) is present as a distinct phase on and/or within composition (a).

Aerosol generating tobacco substrate

Field

The present invention relates to an aerosol generating substrate. The present invention also relates to an aerosol generating article comprising an aerosol generating substrate, and an aerosol generating system comprising the aerosol generating article and an aerosol generating device. The present invention also relates to uses of, and methods of producing, an aerosol generating substrate and methods of generating an inhalable aerosol using an aerosol generating substrate.

Background

Electronic cigarettes (e-cigarettes) are a widespread alternative to traditional cigarettes. Many e-cigarettes (or similar devices like electronic pipes) generate an aerosol by heating a liquid containing a flavourant, an aerosol forming agent and optionally nicotine. However, these e-cigarettes and similar devices can provide an uneven smoking profile and can lack the distinctive flavours of tobacco. Therefore, such devices are not ideal alternatives to traditional burned tobacco products.

As an alternative, various devices and systems are available that heat (instead of burning) a tobacco containing aerosol generating substrate to release aerosol (i.e. vapour) for inhalation by a consumer. These devices and systems may be referred to as “heat-not-burn” and they provide tobacco-based vapor by heating tobacco containing substrates.

To further improve the taste variety of known aerosol generating substrates that are used in heat-not-burn products, it is desirable to add flavours. Flavour is typically added by applying liquid flavour concentrates (for example via a spray nozzle) either during primary tobacco processing or via on-line flavour addition at the cigarette factory. Sometimes, aerosol generating substrates also need to be further heated to be shaped and the application of heat can degrade and/or evaporate the flavour. Furthermore, liquid flavours can leak during the shaping process.

The flavour can alternatively be sprayed onto the substrate after moulding. This method of application also has issues, as it requires additional equipment, and the flavour is only deposited on the surface and not properly transferred into the substrate. When the flavour is deposited only on the substrate surface, the flavour may be in direct contact with the heater, which can cause an uneven vapour profile and negatively affect the vaping experience.

There is therefore a need to provide effective aerosol generating substrates with improved flavouring, for example which reduce flavour loss and/or degradation during processing. This, in turn would improve the vaping experience for the consumer when used in an aerosol generating system such as a heat-not-burn device.

It is one aim of the present invention, amongst others, to provide an aerosol generating substrate that addresses at least one disadvantage of the prior art, whether identified here or elsewhere, or to provide an alternative to existing aerosol generating substrates.

Summary of the Invention

According to aspects of the present invention there are provided: an aerosol generating substrate; a method for producing an aerosol generating substrate; an aerosol generating article comprising the aerosol generating substrate; an aerosol generating system comprising the aerosol generating article and an aerosol generating device; the use of an aerosol generating substrate in an aerosol generating system; and a method of generating an inhalable aerosol using the aerosol generating system.

According to the first aspect of the present invention, there is provided an aerosol generating substrate for use in an aerosol generating article, wherein the aerosol generating substrate comprises:

a) a first solid composition (a) comprising tobacco or a derivative thereof, a humectant, a first gelling agent, and a first binding agent; and

b) a second solid composition (b) comprising a flavourant, a second gelling agent and one or more additives selected from a second binding agent, an emulsifier and a filler,

wherein the first solid composition (a) is granular and wherein the second solid composition (b) is present as a distinct phase on and/or within composition (a).

According to the second 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 an upstream segment comprising an aerosol generating substrate according to the first aspect located at an upstream end of the aerosol generating article and a downstream segment located at a downstream end of the aerosol generating article.

According to the third aspect of the present invention, there is provided use of the second solid composition (b) in the aerosol generating substrate according to the first aspect to increase the stability of the flavourant in the aerosol generating substrate and/or to slow the release of the flavourant from the aerosol generating substrate.

According to the fourth aspect of the present invention, there is provided an aerosol generating system, comprising an aerosol generating article according to the second aspect; and an aerosol generating device comprising a heating chamber for receiving in use the aerosol generating article.

According to the fifth aspect of the present invention, there is provided a method of producing an aerosol generating substrate according to the first aspect, the method comprising contacting the first solid composition (a) and the second solid composition (b), placing the contacted compositions into a mould and applying heat and/or pressure to form the substrate.

According to the sixth aspect of the present invention, there is provided a method of generating an inhalable aerosol, the method comprising:

(i) providing an aerosol generating system according to the fourth aspect; and

(ii) forming an inhalable aerosol by applying heat to the aerosol generating article.

Other features of the invention will be apparent from the dependent claims, and from the description which follows.

Features described in relation to the second, third, fourth, fifth and sixth aspects may have any of the suitable features and advantages described in relation to the first aspect.

