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(71) Demandeur/Applicant:
NICOVENTURES TRADING LIMITED, GB
(72) Inventeur/Inventor:
AOUN, WALID ABI, GB
(74) Agent: BERESKIN & PARR LLP/S.E.N.C.R.L.,S.R.L.

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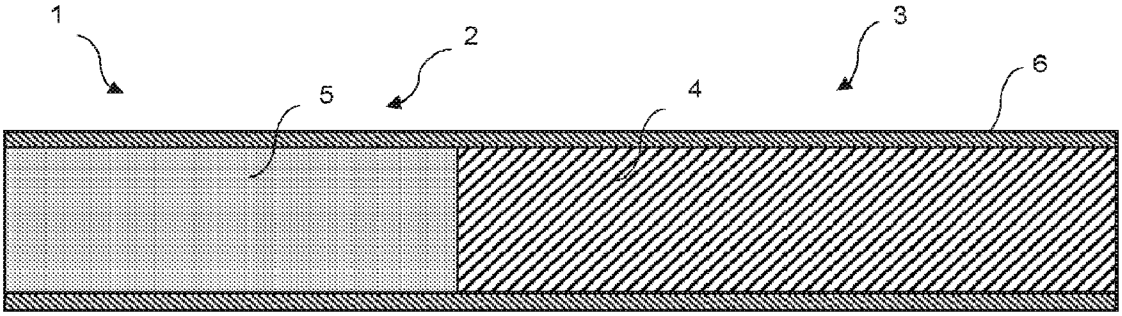

Fig. 1

(57) Abrégé/Abstract:
The invention relates to a combustion retarding material comprising a combustion retarding salt and an amorphous solid material. It also relates to consumables comprising the combustion retarding material, and non-combustible aerosol provision systems comprising such consumables. The invention further relates method for manufacturing the combustion retarding material and the use of a combustion retarding salt and an amorphous material to retard combustion.

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Abstract:

The invention relates to a combustion retarding material comprising a combustion retarding salt and an amorphous solid material. It also relates to consumables comprising the combustion retarding material, and non-combustible aerosol provision systems comprising such consumables. The invention further relates method for manufacturing the combustion retarding material and the use of a combustion retarding salt and an amorphous material to retard combustion.

A combustion retarding material and uses thereof

Field

The invention relates to a combustion retarding material comprising a combustion retarding salt and an amorphous solid material. It also relates to consumables comprising the combustion retarding material, and non-combustible aerosol provision systems comprising such consumables. The invention further relates method for manufacturing the combustion retarding material and the use of a combustion retarding salt and an amorphous material to retard combustion.

Background

Smoking articles such as cigarettes, cigars and the like burn tobacco during use to create tobacco smoke. Attempts have been made to provide alternatives to these articles by creating products that release compounds without combusting. Examples of such products are so-called "heat not burn" products or tobacco heating devices or products, which release compounds by heating, but not burning, smokeable material.

Summary

According to a first aspect of the invention, there is provided a combustion retarding material comprising a combustion retarding salt and an amorphous solid material.

In some embodiments, the combustion retarding salt is an alkali metal salt, optionally selected from the group consisting of: sodium chloride, potassium chloride, sodium bromide, potassium bromide, and combinations thereof.

In some embodiments, the combustion retarding salt is incorporated in the amorphous solid material.

In some embodiments, the combustion retarding salt is applied to the amorphous solid material.

In some embodiments, the combustion retarding material comprises from about 3 wt to about 60 wt% of the combustion retarding salt (dry weight basis).

According to a second aspect of the invention, there is provided a consumable comprising a combustion retarding material according to the first aspect.

In some embodiments, the consumable further comprises an aerosol-generating material.

In some embodiments, the combustion retarding material at least partially surrounds the aerosol-generating material.

In some embodiments, the consumable further comprises a wrapper.

In some embodiments, the combustion retarding material is distributed within the aerosol-generating material.

In some embodiments, the aerosol-generating material comprises tobacco material. In some embodiments, the tobacco material is cut rag tobacco.

In some embodiments, the consumable comprises a binder.

In some embodiments, the consumable is rod shaped.

According to a third aspect of the invention, there is provided a non-combustible aerosol provision system comprising a consumable according to the second aspect.

According to a fourth aspect of the invention, there is provided a method for manufacturing the material according to the first aspect, wherein the combustion retarding salt is incorporated into or added to the amorphous solid material.

In some embodiments, a solution or suspension comprising the combustion retarding salt is applied to the amorphous solid material.

In some embodiments, the combustion retarding salt is added during the manufacture of the amorphous solid material.

According to a fifth aspect of the invention, there is provided use of the material according to the first aspect for retarding combustion of a consumable for use in a non-combustible aerosol provision system.

Brief Description of the Drawings

Embodiments of the invention will now be described, by way of example only, with reference to accompanying drawings, in which:

Figure 1 is a side-on cross sectional view of a first embodiment of a consumable for use with a non-combustible aerosol provision device comprising the combustion retarding material;

Figure 2 is a side-on cross sectional view of a second embodiment of a consumable for use with a non-combustible aerosol provision device comprising the combustion retarding material;

Figure 3 is a perspective illustration of a non-combustible aerosol provision device for generating aerosol from the aerosol-generating material of the consumables of Figure 1 or Figure 2.

Detailed Description

The present invention relates to a combustion retarding material comprising at least one combustion retarding salt and an amorphous solid material.

Combustion retarding salt

The salt used herein is a chemical compound consisting of an ionic assembly of cation and anions. The salts used herein are those whose anion and/or whose cation may be effective in retarding combustion. In some embodiments, the salt is an inorganic salt.

In some embodiments, the salt is a halide salt, i.e. has a halide anion. In some embodiments, the salt is a chloride salt or a bromide salt. The presence of high concentrations of chloride or bromide has been shown to retard combustion, as discussed further below.

In some embodiments, the salt may be an alkali metal salt, i.e. has an alkali metal cation. In some embodiments, the salt has an alkaline earth metal cation. In some embodiments, the salt has a zinc cation or an iron cation, such as a ferric or ferrous cation. In some embodiments, the salt has an ammonium cation or a phosphonium cation.

In some embodiments, the salt may be an alkali metal halide, such as sodium chloride or potassium chloride. The salt may be an alkaline earth metal halide, such as magnesium chloride, calcium chloride. The salt may be another metal halide, such as zinc chloride or sodium bromide.

In some embodiments, the salt has a carboxylate anion. For example, the salt may be an alkali metal carboxylate, such as potassium citrate, potassium succinate, potassium malate, potassium acetate, potassium tartrate, potassium oxalate, sodium citrate, sodium succinate, sodium acetate, or sodium malate.

In other embodiments, the salt has an anion selected from: borate, carbonate, phosphate, sulphate or sulphamate.

Factors that may influence the selection of salt will include, for example, melting point, which will preferably be at least 450°C. In some embodiments, the salt is soluble in water. In some embodiments, the salt is selected to provide a desired pH to the material it is added to. In some embodiments, the salt will not significantly change the pH of the material

In some embodiments, sodium chloride (NaCl) is the salt used. It has been demonstrated that amorphous solid material with a high chloride content is difficult to combust. Further, sodium chloride is neutral, highly soluble and does not affect pH of the amorphous solid material.

The combustion retarding salt may be one salt or a combination of any number of salts disclosed herein or known in the art, and is referred to as “combustion retarding salt” herein. The combustion retarding salt(s) may be advantageously selected to give the combustion retarding material desired characteristics.

In some embodiments, the combustion retarding salt selected may have one or more advantageous properties, such as: inertness, solubility in a precursor liquid, solubility or distribution in the amorphous solid or precursor material to the amorphous solid, density or other properties known in the art.