Detailed Description of the Invention

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

According to, a first aspect of the invention, there is provided an aerosol generating substrate for use in an aerosol generating article, wherein the aerosol generating substrate comprises:

a) a first solid composition (a) comprising tobacco or a derivative thereof, a humectant, a first gelling agent, and a first binding agent; and

b) a second solid composition (b) comprising a flavourant, a second gelling agent and one or more additives selected from a second binding agent, an emulsifier and a filler,

wherein the first solid composition (a) is granular and wherein the second solid composition (b) is present as a distinct phase on and/or within composition (a).

The aerosol generating substrate of the first aspect of the invention is suitable for use in an aerosol generating article. The substrate 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 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. The inhalable aerosol comprises the tobacco or a derivative thereof and the flavourant.

As used herein, the term “aerosol” may include a suspension of vaporizable material as one or more of: solid particles; liquid droplets; gas. Said suspension may be in a gas including air. Aerosol herein may generally refer to/include a vapour. The aerosol may include one or more components of the aerosol generating substrate.

The aerosol generating substrate of the first aspect of the invention comprises a first solid composition (a) and a second solid composition (b). The first solid composition is granular, by which it is meant that the first solid composition is comprised of granules. The granular nature of the first solid composition provides air-permeability and a large surface area for effective and even aerosol generation.

By "granular", we mean that the components are present in the composition (a) 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.

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 second solid composition (b) is present as a distinct phase on and/or within the first solid composition (a). The second solid composition (b) may be present in an amount ranging from 1 to 15 wt%, preferably ranging from 2 to 12 wt%, more preferably ranging from 3 to 10 wt%, even more preferably ranging from 4 to 8 wt%, based on the total weight of the first solid composition. Alternatively, the weight ratio of the second solid composition to the first solid composition may be from 1:99 to 15:85, for example from 2:98 to 12:88, preferably from 3:97 to 10:90, even more preferably from 6:94 to 8:92.

The phrase “distinct phase” as used herein refers to the presence of a discrete boundary between different chemical compositions. In other words, the compositions (a) and (b) exist as separate solid entities within the aerosol generating substrate. Within the aerosol generating substrate, this inevitably results in a heterogeneous mixture. This is advantageous as it allows for control over the flavour distribution within the substrate, and thus improves the consumer experience.

References herein to a solid composition refer to compositions that are in the solid state under normal atmospheric conditions (i.e. at a pressure of 1 atmosphere and 298 K). Compositions (a) and (b) are both solid compositions and all references herein to compositions (a) and (b) refer to solid compositions.

The inventors have surprisingly found that using a second solid composition (b) comprising a flavourant as a distinct phase on and/or within composition (a) in the aerosol generating substrate of the present invention allows for introduction of flavourants without the disadvantages of the prior art. The second solid composition (b) releases a flavourant into the aerosol (i.e. vapour) upon heating in the device but has a greater tolerance to the heat used during processing. Furthermore, combining the second composition with the first composition may allow for additional control of the flavourant release profile by placing the second solid composition (b) on and/or within the first composition (a) in different forms (e.g. as a thin film and/or as microchips) and by varying distribution within the aerosol releasing substrate.

The first solid composition (a) comprises tobacco or a derivative thereof, a humectant, a first gelling agent, and a first binding agent. The second solid composition (b) comprises a flavourant, a second gelling agent and one or more additives selected from a second binding agent, an emulsifier and a filler.

The first and second solid compositions (a) and (b) may be prepared by any suitable method, which would be well known to persons skilled in the art. For example, the first composition may be prepared as described in WO2021/094366 and/or WO2021/094365. Suitably, the first solid composition (a) may be prepared by at least:

1) forming a mixture by mixing at least tobacco or a derivative thereof, a first binding agent, a first gelling agent and a humectant;

2) forming a granular composition from the mixture.

The second solid composition (b) may, for example, be prepared as described in EP2682007 and/or EP2682008. Suitably, the second solid composition (b) may be prepared by at least:

1) forming a mixture by mixing at least a flavourant, a second gelling agent and one or more additives selected from a second binding agent, an emulsifier and a filler;

2) extending the mixture on a substrate;

3) cooling and drying (for example heat-drying) the extended mixture to form a solid composition; and

4) optionally cutting and/or shredding the dried extended slurry

The first solid composition (a) of the first aspect comprises tobacco or a derivative thereof.

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

A suitable form of tobacco or a derivative thereof may be shredded and/or ground and may have a particle size (Dv90) greater than 100 µm or greater than 200 µm, for example greater than 400 µm, or greater than or equal to 500 µm. A suitable form tobacco or a derivative thereof may have a particle size smaller than 1000 µm or smaller than 900 µm, for example, smaller than 800 µm or smaller than 700 µm, for example smaller than or equal to 600 µm. A typical form of tobacco or a derivative thereof may have a particle size from 100 µm to 1000 µm, for example from 400 µm to 700 µm, suitably from 500 µm to 600 µm.

The tobacco or a derivative thereof may be present in the first solid composition in any suitable amount. Preferably, the tobacco or a derivative thereof may be present in an amount greater than 5 wt%, preferably greater than 10 wt%, more preferably greater than 20 wt%, based on the total weight of the first solid composition and/or in an amount less than 70 wt%, preferably less than 60 wt%, more preferably less than 40 wt%, based on the total weight of the first solid composition. Preferably, the tobacco or a derivative thereof may be present in an amount from 30 wt% to 55 wt% based on the total weight of the first solid composition. Preferably, the tobacco or a derivative thereof may be present in an amount from 30 wt% to 40 wt% based on the total weight of the first solid composition.

The second solid composition (b) of the first aspect may optionally comprise tobacco or a derivative thereof. Preferably, the second solid composition (b) may be substantially free, or completely free, of tobacco or a derivative thereof.

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.

The first solid composition (a) of the first aspect comprises a 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. The first solid composition (a) may comprise any suitable humectant and may comprise two or more humectants.

Examples of suitable humectants include, but are not limited to, glycerol, propylene glycol, ethanol, isopropanol, butanol and derivatives thereof (such as isomers of butanol), sebacate esters (such as di-2-ethylhexyl sebacate) and/or mixtures thereof. Suitably, the humectant may comprise a combination of two or more humectants. Suitably, the first solid composition (a) of the first aspect may comprise a humectant selected from glycerol, propylene glycol, ethanol and/or mixtures thereof. Suitably, the first solid composition (a) of the first aspect may comprise a humectant selected from glycerol or propylene glycol and/or mixtures thereof. Preferably, the first solid composition (a) of the first aspect may comprise a humectant comprising a mixture of glycerol and propylene glycol. When the humectant comprises a mixture of glycerol and propylene glycol, these may be present in a weight ratio of from 80:20 and 20:80 or between 80:20 and 20:80, suitably from 70:30 to 30:70 or between 70:30 and 30:70. Typically, the amount of glycerol present may be greater than the amount of propylene glycol.

The humectant may be present in the first solid composition (a) in any suitable amount, such as in an amount from 5 wt% to 70 wt%, suitably from 10 wt% to 60 wt%, more suitably from 15 wt% to 50 wt%, for example from 25 wt% to 45 wt%, for example from 35 wt% to 45 wt%, based on the total weight of the first solid composition.

The first and second compositions of the first aspect each independently comprise a gelling agent (referred to as the “first gelling agent” and “second gelling agent” respectively). The term “gelling agent” as used herein refers to a compound providing viscoelasticity to the substrate, i.e. producing a non-flowable gel. The first and second solid compositions may comprise any suitable gelling agents and may comprise two or more gelling agents. The first and second solid compositions may comprise the same or different gelling agents.

Suitable gelling agents include non-protein-containing polysaccharides. Typically, the first and second gelling agents of the first aspect may be independently selected from 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 and/or mixtures thereof. Suitably, the first and second gelling agents may be independently selected from gellan gum, lecithin, agar and/or mixtures thereof. More suitably, the first and second gelling agents may be independently selected from gellan gum, agar and/or mixtures thereof. Examples of suitable commercially available gelling agents include gellan gum Roeper 700f (from C.E Roeper GmbH).

The first gelling agent may be present in the first solid composition (a) in any suitable amount, such as in an amount less than 35 wt%, for example less than 30 wt%, less than 25 wt%, less than 20 wt%, less than 15 wt%, less than 12 wt%, or less than 8 wt% and/or greater than 1 wt%, for example greater than 4 wt% based on the total weight of the first solid composition. For

example, the first gelling agent may be present in the first solid composition (a) in an amount from 1 wt% to 35 wt%, suitably from 4 wt% to 30 wt%, based on the total weight of the first solid composition.

The second gelling agent may be present in the second solid composition (b) in any suitable amount, such as in an amount less than 35 wt%, for example less than 30 wt%, less than 25 wt%, less than 20 wt%, less than 15 wt%, less than 12 wt%, or less than 8 wt% and/or greater than 1 wt%, for example greater than 4 wt% based on the total weight of the second solid composition. For example, the second gelling agent may be present in the second solid composition (b) in an amount from 1 wt% to 35 wt%, suitably from 4 wt% to 30 wt%, based on the total weight of the first solid composition.

The first composition of the first aspect comprises a binding agent (referred to as the "first binding agent"). The second composition of the first aspect may independently comprise a binding agent (referred to as the "second binding agent"). The term "binding agent" as used herein refers to a compound used to increase the viscosity of the substrate while retaining flowability. The first and second solid compositions may comprise any suitable binding agents and may each comprise two or more binding agents. The first and second solid compositions may comprise the same or different binding agents.