In some embodiments, the combustion retarding salt comprises, consists essentially of, or consists of sodium chloride, potassium chloride, sodium bromide and/or potassium bromide.

Depending on the combustion retarding or other physical properties desired, the components of the salt may be in free base form, salt form, or as a complex, or as a solvate. The combustion retarding salt may be of any density and any crystalline structure.

In some embodiments, the combustion retarding salt is incorporated into or added to the amorphous solid material dissolved in a solvent or liquid carrier. In some embodiments, the combustion retarding salt is suspended in a liquid carrier. The solvent or liquid carrier may be an aqueous or organic liquid, and may be polar or non-polar depending on its suitable application.

The liquid carrier or precursor solvent may be advantageously selected to be readily removed during the manufacture of the combustion retarding material to leave the combustion retarding salt in or on the amorphous solid material.

In some embodiments, the liquid carrier is a mixture of liquids, including aqueous liquid (water) and non-aqueous liquid (e.g. glycerol). Upon removal of the water following application of the salt, the glycerol will be retained in the amorphous solid material, where it offers flexibility and assists in aerosol formation upon heating.

The amorphous solid material

The combustion retarding material comprises an "amorphous solid material", which may alternatively be referred to as a "monolithic solid" (i.e. non-fibrous). In some embodiments, the amorphous solid material may be a dried gel. The amorphous solid is a solid material that may retain some fluid, such as liquid, within it.

The amorphous solid material may comprise from about 0.1 wt%, 0.5 wt%, 1 wt%, 5 wt%, 10 wt%, 15 wt%, 20 wt% or 25 wt% to about 60 wt%, 50 wt%, 45 wt%, 40 wt% or 35 wt% of a gelling agent (all calculated on a dry weight basis). For example, the amorphous solid may comprise 1-50 wt%, 5-45 wt%, 10-40 wt% or 20-35 wt% of a gelling agent. In some embodiments, the gelling agent comprises a hydrocolloid.

In some embodiments, the gelling agent comprises one or more compounds selected from the group comprising alginates, pectins, starches (and derivatives), celluloses (and derivatives), gums, silica or silicones compounds, clays, polyvinyl alcohol and combinations thereof. For example, in some embodiments, the gelling agent comprises one or more of alginates, pectins, hydroxyethyl cellulose, hydroxypropyl cellulose, carboxymethylcellulose, pullulan, xanthan gum guar gum, carrageenan, agarose, acacia gum, fumed silica, PDMS, sodium silicate, kaolin and polyvinyl alcohol. In some cases, the gelling agent comprises alginate and/or pectin, and may be combined with a setting agent (such as a calcium source) during formation of the amorphous solid. In some cases, the amorphous solid may comprise a calcium-crosslinked alginate and/or a calcium-crosslinked pectin.

In some embodiments, the gelling agent comprises alginate. In a preferred embodiment, the alginate is present in the amorphous solid in an amount of from 1-30 wt% of the amorphous solid (calculated on a dry weight basis). In some embodiments, alginate is the only gelling agent present in the amorphous solid. In other embodiments, the gelling agent comprises alginate and at least one further gelling agent, such as pectin.

In some embodiments the combustion retarding material may comprise an amorphous solid which may include gelling agent comprising carrageenan.

Suitably, the amorphous solid may comprise from about 0.1 wt%, 0.5 wt%, 1 wt%, 3 wt%, 5 wt%, 7 wt%, 10 wt%, 15 wt%, 20 wt%, 25 wt%, 30 wt%, 35 wt% or 40% to about 75 wt%, 70 wt%, 65 wt%, 60 wt%, 55 wt% or 50 wt% of an aerosol-former material (all calculated on a dry weight basis). For example, the amorphous solid may comprise 5-10 wt%, 20-70 wt%, 40-60 wt% or 50-60 wt% of an aerosol-former material.

As used herein, the aerosol-former material may comprise one or more of glycerine, glycerol, propylene glycol, diethylene glycol, triethylene glycol, tetraethylene glycol, 1,3-butylene glycol, erythritol, meso-Erythritol, ethyl vanillate, ethyl laurate, a diethyl suberate, triethyl citrate, triacetin, a diacetin mixture, benzyl benzoate, benzyl phenyl acetate, tributyrin, lauryl acetate, lauric acid, myristic acid, and propylene carbonate.

In some cases, the aerosol-former material comprises one or more compound selected from erythritol, propylene glycol, glycerol, vegetable glycerine (VG), triacetin, sorbitol and xylitol. In some cases, the aerosol-former material comprises, consists essentially of or consists of glycerol.

The aerosol-former material may act as a plasticiser. For example, the amorphous solid material may comprise 0.5-40 wt%, 3-35 wt% or 10-25 wt% of an aerosol-former material. In some cases, the aerosol-former material comprises one or more compound selected from erythritol, propylene glycol, glycerol, triacetin, sorbitol and xylitol. In some cases, the aerosol-former material comprises, consists essentially of or consists of glycerol. The inventors have established that if the content of the plasticiser is too high, the amorphous solid material may absorb water resulting in a material that does not create an appropriate consumption experience in use. The inventors have established that if the plasticiser content is too low, the amorphous solid material may be brittle and easily broken. The plasticiser content specified herein provides an amorphous solid flexibility which allows the amorphous solid sheet to be wound onto a bobbin, which is useful in manufacture of aerosol-generating articles.

In some embodiments, the amorphous solid material is a hydrogel and comprises less than about 20 wt% of water calculated on a wet weight basis. In some cases, the hydrogel may comprise less than about 15 wt%, 12 wt% or 10 wt% of water calculated on a wet weight basis. In some cases, the hydrogel may comprise at least about 1 wt%, 2 wt% or at least about 5 wt% of water (WWB).

The combustion retarding material

In some embodiments, the combustion retarding material comprises a combination of an amorphous solid material and a combustion retarding salt, as discussed herein.

In some embodiments, the proportion of combustion retarding salt in the combustion retarding material may be advantageously selected for its combustion retardant properties. Suitably, the combustion retarding material may comprise from about 3 wt%, 15 wt%, 20 wt%, 25 wt %, 30 wt%, 35 wt%, 40 wt%, 45 wt%, or from about 50 wt% to about 90 wt%, 85 wt%, 80 wt%, 75 wt%, 70 wt%, 65 wt% or to about 60 wt% of the combustion retarding salt (all calculated on a dry weight basis).

In some embodiments, the combustion retarding salt is incorporated into the amorphous solid material. This means that the combustion retarding salt is included within the amorphous solid composition. For example, during the preparation of the amorphous solid material, a liquid precursor of the amorphous solid material is mixed with combustion retarding salt. This distributes the combustion retarding salt throughout the resultant amorphous solid material. In some embodiments, the distribution of the combustion retarding salt is even throughout the amorphous solid and this may be advantageous as the combustion retarding effect is effective across all of the material. The combustion retarding salt may be added in the form of a solution or suspension. Alternatively, the combustion retarding salt may be added to the liquid precursor in solid form, for example in particulate form, such as a powder.

In other embodiments, the combustion retarding salt is added or applied to the amorphous solid material. For example, once the amorphous solid material has been prepared, a solution or suspension comprising the combustion retarding salt is applied to the surface of the amorphous solid material, to deposit the combustion retarding salt on the surface of the amorphous solid material.

In some embodiments, the amorphous solid material is contacted with a solution or a suspension comprising the combustion retarding salt. This technique may be used to form a coating of salt on the surface of the amorphous material. This technique may be repeated multiple times to form one or more layers of the combustion retarding salt. In some embodiments, different combustion retarding salts may be incorporated in the one or more coatings and/or in the amorphous solid material. This may provide a specific combustion-retarding profile.