Suitable binding agents include cellulose derivatives (for example hydroxyalkylated cellulose, carboxyalkyl cellulose), modified starches and xanthan gum. Typically, the first and second binding agents of the first aspect may be independently selected from carboxymethylcellulose, hydroxypropylcellulose, modified starch, agar, gellan gum, xanthan gum and/or mixtures thereof. Suitably, the first and second binding agents may be independently selected from carboxymethylcellulose, hydroxypropylcellulose and/or mixtures thereof. A preferred first binding agent of the first aspect is purified carboxymethylcellulose, such as Ceroga 4550 C or CEKOL® 2000 (available from C.E. Roeper GmbH).

The first binding agent may be present in the first solid composition (a) in any suitable amount, such as in an amount less than 35 wt%, for example less than 30 wt%, less than 25 wt%, less than 20 wt%, or less than 15 wt% and/or greater than 1 wt%, for example greater than 5 wt%, or greater than 10 wt% based on the total weight of the first solid composition. For example, the first binding agent may be present in the first solid composition (a) in an amount from 1 wt% to 35 wt%, suitably from 5 wt% to 30 wt%, based on the total weight of the first solid composition.

When the second solid composition (b) comprises a second binding agent, it may be present in any suitable amount, such as in an amount less than 35 wt%, for example less than 30 wt%, less than 25 wt%, less than 20 wt%, or less than 15 wt% and/or greater than 1 wt%, for example

greater than 5 wt%, or greater than 10 wt%, based on the total weight of the second solid composition. For example, when present, the second gelling agent may be present in the second solid composition (b) in an amount from 1 wt% to 35 wt%, suitably from 4 wt% to 30 wt%, based on the total weight of the first solid composition.

The second solid composition (b) of the first aspect comprises a flavourant. The term “flavourant” as used herein refers to a compound (or mixture of compounds) that provide a flavour, i.e. to provide a flavour to an aerosol that is generated from the aerosol generating substrate. A “flavourant” may alternatively be referred to as a flavour or flavouring.

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 product or e-cigarette and/or mixtures 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), and/or mixtures thereof. Preferably, the flavourant may be substantially free, or completely free, of tobacco or a derivative thereof.

The flavourant in the second solid composition (b) may be present in any suitable amount and the amount may be determined according to the desired flavour profile. For example, the flavourant in the second solid composition (b) may be present in an amount from 2 to 80 wt% based on the total weight of the second solid composition. The flavourant may be present in the second solid composition (b) in an amount less than 35 wt%, for example less than 30 wt%, suitably less than 25 wt% or less than 20 wt%. Alternatively, the flavourant may be present in the second solid composition (b) in an amount greater than 40 wt%, for example greater than 45 wt%, suitable greater than 50 wt% or greater than 55 wt%. A high or a low content of flavourant in the second composition may be associated with different advantages. For example, a high flavourant content may allow for a strong flavour and consistent flavour. A low flavourant content may allow for a subtle flavouring.

The second solid composition (b) may further comprise a stimulant. 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.

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

The first solid composition (a) of the first aspect may comprise water. For example, the first solid composition (a) may contain less than 20 wt%, for example less than 10 wt%, of water based on the total weight of the first solid composition. The first solid composition (a) may contain greater than 1 wt%, for example greater than 2 wt%, of water based on the total weight of the first solid composition. For example, the first solid composition may comprise from 3 to 9 wt%, such as from 3 to 6 wt%, of water. Preferably, a drying step is not required in the preparation of the first solid composition (a).

The second solid composition (b) may comprise water. For example, the second solid composition may comprise less than 10 wt%, for example less than 9 wt%, suitably less than 6 wt% and/or greater than 1 wt%, for example greater than 3 wt%, of water based on the total weight of the second solid composition. For example, the second solid composition may comprise from 3 to 9 wt%, such as from 3 to 6 wt%, of water.

The second solid composition (b) comprises one or more additives selected from a second binding agent, an emulsifier and a filler. For example, the second solid composition (b) may comprise one of a second binding agent, an emulsifier and a filler, or may comprise two or three or more of a second binding agent, an emulsifier and a filler.

As used herein, the term “emulsifier” refers to a compound (or mixture of compounds) that facilitates formation of an emulsion. Any suitable emulsifier may be used, for example lecithin may be used. A suitable emulsifier may be Sun Lecithin A1 (available from Taiyo Co., Ltd.). Where the second solid composition (b) comprises an emulsifier, the emulsifier may be present in an amount of from 0.005 to 2 wt%, for example from 0.025 to 1.25 wt%, based on the total weight of the second solid composition. Alternatively, the emulsifier may be present in the second solid composition in an amount from 0.5 to 5.0 wt%, for example 1.0 to 4.5 wt% based on the weight of the second gelling agent in the second solid composition.

As used herein, the term “filler” refers to a compound (or compounds) that increases the total mass (i.e. dry matter mass) of a composition. Preferably, a suitable filler does not affect the flavour of the composition. Any suitable filler may be used, for example a starch hydrolysate may

be used. A starch hydrolysate refers to a substance obtained or obtainable by hydrolysing starch, for example a dextrin or indigestible dextrin. Suitable fillers may include Pinedex #100, Pinefiber and TK-16 (all commercially available from Matsutani Chemical Industry Co., Ltd.). When the second solid composition (b) comprises a filler, the filler may be present in any suitable amount. For example, the filler may be present in an amount of from 5 to 95 wt% based on the total weight of the second solid composition. Alternatively, the filler may be present in the second solid composition in an amount of from 100 to 500 wt% or from 200 to 500 wt% based on the weight of the second gelling agent in the second solid composition.

The first and second solid compositions may contain any other additives typically known to one skilled in the art, such as preservatives (e.g. sodium benzoate) and/or antioxidants (e.g. ascorbic acid).

Some compounds may fulfil multiple roles in a composition, for example lecithin may be included as an emulsifier or a gelling agent. Thus, in some instances, lecithin may be included in the second solid composition (b) as both the second gelling agent and the emulsifier. Preferably, each role is fulfilled by a separate compound, for example, if the second solid composition (b) comprises lecithin as a second gelling agent, it may preferably comprise a further additive as a second binding agent, an emulsifier and/or a filler.

The aerosol generating substrate may be provided in any suitable shape. Suitably, the aerosol generating substrate is a shaped substrate, wherein the shape may be formed by application of heat and/or pressure. Suitably, the substrate has a flat shaped structure (otherwise referred to as a flat shape consumable). A flat shaped structure is useful to maximise aerosol production, and/or to achieve even heating within an aerosol generating device/system. The 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 aerosol generating substrate of the first aspect may be formed into any suitable shape. A specific shape may be desirable to fit the aerosol generating article. This shape may be achieved by any suitable means, for example, the shape may be formed by application of heat and/or pressure. For example, the aerosol generating substrate may be pressed into a mould of a desired shape by press forming at a suitable pressure.

The aerosol generating substrate may be pressed into a mould of a desired shape by press forming at a suitable temperature and/or pressure. A suitable pressure for forming the aerosol generating 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 temperature for forming the aerosol generating 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 100 °C and 110 °C.

The second solid composition (b) of the first aspect of the invention may be provided in various forms. Suitable forms may include films, microchips, granules, and/or combinations thereof.

The term “microchip” as used herein refers to fragments of a film of material. Microchips may be regular or irregular in shape depending on the method of production.

The second solid composition (b) may be in the form of a film. When the second solid composition (b) is in the form of a film, the film may be applied over and to a layer of the first solid composition (a), for example wherein the film is embedded between layers of the first solid composition (a). Suitably, a film of the second solid composition may have a thickness of less than 1 mm. Preferably, a film of the second solid composition may have a thickness of from 0.01 to 0.30 mm, for example from 0.05 to 0.15 mm.

A film of the second solid composition (b) may be produced by any suitable means. A film may be present on and/or within the first solid composition (a) in any configuration. For example, a film may be embedded between layers of the first solid composition (a).

The second solid composition (b) may be in the form of microchips.

Microchips of the second solid composition (b) may be produced by subdivision of a film by any suitable means, for example by cutting, shredding, shattering and/or combinations thereof. Microchips of the second solid composition (b) may have the thickness of the film from which they were produced, for example this may be less than 1 mm. Preferably, microchips of the second solid composition may have a thickness of from 0.01 to 0.30 mm, for example from 0.05 to 0.15 mm. The surface area (of the largest face) of the microchips may be less than 50 mm^2, for example less than 30 mm^2, suitably less than 25 mm^2.

Microchips of the second solid composition (b) may be present in any distribution on and/or within the first solid composition (a). Suitably, the microchips may be evenly distributed on and/or within the first solid composition (a). Such a distribution would improve ease of manufacture and consistency of flavour throughout the substrate. Suitably, the microchips may be unevenly

distributed on and/or within the first solid composition (a). Such a distribution would allow for greater control of the flavour profile and flavour release rate during use. If the microchips are unevenly distributed, any uneven distribution may be used. A preferred uneven distribution is one wherein the microchips are predominantly distributed on and/or within the first solid composition (a) in an area at and/or adjacent to an edge of the substrate. For example, up to 50% by weight of the microchips may be evenly distributed within the first solid composition (a) and at least 50% by weight of the microchips may be distributed on and/or within the first solid composition (a) in an area at and/or adjacent to an edge of the substrate.