In some embodiments, a solution or suspension of the combustion retarding salt may be sprayed directly onto the amorphous solid. This is advantageous because the layer of the inorganic solid may be evenly distributed over the amorphous solid. This process may also be repeated to provide a desired thickness of the layer of combustion retarding salt, which is a further advantage. The layers of the combustion retarding salt may comprise the same salt or different salts. Additionally, the proportion of the combustion retarding salt in the carrier liquid or solvent may be altered to provide a layer on the amorphous solid material with desired properties. In such embodiments, the proportion of the combustion retarding salt in the solvent or carrier liquid may comprise from about 1 wt%, 5 wt%, 10 wt%, 15 wt%, 20 wt% or 25 wt% to about 60 wt%, 50 wt%, 45 wt%, 40 wt% or 35 wt% of the combustion retarding salt (all calculated on a dry weight basis).

In some embodiments, the combustion retarding material comprises:
- about 1 to about 50 wt% of a gelling agent;
- about 0.1 to about 50 wt% of an aerosol-former agent; and

- about 3 to about 90 wt% of an combustion retarding salt;

wherein these weights are calculated on a dry weight basis.

In particular exemplary embodiments, the combustion retarding material comprises:

- about 20 to about 30 wt% of a gelling agent;
- about 20 to about 30 wt% of an aerosol-former agent; and
- about 50 to about 60 wt% of an combustion retarding salt;

wherein these weights are calculated on a dry weight basis.

In another example, the combustion retarding material is formed from a slurry comprising:

43 g alginate (2.7%)
100 g sodium chloride (6.3%)
50 g glycerol (3.1%)
1400 ml water (87.9%).

Once this slurry has been dried, the composition of the combustion retarding material will be as follows: alginate (22.3%); sodium chloride (52.1%); and 50 g glycerol (25.6%).

In some cases, the combustion retarding material may consist essentially of, or consist of a combustion retarding salt, a gelling agent, an aerosol-former agent and water.

The inventors have advantageously found that an improved article may be produced comprising a combustion retarding material comprising a combustion retarding salt and an amorphous solid, wherein the material properties (e.g. density) and specification (e.g. thickness, length, and cut width) fall within the ranges set out herein.

In some cases, the combustion retarding material may have a thickness of about 0.015 mm to about 1.5 mm, suitably about 0.05 mm to about 1. 5 mm or 0.05 mm to about 1 mm. Suitably, the thickness may be in the range of about 0.1 mm or 0.15 mm to about 1 mm, 0.5 mm or 0.3 mm. The combustion retarding material may comprise more than one layer, and the thickness described herein refers to the aggregate thickness of those layers.

In some embodiments in which the combustion retarding material includes the combustion retarding salt as a coating on the amorphous solid, the coating layer of combustion retarding salt may have a thickness of about 0.01 mm to about 0.1 mm. The combustion retarding salt coating may comprise more than one layer, and the thickness described herein refers to the aggregate thickness of those layers.

The thickness of the material or layers discussed herein may be measured using a microscope such as a scanning electron microscope (SEM), as known to those skilled in the art, or any other suitable technique known to those skilled in the art.

The inventors have established that if the combustion retarding material is too thick, then heating efficiency can be compromised. This can adversely affect power consumption in use, for instance the power consumption for release of flavour from the amorphous solid. Conversely, if the combustion retarding material is too thin, it can be difficult to manufacture and handle; a very thin material can be harder to cast and may be fragile, compromising aerosol formation in use. In some cases, an individual strip or piece of combustion retarding material has a minimum thickness over its area of about 0.015 mm. In some cases, an individual strip or piece of the amorphous solid has a minimum thickness over its area of about 0.05 mm or about 0.1 mm. In some cases, an individual strip or piece of the amorphous solid has a maximum thickness over its area of about 1.0mm. In some cases, an individual strip or piece of the combustion retarding material has a maximum thickness over its area of about 0.5 mm or about 0.3 mm.

For the avoidance of doubt, where reference is made herein to area density, this refers to an average area density calculated for a given strip, piece or sheet of combustion retarding material, the area density calculated by measuring the surface area and weight of the given strip, piece or sheet of combustion retarding material.

In some cases, the combustion retarding material thickness may vary by no more than 25%, 20%, 15%, 10%, 5% or 1% across its area.

In some embodiments in which the combustion retarding material is in sheet form, the sheet may have any suitable area density, such as from about 30 g/m^2 to about 150 g/m^2. In some cases, the sheet may have a mass per unit area of about 55 g/m^2 to about 135 g/m^2, or about 80 to about 120 g/m^2, or from about 70 to about 110 g/m^2, or particularly from about 90 to about 110 g/m^2, or suitably about 100 g/m^2. Such area densities may be particularly suitable where the combustion retarding material is included in an aerosol-generating article as a shredded sheet (described further herein). In some cases, the sheet may have a mass per unit area of about 30 to 70 g/m^2, 40 to 60 g/m^2, or 25 to 60 g/m^2 and may be used to wrap an aerosolisable material such as tobacco.

The density of the combustion retarding material has an impact on the speed at which heat conducts through the material, with lower densities, for instance those below 700 mg/cc, conducting heat more slowly through the material, and therefore enabling a more sustained release of aerosol. The density of the combustion retarding salt also has an impact on the speed of heat conductions, as well as the aforementioned combustibility of the consumable.

In some examples, such as where the combustion retarding material does not comprise a filler, the combustion retarding material may have a tensile strength of from 200 N/m to 400 N/m, or 200 N/m to 300 N/m, or about 250 N/m. Such tensile strengths may be particularly suitable for embodiments wherein combustion retarding material is formed as a sheet and then shredded and incorporated into the consumable.

In some embodiments, such as where the combustion retarding material is used in sheet form, a filler is included to increase the tensile strength. In some embodiments, the combustion retarding material may have a tensile strength of at least about 1500 or at least about 2000 N/m and/or up to about 5000 N/m. In some embodiments, the tensile strength may be from about 3000 to about 4000 N/m. Such tensile strengths may be particularly suitable for embodiments wherein combustion retarding material is incorporated into a consumable in sheet form, for example as a wrapper.

In some embodiments, the combustion retarding material comprises an amorphous solid which is a hydrogel and comprises less than about 20 wt% of water calculated on a wet weight basis. In some cases, the hydrogel may comprise less than about 15 wt%, 12 wt% or 10 wt% of water calculated on a wet weight basis. In some cases, the hydrogel may comprise at least about 1 wt%, 2 wt% or at least about 5 wt% of water.

Additional components of the combustion retarding material

In some embodiments, the combustion retarding material may comprise of additional components, which are described herein. The additional components may be included in any part of the combustion retarding material. In some embodiments the additional components included in the amorphous solid material and so are distributed within the combustion retarding material.

In some embodiments, the combustion retarding material comprises one or more other functional materials, which may comprise one or more of pH regulators, colouring agents, preservatives, binders, fillers, stabilizers, and/or antioxidants.

In some embodiments, the combustion retarding material comprises a flavour. The combustion retarding material therefore has the advantage of preventing the combustion of the flavourant and delivering a desired taste.

In some embodiments, the combustion retarding material may comprise up to about 80 wt%, 70 wt%, 60 wt%, 55 wt%, 50 wt% or 45 wt% of a flavour. In some cases, the combustion retarding material may comprise at least about 0.1 wt%, 1 wt%, 10 wt%, 20 wt%, 30 wt%, 35 wt% or 40 wt% of a flavour (all calculated on a dry weight basis).

For example, the combustion retarding material may comprise 1-80 wt%, 10-80 wt%, 20-70 wt%, 30-60 wt%, 35-55 wt% or 30-45 wt% of a flavour. In some cases, the flavour comprises, consists essentially of or consists of menthol.

In some embodiments, the flavourant is included in the aerosol-generating material. Flavour provided in the amorphous solid material may be more stably retained, resulting in a more consistent flavour profile between consumables as disclosed herein.

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

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

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

The amorphous solid may be made from a gel, and this gel may additionally comprise a solvent, included at 0.1-50 wt%. However, the inventors have established that the inclusion of a solvent in which the flavour is soluble may reduce the gel stability and the flavour may crystallise out of the gel. As such, in some cases, the gel does not include a solvent in which the flavour is soluble. In some embodiments, solvent may be removed by evaporation prior to the inclusion of a flavour.

In some cases, the combustion retarding material may additionally comprise an emulsifying agent, which emulsified molten flavour during manufacture. For example, the combustion retarding material may comprise from about 5 wt% to about 15 wt% of an emulsifying agent (calculated on a dry weight basis), suitably about 10 wt%. The emulsifying agent may comprise acacia gum (gum arabic) or guar gum.

In some embodiments, the emulsifying agent is included in the amorphous solid material.

In some embodiments, and where local regulations permit, the combustion retarding material may comprise an active substance. In some embodiments, the combustion retarding material does not comprise an active substance.

In some embodiments, the active substance is included in the amorphous solid material.

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

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

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

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

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

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

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

In some cases, the total content of active substance and/or flavour in the combustion retarding material may be at least about 0.1 wt%, 1 wt%, 5 wt%, 10 wt%, 20 wt%, 25 wt% or 30 wt%. In some cases, the total content of active substance and/or flavour may be less than about 90 wt%, 80 wt%, 70 wt%, 60 wt%, 50 wt% or 40 wt% (all calculated on a dry weight basis).

In some embodiments and where local regulations permit, the combustion retarding material additionally comprises plant material or tobacco material and/or nicotine.

In some cases, the combustion retarding material may comprise 5-60 wt% (calculated on a dry weight basis) plant material and/or tobacco material and/or nicotine and/or tobacco extract. In some cases, the combustion retarding material may comprise from about 1 wt%, 5 wt%, 10 wt%, 15 wt%, 20 wt% or 25 wt% to about 70 wt%, 60 wt%, 50 wt%, 45 wt%, 40 wt%, 35 wt%, or 30 wt% (calculated on a dry weight basis) plant material and/or tobacco material and/or nicotine and/or tobacco extract.

In some cases, the combustion retarding material may comprise 5-60 wt% (calculated on a dry weight basis) plant material and/or tobacco material and/or nicotine and/or tobacco extract. In some cases, the combustion retarding material may comprise from about 1 wt%, 5 wt%, 10 wt%, 15 wt%, 20 wt% or 25 wt% to about 70 wt%, 60 wt%, 50 wt%, 45 wt%, 40 wt%, 35 wt%, or 30 wt% (calculated on a dry weight basis) plant material and/or tobacco material and/or nicotine and/or tobacco extract. In a preferred embodiment of the invention, the combustion retarding material may comprise 5-60 wt% (calculated on a dry weight basis) plant material and/or tobacco material and/or nicotine and/or tobacco extract.

In some cases, there may be no nicotine in the combustion retarding material other than that which is provided from the tobacco material or the tobacco extract.

In some embodiments the combustion retarding material comprises no tobacco material but does comprise nicotine. In some such cases, the combustion retarding material may comprise from about 1 wt%, 2 wt%, 3 wt% or 4 wt% to about 20 wt%, 18 wt%, 15 wt% or 12 wt% (calculated on a dry weight basis) nicotine. For example, the combustion retarding material may comprise 1-20 wt%, 2-18 wt% or 3-12 wt% nicotine.

In some embodiments, the combustion retarding material comprises a filler. In some embodiments, the filler is included in the amorphous solid material.

In some embodiments, the combustion retarding material comprises less than 60 wt% of a filler, such as from 1 wt% to 60 wt%, or 5 wt% to 50 wt%, or 5 wt% to 30 wt%, or 10 wt% to 20 wt%.

In other embodiments, the combustion retarding material comprises less than 20 wt%, suitably less than 10 wt% or less than 5 wt% of a filler. In some cases, the amorphous solid material comprises less than 1 wt% of a filler, and in some cases, comprises no filler.

The filler, if present, may comprise one or more inorganic filler materials in addition to the combustion retarding salt(s), such as calcium carbonate, perlite, vermiculite, diatomaceous earth, colloidal silica, magnesium oxide, magnesium sulphate, magnesium carbonate, and suitable inorganic sorbents, such as molecular sieves. The filler may comprise one or more organic filler materials such as wood pulp, cellulose and cellulose derivatives. In particular cases, the combustion retarding material comprises no calcium carbonate such as chalk.

In particular embodiments which include filler, the filler is fibrous. For example, the filler may be a fibrous organic filler material such as wood pulp, hemp fibre, cellulose or cellulose derivatives. Without wishing to be bound by theory, it is believed that including fibrous filler in the combustion retarding material may increase the tensile strength of the material.

In some embodiments, the combustion retarding material does not comprise tobacco fibres.

In some examples, such as where the combustion retarding material comprises a filler, combustion retarding material may have a tensile strength of from 600 N/m to 900 N/m, or from 700 N/m to 900 N/m, or around 800 N/m. Such tensile strengths may be particularly suitable for embodiments wherein the combustion retarding material is included in an aerosol-generating article as a rolled sheet, suitably in the form of a tube or a rod.

Consumables

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

In the present invention, the consumable comprises a combustion retarding material as disclosed herein. In some territories, it is necessary for the consumable to resist combustion and this may be enhanced by inclusion of the combustion retarding material.

In some embodiments, the inclusion of the combustion retarding material in the consumable means that it is not necessary to include a foil in the consumable. Consumables can include a metal foil, such as aluminium foil, as part of the wrapper surrounding the aerosol-generating material to retard or prevent combustion.

In some embodiments, the combustion retarding material surrounds at least some of the aerosol-generating material. For example, a wrapper surrounding the aerosol-generating material may comprise or consist of a combustion retarding material. The combustion retarding material may be in the form of a sheet. One or more layers of the combustion retarding material may circumscribe the aerosol-generating material.

In some embodiments, the combustion retarding material surrounds all of the aerosol-generating material. Where the aerosol-generating material is provided in the form of a rod, the combustion retarding material not only circumscribes the length of the rod of aerosol-generating material but also encloses the end of the rod. This may be in the form of the sheet being folded or otherwise extended over the end of the rod, or a plug of the combustion retarding material being inserted into the end of the rod. This will prevent the aerosol-generating material combusting if an attempt is made to light the consumable like a cigarette.

As described herein, the rod of aerosol-generating material may have a first end and a second end. In use, the rod has a downstream end, usually connected to or comprising a mouthpiece and/or filter, and an upstream end, also referred to as a distal end.

In other embodiments, the combustion retarding material is provided locally, for example, at the distal end of a rod of aerosol-generating material, with little or no combustion retarding material provided in other parts of the consumable. In some embodiments, the combustion retarding material is provided in greater concentration at a location proximal to the distal end. In some embodiments, the combustion retarding material is provided exclusively at a location proximal to the distal end. The area in which the combustion retarding material is provided may be at most about 5%, at most about 10%, at most about 20%, at most about 30%, at most about 40%, at most about 50%, or at most about 60% of the rod from the distal end. In some embodiments the combustion retarding material is disposed at the distal end of the rod in the form of a shredded sheet. In some embodiments in which the combustion retarding material is shredded, said combustion retarding material may be interspersed, mixed or otherwise combined with the aerosol-generating material. Alternatively, the shredded combustion retarding material may circumscribe the aerosol-generating material. In other embodiments, the shredded combustion retarding material is not mixed with the aerosol-generating material, and may be in the form of a plug. The shredded format of the combustion retarding material has the advantage that this is well suited to being incorporated into the rod.