The invention may provide an aerosol generating article for use in an aerosol generating device, wherein the aerosol generating article comprises an aerosol generating substrate according to the first aspect of the invention.

The aerosol generating article may be any article suitable to be used in/with an aerosol generating device. The aerosol generating article may house the aerosol generating substrate according to the first aspect. The aerosol generating article may be replaceable.

The aerosol generating article may further comprise a support unit, such that the article (including the support unit) may be inserted into an aerosol generating device. The aerosol generating article may further comprise a filter and/or a cooling chamber.

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, simulating the act of tobacco smoking. In general, an aerosol generating device contains four main components: a mouthpiece, a housing for an aerosol generating article, a heating chamber, and a battery.

According to the second aspect of the invention, there is provided an aerosol generating article for use in an aerosol generating device, wherein the aerosol generating article comprises an upstream segment comprising an aerosol generating substrate according to the first aspect located at an upstream end of the aerosol generating article and a downstream segment located at a downstream end of the aerosol generating article, preferably wherein the downstream segment comprises a support element, a cooling element, a filter element or a combination thereof.

The terms “upstream” and “downstream” as used herein refer to the direction of flow of aerosol though an aerosol generating article/system/device. The downstream end is therefore the end from which aerosol exits the article/system/device and is the end closer to the mouth of the

consumer while in use. The downstream end can equally refer to the proximal end of the aerosol generating article/system/device. The upstream end is the end from which aerosol enters the article/system/device. The upstream end can equally refer to the distal end of an aerosol generating article/system/device.

The arrangement of the aerosol generating article of the second aspect allows aerosol generated at the aerosol generating substrate to be cooled and/or filtered before exiting the device.

The aerosol generating article of the second aspect of the invention may further comprise a wrapper. 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 have a shape that reflects that of the aerosol generating structure, for example it may have a flat shaped structure.

According to the third aspect of the invention, there is provided a use of the second solid composition (b) according to the first aspect to increase the stability of the flavourant in the aerosol generating substrate, improve flavour distribution, and/or to slow the release of the flavourant from the aerosol generating substrate. The use of the second solid composition for these purposes may improve the sensory experience of consuming an aerosol generated using the aerosol generating substrate. References to increasing stability, to improving flavour distribution and to slowing release are intended to mean compared to an aerosol generating substrate which does not comprise a second solid composition as defined herein which is present as a distinct phase on and/or within a solid composition (a).

According to the fourth aspect of the invention, there is provided an aerosol generating system, comprising an aerosol generating article according to the second aspect; and an aerosol generating device comprising a heating chamber for receiving (for example in use) the aerosol generating article.

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 in the aerosol generating article or substrate. The aerosol generating device may be an electronic cigarette, particularly a “heat-not-burn” system or product.

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.

Suitably, in the fourth aspect, the heating chamber of the aerosol generating device comprises a heating element, wherein the heating element is not in direct contact with the second solid composition (b) contained in the aerosol generating article.

An aerosol generating substrate of the first aspect may be produced by any suitable method.

According to the fifth aspect of the invention, there is provided a method of producing an aerosol generating substrate according to the first aspect, the method comprising contacting the first solid composition (a) and the second solid composition (b), placing the contacted compositions into a mould and applying heat and/or pressure to form the substrate.

Suitably, the first and second solid compositions are solid prior to contacting the compositions.

The method of the fifth aspect may include any suitable step of contacting the first solid composition (a) and the second solid composition (b). For example, this may involve mixing the second solid composition (b) into the first solid composition (a). Alternatively, this may involve contacting at least one layer of composition (a) with at least one layer of composition (b), for example in an alternating manner. This may involve a step of placing the contacted compositions into a mould and may include applying heat and/or pressure to shape the substrate. This may alternatively include a step of stamping a desired shaped out of a sheet of substrate. The shape may suitably be a flat shaped structure.

Preferably, the method of the fifth aspect does not include a step of contacting (for example by spraying) a liquid composition with the substrate.

According to the sixth aspect of the invention, there is provided a method of generating an inhalable aerosol, the method comprising:

(i) providing an aerosol generating system according to the fourth aspect; and

(ii) forming an inhalable aerosol by applying heat to the aerosol generating article.

The aerosol generating article many be heated to any suitable temperature to generate the inhalable aerosol, such as a temperature of about 350°C.

Brief Description of the Drawings

Examples of the present disclosure will now be described with reference to the accompanying drawings.

Figure 1 shows a schematic cross-sectional view of an aerosol generating substrate;

Figure 2 shows a schematic cross-sectional view of an aerosol generating substrate; and

Figure 3 shows a schematic cross-sectional view of an aerosol generating substrate.