In some embodiments where the combustion retarding material is disposed at the distal end of the rod, the combustion retarding material may be in the form of a gathered sheet. In some embodiments the gathered sheet is in the form of a plug. The gathered sheet format has the advantage that travel of salt up the rod is reduced. A plug of combustion retarding material may also be formed as a solid mass comprising a combustion retarding salt and an amorphous solid material.

In some embodiments, a portion of the aerosol-generating material, such as tobacco, may be replaced with the combustion retarding material. In some embodiments, between about 5% to about 15%, or about 8% to about 12% of the weight of the aerosol-generating material may be replaced with the combustion retarding material. The combustion retarding material may be in the form of a plug. This embodiment enjoys the advantage of preventing the aerosol-generating material combusting if an attempt is made to light the consumable like a cigarette, whilst maintaining the total size of the consumable or rod. This is particularly beneficial when the rod is used as consumable in an aerosol-generating device and can be swapped with alternative consumable(s) already in production.

In some embodiments, the consumable may comprise at least one ventilation area arranged to allow external air to flow into the article. The ventilation area may comprise one or more ventilation apertures or perforations cut into the wrapper to allow ambient air to be drawn into the article. This will influence pressure drop and can enhance the user's experience of the flavour properties of the aerosol generating material. The location of these vents and/or perforations may be between about 0.5 mm to about 10 mm, between about 1 mm to about 4 mm or between about 4mm to about 8 mm from the distal end of the rod. The vents and/or perforations may be of any suitable size and/or number to adapt the flow-through of air. The size, number and location on the wrapper of the vents and/or perforations may be selected to provide the appropriate flow through of air. For example, more numerous and larger vents and/or perforations may introduce more air into the rod, increase the flow-through of air and thus provide the appropriate pressure drop.

In other embodiments, the combustion retarding material is mixed with the aerosol-generating material. In such embodiments, the combustion retarding material may be in the form of a shredded or cut sheet, mixed with the aerosol-generating material.

The presence of the combustion retarding material distributed within the aerosol-generating material can reduce the tendency of the aerosol-generating material to combust when exposed to high temperatures and/or a flame.

In exemplary embodiments, the consumable comprises a blend of aerosol-generating material and combustion retarding material. For example, the blend comprises aerosol-generating material in an amount from 50% to 98%, for instance from 80% to 95%, wherein the aerosol-generating material is for instance cut rag tobacco, and shredded amorphous solid material in an amount from 2% to 50%, for instance from 5% to 20%.

In some embodiments, even mixing of the aerosol-generating material and the combustion retarding material can be achieved when the combustion retarding material in sheet form is shredded. Preferably the cut width of the shredded combustion retarding material is between 0.75 mm and 2 mm, for instance between 1 mm and 1.5 mm. The strands of combustion retarding material formed by shredding may be cut width-wise, for example in a cross-cut type shredding process, to define a cut length for the shredded combustion retarding material, in addition to a cut width. The cut length of the shredded combustion retarding material is preferably at least 5 mm, for instance at least 10 mm, or at least 20 mm. The cut length of the shredded combustion retarding material can be less than 60 mm, less than 50 mm, or less than 40 mm. In some embodiments, to achieve even mixing of the shredded combustion retarding material with cut rag tobacco, the cut length of the shredded a combustion retarding material is preferably non-uniform. Although referred to as cut length, the length of the shreds or strips of combustion retarding material can alternatively or additionally be dictated by a dimension of the material determined during its manufacture, for instance the width of a sheet of the material as manufactured.

In some embodiments, the aerosol-generating material included in the consumable comprises one or more active substances and/or flavours. In some embodiments, this material includes tobacco or other plant derived material. When this aerosol-generating material includes tobacco, heating this material releases volatile tobacco components including nicotine and flavour or aroma compounds.

In some embodiments, the aerosol-generating material comprises a plant-based material, such as tobacco material. As used herein, the term “tobacco material” refers to any material comprising tobacco or derivatives or substitutes thereof. The term “tobacco material” may include one or more of tobacco, tobacco derivatives, expanded tobacco, reconstituted tobacco or tobacco substitutes. The tobacco material may comprise one or more of ground tobacco, tobacco fibre, cut tobacco, extruded tobacco, tobacco stem, tobacco lamina, reconstituted tobacco and/or tobacco extract.

In some embodiments, the plant material is tobacco material and may be provided in the form of cut rag tobacco. The cut rag tobacco can have a cut width of at least 15 cuts per inch (about 5.9 cuts per cm, equivalent to a cut width of about 1.7 mm). Preferably, the cut rag tobacco has a cut width of at least 18 cuts per inch (about 7.1 cuts per cm, equivalent to a cut width of about 1.4 mm), more preferably at least 20 cuts per inch (about 7.9 cuts per cm, equivalent to a cut width of about 1.27 mm). In one example, the cut rag tobacco has a cut width of 22 cuts per inch (about 8.7 cuts per cm, equivalent to a cut width of about 1.15 mm). Preferably, the cut rag tobacco has a cut width at or below 40 cuts per inch (about 15.7 cuts per cm, equivalent to a cut width of about 0.64 mm). Cut widths between 0.5 mm and 2.0 mm, for instance between 0.6 and 1.7 mm or between 0.6 mm and 1.5 mm, have been found to result in tobacco material which is preferably in terms of surface area to volume ratio, particularly when heated, and the overall density and pressure drop of the rod of aerosol-generating material. The cut rag tobacco can be formed from a mixture of forms of tobacco material, for instance a mixture of one or more of paper reconstituted tobacco, leaf tobacco, extruded tobacco and bandcast tobacco. Preferably the tobacco material comprises paper reconstituted tobacco or a mixture of paper reconstituted tobacco and leaf tobacco.

The plant material, such as tobacco material, may have any suitable thickness. The plant material, such as tobacco material, may have a thickness of at least about 0.145 mm, for instance at least about 0.15 mm, or at least about 0.16 mm. The plant material may have a maximum thickness of about 0.25 mm, for instance the thickness of the plant material may be less than about 0.22 mm, or less than about 0.2 mm. In some embodiments, the plant material may have an average thickness in the range 0.175 mm to 0.195 mm. Such thicknesses may be particularly suitable where the plant material is a reconstituted tobacco material.

The tobacco material can comprise reconstituted tobacco material having a density of less than about 700 mg/cc, for instance paper reconstituted tobacco material. For instance, the aerosol-generating material comprises reconstituted tobacco material having a density of less than about 600 mg/cc. Alternatively or in addition, the aerosol-generating material can comprise reconstituted tobacco material having a density of at least 350 mg/cc.

In some embodiments, the aerosol-generating material contains a filler component. The filler component is generally a non-tobacco component, that is, a component that does not include ingredients originating from tobacco. The filler component may be a non-tobacco fibre such as wood fibre or pulp or wheat fibre. The filler component may also be an inorganic material such as chalk, perlite, vermiculite, diatomaceous earth, colloidal silica, magnesium oxide, magnesium sulphate, magnesium carbonate. The filler component may also be a non-tobacco cast material or a non-tobacco extruded material. The filler component may be present in an amount of 0 to 20% by weight of the tobacco material, or in an amount of from 1 to 10% by weight of the composition. In some embodiments, the filler component is absent.

In some embodiments, the aerosol-generating material contains an aerosol-former material.

In some embodiments, the aerosol-former material included with the plant or tobacco material may be glycerol, propylene glycol, or a mixture of glycerol and propylene glycol. Glycerol may be present in an amount of from 10 to 20 % by weight of the tobacco material, for example 13 to 16 % by weight of the composition, or about 14% or 15% by weight of the composition. Propylene glycol, if present, may be present in an amount of from 0.1 to 15% by weight of the composition.

In some embodiments in which the plant material is a tobacco material, the tobacco material can contain between 10% and 90% by weight tobacco leaf, wherein the aerosol-former material is provided in an amount of up to about 10% by weight of the leaf tobacco. To achieve an overall level of aerosol-former material between 10% and 20% by weight of the tobacco material, it has been advantageously found that this can be added in higher weight percentages to the another component of the tobacco material, such as reconstituted tobacco material.

The tobacco material described herein contains nicotine. The nicotine content is from 0.5 to 1.75% by weight of the tobacco material, and may be, for example, from 0.8 to 1.5% by weight of the tobacco material. Additionally or alternatively, the tobacco material contains between 10% and 90% by weight tobacco leaf having a nicotine content of greater than 1.5% by weight of the tobacco leaf. It has been advantageously found that using a tobacco leaf with nicotine content higher than 1.5% in combination with a lower nicotine base material, such as paper reconstituted tobacco, provides a tobacco material with an appropriate nicotine level but better sensory performance than the use of paper reconstituted tobacco alone. The tobacco leaf, for instance cut rag tobacco, can, for instance, have a nicotine content of between 1.5% and 5% by weight of the tobacco leaf.

The plant or tobacco material described herein can contain an aerosol modifying agent, such as any of the flavours described herein. In one embodiment, the tobacco material contains menthol, forming a mentholated article. The tobacco material can comprise from 3 mg to 20 mg of menthol, preferably between 5 mg and 18 mg and more preferably between 8 mg and 16 mg of menthol. In the present example, the tobacco material comprises 16 mg of menthol. The tobacco material can contain between 2% and 8% by weight of menthol, preferably between 3% and 7% by weight of menthol and more preferably between 4% and 5.5% by weight of menthol. In one embodiment, the tobacco material includes 4.7% by weight of menthol. Such high levels of menthol loading can be achieved using a high percentage of reconstituted tobacco material, for instance greater than 50% of the tobacco material by weight. Alternatively or additionally, a higher level of menthol loading that can be achieved by incorporation of the menthol in an aerosol-generating material comprising an aerosol forming agent and one or more binder and/or cross-linker

In an embodiment, the tobacco material comprises the tobacco component as defined herein and the aerosol-former material as defined herein. In an embodiment, the tobacco material consists essentially of the tobacco component as defined herein and the aerosol-former material as defined herein. In an embodiment, the tobacco material consists of the tobacco component as defined herein and the aerosol-former material as defined herein.

Paper reconstituted tobacco may be present in the tobacco component of the tobacco material described herein in an amount of from 10% to 100% by weight of the tobacco component. In embodiments, the paper reconstituted tobacco is present in an amount of from 10% to 80% by weight, or 20% to 70% by weight, of the tobacco component. In a further embodiment, the tobacco component consists essentially of, or consists of, paper reconstituted tobacco. In preferred embodiments, leaf tobacco is present in the tobacco component of the tobacco material in an amount of from at least 10% by weight of the tobacco component. For instance, leaf tobacco can be present in an amount of at least 10% by weight of the tobacco component, while the remainder of the tobacco component comprises paper reconstituted tobacco, bandcast reconstituted tobacco, or a combination of bandcast reconstituted tobacco and another form of tobacco such as tobacco granules. Suitably, leaf tobacco can be present in an amount up to 40 % or 60% of the tobacco material, while the remainder of the tobacco component comprises paper reconstituted tobacco, bandcast reconstituted tobacco, or a combination of bandcast reconstituted tobacco and another form of tobacco such as tobacco granules.

Paper reconstituted tobacco refers to tobacco material formed by a process in which tobacco feedstock is extracted with a solvent to afford an extract of solubles and a residue comprising fibrous material, and then the extract (usually after concentration, and optionally after further processing) is recombined with fibrous material from the residue (usually after refining of the fibrous material, and optionally with the addition of a portion of non-tobacco fibres) by deposition of the extract onto the fibrous material. The process of recombination resembles the process for making paper.

The paper reconstituted tobacco may be any type of paper reconstituted tobacco that is known in the art. In a particular embodiment, the paper reconstituted tobacco is made from a feedstock comprising one or more of tobacco strips, tobacco stems, and whole leaf tobacco. In a further embodiment, the paper reconstituted tobacco is made from a feedstock consisting of tobacco strips and/or whole leaf tobacco, and tobacco stems. However, in other embodiments, scraps, fines and winnowings can alternatively or additionally be employed in the feedstock.

The paper reconstituted tobacco for use in the tobacco material described herein may be prepared by methods which are known to those skilled in the art for preparing paper reconstituted tobacco.

The density of the tobacco material has an impact on the speed at which heat conducts through the material, with lower densities, for instance those below 700 mg/cc, conducting heat more slowly through the material, and therefore enabling a more sustained release of aerosol.

In the figures described herein, like reference numerals are used to illustrate equivalent features, articles or components.

Figure 1 is a side-on cross sectional view of a consumable or article 1 for use in an aerosol delivery system.

The article 1 comprises a mouthpiece segment 2, and an aerosol generating segment 3.

The aerosol generating segment 3 is in the form of a cylindrical rod and comprises an aerosol-generating material 4 comprising cut rag reconstituted tobacco. The aerosol-generating material can be any of the materials discussed herein.

Although described above in rod form, the aerosol generating segment 3 can be provided in other forms, for instance a plug, pouch, or packet of material within an article.

The mouthpiece segment 2, in the illustrated embodiment, includes a body of material 5 such as a fibrous or filamentary tow.

The rod-shaped consumable 1 further comprises a wrapper 6 circumscribing the mouthpiece segment 2 and aerosol generating segment 3. The wrapper 6 comprises a sheet of combustion retarding material as described herein. In the illustrated example, the combustion retarding material is a sheet of amorphous solid material comprising sodium chloride.

Figure 2 is a side-on cross sectional view of an alternative embodiment of a consumable or article 1 for use in an aerosol delivery system.

In this alternative embodiment, the article 1 again comprises a mouthpiece segment 2, and an aerosol generating segment 3. The aerosol generating segment 3 comprises a blend 7 of aerosol-generating material and combustion retarding material.

The rod-shaped consumable 1 further comprises a wrapper 8 circumscribing the mouthpiece segment 2 and aerosol generating segment 3. The wrapper 8 comprises a sheet of paper.

Non-combustible aerosol provision systems

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

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

In some embodiments, the non-combustible aerosol provision system is an electronic cigarette, also known as a vaping device or electronic nicotine delivery system (END), although it is noted that the presence of nicotine in the aerosol-generating material is not a requirement.

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

In some embodiments, the non-combustible aerosol provision system is a hybrid system to generate aerosol using a combination of aerosol-generating materials, one or a plurality of which may be heated. Each of the aerosol-generating materials may be, for example, in the form of a solid, liquid or gel and may or may not contain nicotine. In some embodiments, the hybrid system comprises a liquid or gel aerosol-generating material and a solid aerosol-generating material. The solid aerosol-generating material may comprise, for example, tobacco or a non-tobacco product.