Figure 1 is a schematic diagram of a flat aerosol generating substrate of the first aspect of the invention. A film (11) of the second solid composition (b) is embedded between layers (10) of the first solid composition (a). The film (11) of the second solid composition (b) is in contact with the layers (11) of the first solid composition, but is present as a distinct phase within the substrate.

Figure 2 is a schematic diagram of a flat aerosol generating substrate of the first aspect of the invention. Microchips (20) of the second solid composition (b) are evenly distributed throughout the first solid composition (a) (10). The microchips (20) of the second solid composition (b) are in contact with the first solid composition (10), but are present as a distinct phase within the substrate.

Figure 3 is a schematic diagram of a flat aerosol generating substrate of the first aspect of the invention. Microchips (20) of the second solid composition (b) are unevenly distributed throughout the first solid composition (a) (10) with at least 50% in the region around the edges of the aerosol generating substrate. The microchips (20) of the second solid composition (b) are in contact with the first solid composition (10), but are present as a distinct phase within the substrate.

When in use in an aerosol generating device, the top and bottom surfaces of the substrate are heated, which provides even heating without direct contact between heating elements and second solid composition (b).

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 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% 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 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 wt%, this means the weight percentage of the specified component in relation to the whole composition referred to. For example, “wherein the aerosol generating substrate comprises from 1 to 15 wt% of tobacco” means that 1 wt% to 15 wt% of the aerosol generating substrate is provided by tobacco.

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 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 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 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 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 combination, of the steps of any method or process so disclosed.

Claims

1. An aerosol generating substrate for use in an aerosol generating article, wherein the aerosol generating substrate comprises:

a) a first solid composition (a) comprising tobacco or a derivative thereof, a humectant, a first gelling agent, and a first binding agent; and

b) a second solid composition (b) comprising a flavourant, a second gelling agent and one or more additives selected from a second binding agent, an emulsifier and a filler,

wherein the first solid composition (a) is granular and wherein the second solid composition (b) is present as a distinct phase on and/or within composition (a).

2. An aerosol generating substrate according to claim 1, which is a shaped substrate and wherein the shape is formed by application of heat and/or pressure.

3. An aerosol generating substrate according to any preceding claim, wherein the substrate has a flat shaped structure.

4. An aerosol generating substrate according to any preceding claim, wherein the second solid composition (b) is substantially free of tobacco.

5. An aerosol generating substrate according to any preceding claim, wherein the second solid composition (b) is in the form of a film, preferably wherein the film is applied over and to a layer of the first solid composition (a), for example wherein the film is embedded between layers of the first solid composition (a).

6. An aerosol generating substrate according to any of claims 1 to 4, wherein the second solid composition (b) is in the form of microchips.

7. An aerosol generating substrate according to claim 6, wherein the microchips are evenly distributed on and/or within the first solid composition (a).

8. An aerosol generating substrate according to claim 6, wherein the microchips are unevenly distributed on and/or within the first solid composition (a), preferably wherein the microchips are predominantly distributed on and/or within the first solid composition (a) in an area at and/or adjacent to an edge of the substrate.

9. An aerosol generating substrate according to claim 6 or 8, wherein up to 50% by weight of the microchips are evenly distributed within the first solid composition (a) and at least 50% by

weight of the microchips are distributed on and/or within the first solid composition (a) in an area at and/or adjacent to an edge of the substrate.

10. An aerosol generating article for use in an aerosol generating device, wherein the aerosol generating article comprises an upstream segment comprising an aerosol generating substrate according to any of the preceding claims located at an upstream end of the aerosol generating article and a downstream segment located at a downstream end of the aerosol generating article, preferably wherein the downstream segment comprises a cooling element, a filter element or a combination thereof.

11. The use of the second solid composition (b) in the aerosol generating substrate according to claim 1 to increase the stability of the flavourant in the aerosol generating substrate, to improve flavour distribution, and/or to slow the release of the flavourant from the aerosol generating substrate.

12. An aerosol generating system, comprising an aerosol generating article according to claim 10; and an aerosol generating device comprising a heating chamber for receiving the aerosol generating article.

13. An aerosol generating system according to claim 12, wherein the heating chamber comprises a heating element and wherein the heating element is not in direct contact with the second solid composition (b) contained in the aerosol generating article.

14. A method of producing an aerosol generating substrate according to any of claims 1 to 9, the method comprising contacting the first solid composition (a) and the second solid composition (b), placing the contacted compositions into a mould and applying heat and/or pressure to form the substrate.

15. A method of generating an inhalable aerosol, the method comprising:

(i) providing an aerosol generating system according to claim 12 or 13; and

(ii) forming an inhalable aerosol by applying heat to the aerosol generating article.