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

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

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

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

Figure 3 shows an example of a non-combustible aerosol provision device 100 for generating aerosol from an aerosol-generating medium/material such as the aerosol-generating material of a consumable 110, as described herein. In broad outline, the device 100 may be used to heat a replaceable article 110 comprising the aerosol-generating medium, for instance an article 1 as illustrated in any one of Figures 1 or 2 or as described elsewhere herein, to generate an aerosol or other inhalable medium which is inhaled by a user of the device 100. The device 100 and replaceable article 110 together form a system.

The device 100 comprises a housing 102 (in the form of an outer cover) which surrounds and houses various components of the device 100. The device 100 has an opening 104 in one end, through which the article 110 may be inserted for heating by a heating assembly. In use, the article 110 may be fully or partially inserted into the heating assembly where it may be heated by one or more components of the heater assembly.

The device 100 of this example comprises a first end member 106 which comprises a lid 108 which is moveable relative to the first end member 106 to close the opening 104 when no article 110 is in place. In Figure 3, the lid 108 is shown in an open configuration, however the lid 108 may move into a closed configuration. For example, a user may cause the lid 108 to slide in the direction of arrow "B".

The device 100 may also include a user-operable control element 112, such as a button or switch, which operates the device 100 when pressed. For example, a user may turn on the device 100 by operating the switch 112.

The device 100 may also comprise an electrical component, such as a socket/port 114, which can receive a cable to charge a battery of the device 100. For example, the socket 114 may be a charging port, such as a USB charging port.

Method of manufacture

In some embodiments, the combustion retarding salt is incorporated into or added to the amorphous solid material dissolved in a solvent or liquid carrier. In some embodiments, the combustion retarding salt is a suspension in a liquid carrier. The solvent or liquid carrier may be an aqueous or organic liquid, and may be polar or non-polar depending on its suitable application. The liquid carrier or precursor solvent may be advantageously selected to be volatile, so that the carrier liquid or solvent may be removed to leave the combustion retarding salt in or on the amorphous solid material.

In some embodiments, the solvent or liquid carrier comprises a mixture of water and glycerol.

Example

Consumables with a range of different wrappers surrounding a rod of aerosol-generating material were prepared and their combustion characteristic compared.

Consumables comprising cut rag aerosol-generating material were prepared, using a variety of different wrappers.

The first wrapper used was paper, namely 24 GSM (grammes per square metre) paper with a porosity of 75 CU (Coresta units).

Further wrappers used were 32 GSM and 64 GSM Delfort papers.

A further wrapper used was laminated aluminium foil comprising 6.3 μm thickness lacquered aluminium foil laminated with 23.5 GSM paper with 37 μm thickness.

Finally, a combustion retarding material according to the present disclosure was used, formed from a slurry having the following make up:

43 g alginate (2.7%)
100 g sodium chloride (6.3 %)
50 g glycerol (3.1%)
1400 ml water (87.9 %)

The consumables were hand made, by inserting the combustion retarding sheet as an inner wrapper, and then filling the rod with tobacco.

For testing, the consumables were lit in the manner of a combustible cigarette and attempts were made to smoke them by puffing. The greater the combustion resistance of the wrapper materials, the less of the consumable was combusted.

Tests showed that the amorphous solid material comprising sodium chloride resisting combustion well and performed similarly to the known combustion retardant foil and Delfort papers.

In addition, further combustion retarding material according to the present disclosure was used, formed from a slurry having the following make up:

21.5 g alginate
21.5 g wood pulp
120 g sodium chloride
30 g glycerol
1400 ml water

The slurry was dried in an oven to form a sheet. The sheets that were obtained did not combust when exposed to a naked flame from a lighter.

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

Claims

1. A material comprising a combustion retarding salt and an amorphous solid material.

2. The material as claimed in claim 1, wherein the combustion retarding salt is an alkali metal salt, optionally selected from the group consisting of: sodium chloride, potassium chloride, sodium bromide, potassium bromide, and combinations thereof.

3. The material as claimed in claim 1 or claim 2, wherein the combustion retarding salt is incorporated in the amorphous solid material.

4. The material as claimed in claim 1 or claim 2, wherein the combustion retarding salt is applied to the amorphous solid material.

5. The material as claimed in any one of claims 1 to 4, wherein the material comprises from about 3 wt% to about 60 wt% combustion retarding salt (dry weight basis).

6. A consumable comprising the material as claimed in any one of claims 1 to 5.

7. The consumable as claimed in claim 6, wherein the consumable further comprises an aerosol-generating material.

8. The consumable as claimed in claim 7, wherein the material at least partially surrounds the aerosol-generating material.

9. The consumable as claimed in any one of claims 6 to 8, wherein the consumable further comprises a wrapper.

10. The consumable as claimed in any one of claims 7 to 9, wherein the material is distributed within the aerosol-generating material.

11. The consumable as claimed in claim 6, wherein the aerosol-generating material comprises tobacco material.

12. The consumable as claimed in claim 11, wherein the tobacco material is cut rag tobacco.

13. The consumable as claimed in any one of claims 6 to 12, wherein the consumable comprises a binder.

14. The consumable as claimed in any one of claims 6 to 13, wherein the consumable is rod shaped.

15. The consumable as claimed in claim 14, wherein the rod has a distal and proximal end and wherein the material is provided exclusively or in greater concentration at a location proximal to the distal end of the rod.

16. A non-combustible aerosol provision system comprising a consumable as claimed in any one of claims 6 to 15.

17. A method for manufacturing the material as claimed in any one of claims 1 to 5, wherein the combustion retarding salt is incorporated into or added to the amorphous solid material.

18. The method as claimed in claim 17, wherein a solution or suspension comprising the combustion retarding salt is applied to the amorphous solid material.

19. The method as claimed in claim 17 or 18, wherein the combustion retarding salt is added during the manufacture of the amorphous solid material.

20. Use of the material as claimed in any one of claims 1 to 5 for retarding combustion of a consumable for use in a non-combustible aerosol provision system.

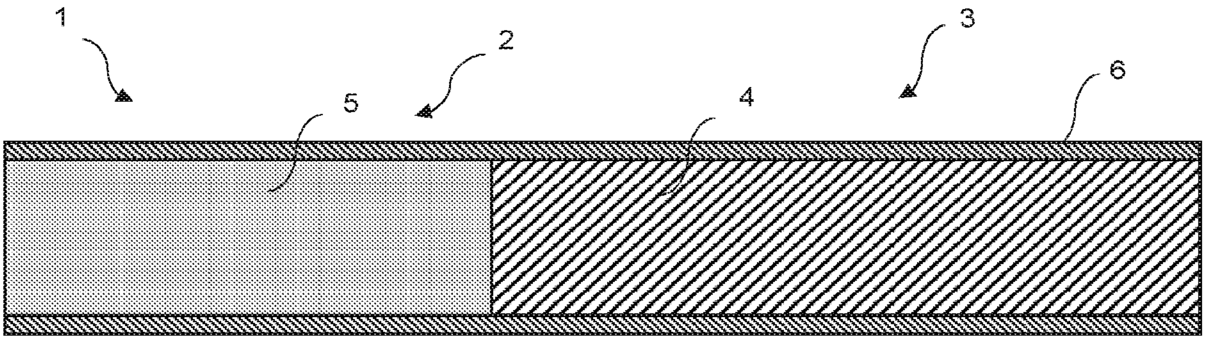

Fig. 1

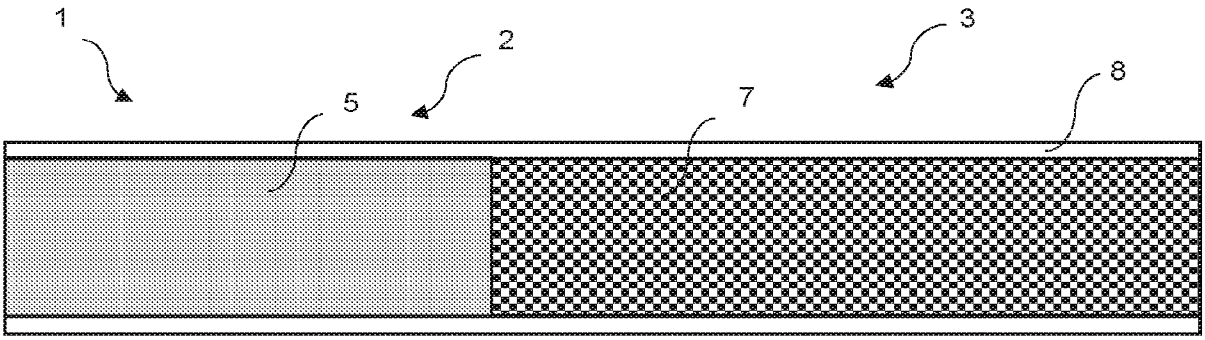

Fig. 2

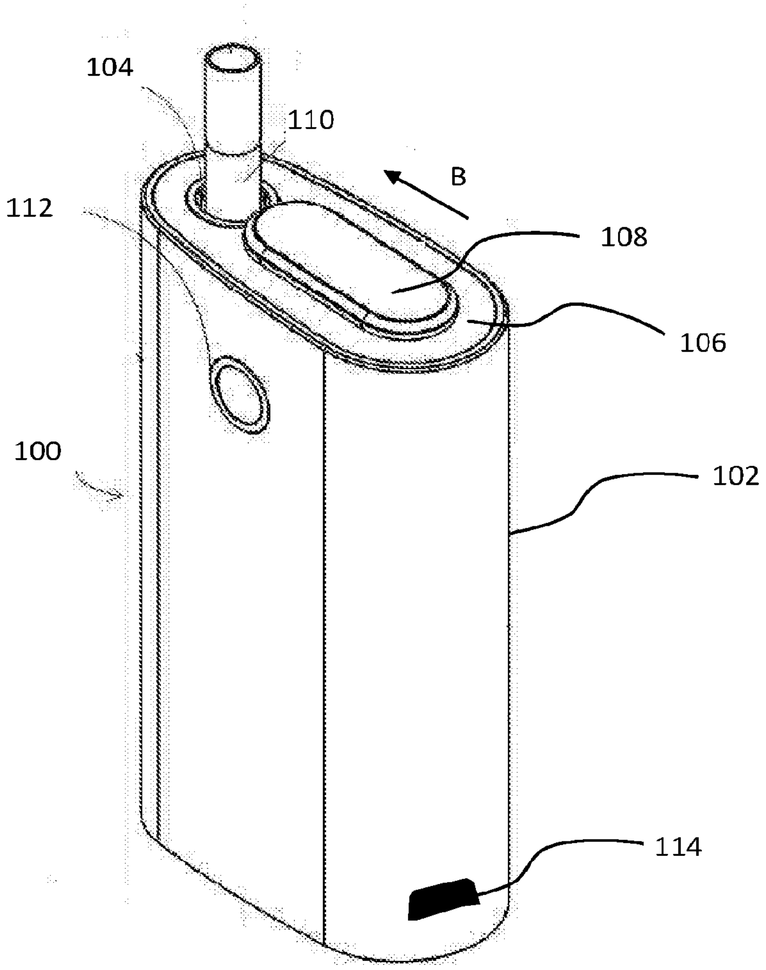

Fig. 3

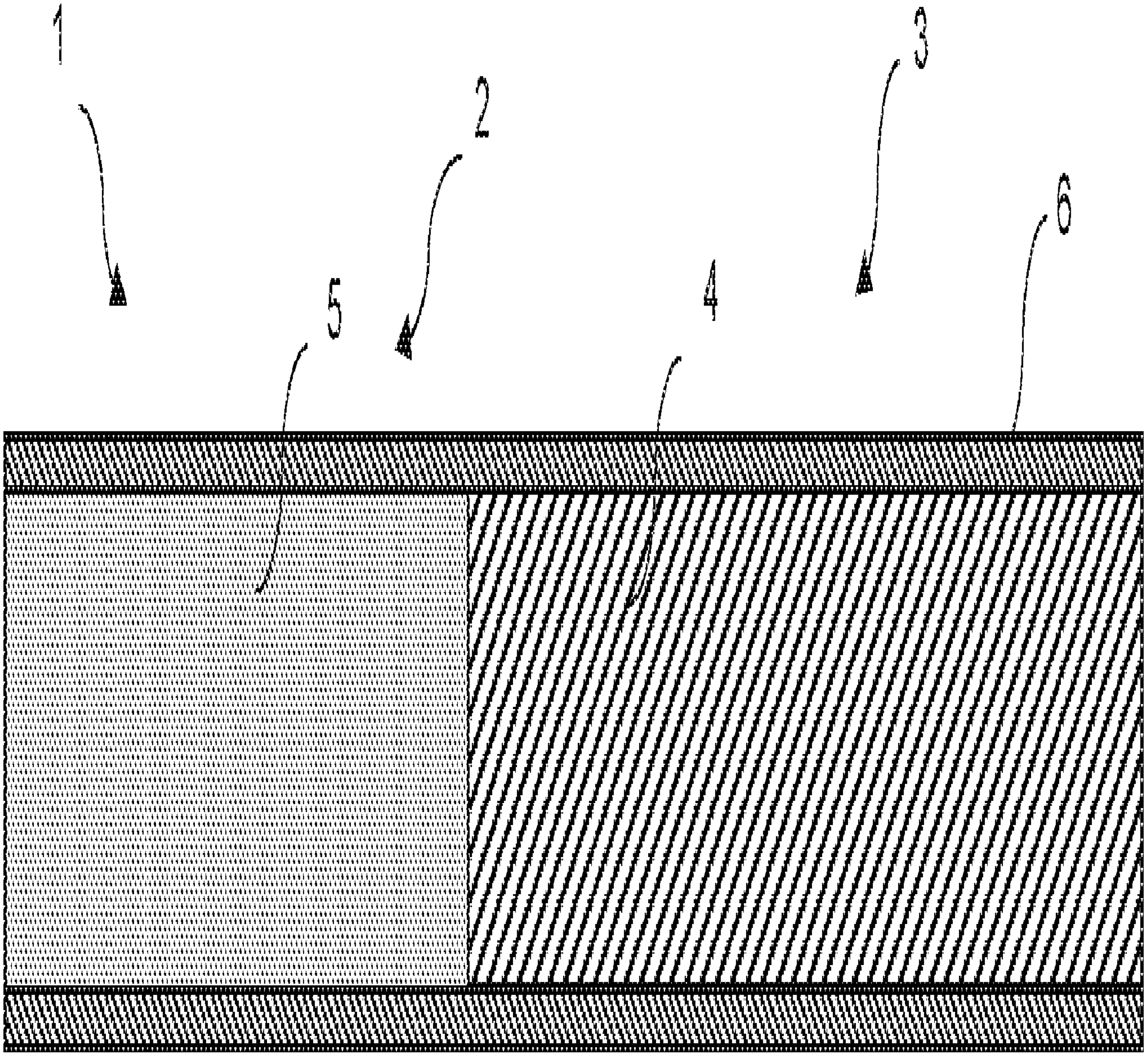

Fig. 1