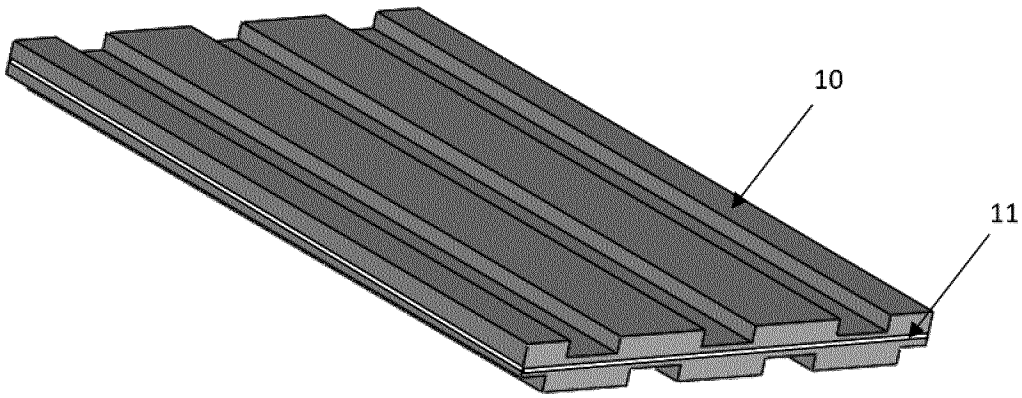


FIGURE 1

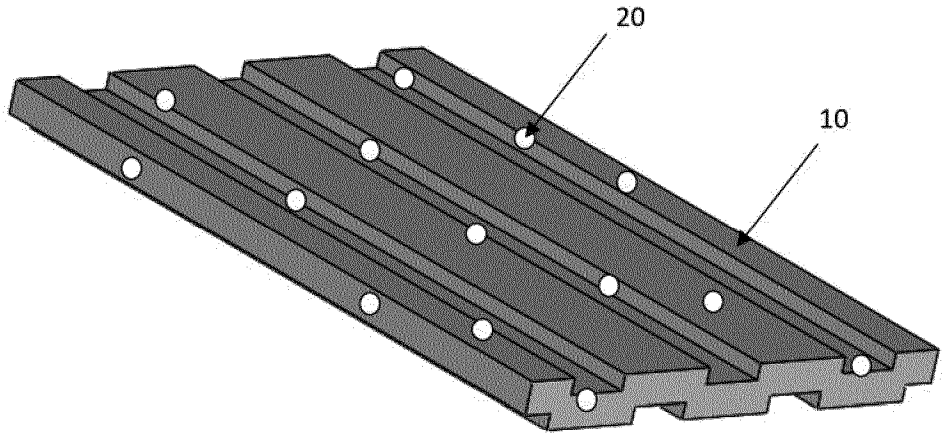


FIGURE 2

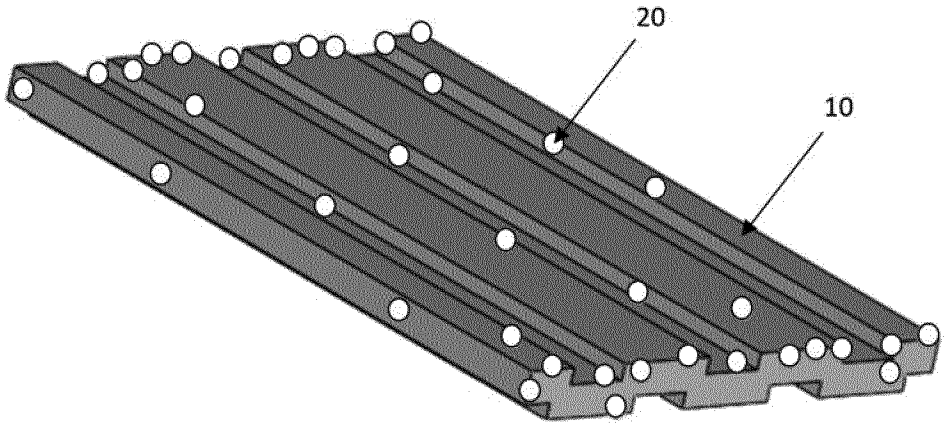


FIGURE 3

INTERNATIONAL SEARCH REPORT

International application No
PCT/EP2024/058350

A. CLASSIFICATION OF SUBJECT MATTER
INV. A24B15/16 A24B15/28 A24B15/14 A24F40/42
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 A24D A24F

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

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X	EP 4 115 747 A1 (JAPAN TOBACCO INC [JP]) 11 January 2023 (2023-01-11)	1-13,15
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[x] Further documents are listed in the continuation of Box C.

[x] 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	Date of mailing of the international search report
29 May 2024	14/06/2024

Name and mailing address of the ISA/	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Kirchhoff, Eva

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International application No
PCT/EP2024/058350

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