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(54) **METHOD FOR MANUFACTURING COMBUSTIBLE HEAT SOURCE FOR SMOKING ARTICLE, AND SMOKING ARTICLE INCLUDING SAME**

(57) The present disclosure provides a method for manufacturing a combustible heat source for a smoking article, the method comprising the steps of: mixing a carbon powder and an organic binder (S 1); preparing a combustible heat source composition for a smoking article by adding an aqueous sugar solution after the step S 1 (S2); adding oil to the composition (S3); and compressing the composition (S4). The present disclosure is characterized in that the composition solves the surface cracking phenomenon during combustion of the heat source by comprising an aqueous sugar solution, and a smoking article to which the combustible heat source composed of the composition is applied is excellent in ignition and combustibility.

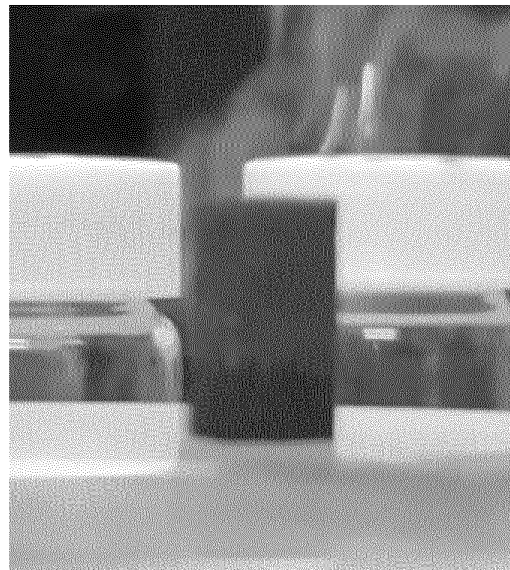


FIG. 1

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Description**Technical Field**

5 **[0001]** The following description relates to a method for manufacturing a combustible heat source for a smoking article, a combustible heat source manufactured by the manufacturing method, and a smoking article comprising the combustible heat source.

Background Art

10 **[0002]** A number of smoking articles which are heated rather than combusted have recently been proposed. Unlike conventional smoking articles, these non-combustion type smoking articles are used by sucking an aerosol generated by heating the smoking article medium without burning the smoking article medium. As one of these types of heating-type smoking articles, there is a smoking article product to which a carbon heat source is applied.

15 **[0003]** A smoking article to which the carbon heat source is applied generates an aerosol by heat transfer from the carbon heat source to a smoking article medium located downstream of the carbon heat source.

[0004] The smoking article to which the carbon heat source is applied has a smoking form similar to that of a traditional smoking article, unlike general heating-type electronic smoking articles using a dedicated device, so that consumers' smoking convenience and satisfaction can be expected to be improved.

Related Art DocumentPatent Document

25 **[0005]** (Patent Document 1) Korean Patent Publication No. 2020-0030364

Disclosure of the Invention**Technical Goals**

30 **[0006]** An object of the present disclosure is to provide a method for manufacturing a combustible heat source having reduced flame generation or surface cracking phenomenon during combustion and at the same time excellent ignitability and combustion persistency, and a smoking article comprising the heat source.

Technical Solutions

35 **[0007]** The present disclosure provides a method for manufacturing a combustible heat source for a smoking article, the method comprising the steps of:

40 mixing a carbon powder and an organic binder (S1);
preparing a combustible heat source composition for a smoking article by adding an aqueous sugar solution after the step S1 (S2);
adding oil to the composition (S3); and
compressing the composition (S4).

45 **[0008]** In one embodiment of the present disclosure, the aqueous sugar solution may be contained in the composition in an amount of 5 to 15% by weight.

[0009] In another embodiment of the present disclosure, the aqueous sugar solution may be prepared by mixing sugar and water at a weight ratio of 7: 3 to 5: 5.

50 **[0010]** In yet another embodiment of the present disclosure, the sugar may be one or more sugar alcohols selected from the group consisting of sorbitol, xylitol, mannitol, maltitol, lactitol, erythritol, reduced palatinose, and reduced starch syrup.

[0011] In still another embodiment of the present disclosure, the composition may further comprise potassium nitrate.

[0012] In yet still another embodiment of the present disclosure, the carbon powder may include charcoal and graphite.

55 **[0013]** In a further embodiment of the present disclosure, the organic binder may be one or more selected from the group consisting of carboxymethylcellulose (CMC), guar gum, methylcellulose (MC), and hydroxypropyl methylcellulose (HPMC).

[0014] In a still further embodiment of the present disclosure, the heat source may be ignited within 30 seconds, and

combustion may last for 140 seconds or more.

[0015] Furthermore, the present disclosure provides a smoking article comprising a combustible heat source comprised of the composition.

Effects

[0016] Conventional combustible heat sources have had limitations in that ignition is not easy due to charcoal as the main component. Accordingly, the present disclosure uses an aqueous sugar solution to facilitate the ignition of the combustible heat source, and the heat source consisting of the composition according to the present disclosure is characterized by having improved ignitability and combustibility compared to the conventional heat sources.

Brief Description of Drawings

[0017]

FIG. 1 is a view showing the result of checking the combustion process during combustion of the heat source according to Embodiment containing an aqueous sugar solution.

FIG. 2 is a view showing the results of checking the combustion process during combustion of the heat sources according to Comparative Embodiments containing a solid sugar.

Best Mode for Carrying Out the Invention

[0018] Most heating-type electronic smoking articles have a device in the structure of [device + dedicated stick]. As a new type of smoking article, a product having a smoking form similar to those of general smoking articles is being developed by applying a carbon-based heat source to the tip of the smoking article. Accordingly, the present disclosure has attempted to develop a combustible heat source that can have a smoking form (ignition, smoking start point) similar to those of the general smoking articles.

[0019] In order to improve ignitability in conventional combustible heat sources, an ignition accelerator composed of potassium nitrate/sugar was used in the present disclosure. When mixing the materials in the combustible carbon heat source, it was confirmed that a small amount of potassium nitrate/sugar in a powder form was not evenly mixed compared to the main used carbon powder, causing problems during combustion. In order to prevent this, in the present disclosure, a small amount of oil/moisture is applied to the carbon heat source, and sugar is applied in the form of an aqueous sugar solution to promote an even distribution inside the combustion body, and it is confirmed that problems occurring during combustion are solved, completed the present disclosure.

[0020] Therefore, the present disclosure seeks to present a method for manufacturing a combustible heat source, which has excellent ignitability and combustion persistency at the same time by adding sugar and enables stable combustion without a phenomenon such as flying flame by being evenly mixed with sugar, a combustible heat source manufactured through this, and a smoking article comprising the combustible heat source.

[0021] Accordingly, the present disclosure provides a method for manufacturing a combustible heat source for a smoking article, the method comprising the steps of:

- mixing a carbon powder and an organic binder (S1);
- preparing a combustible heat source composition for a smoking article by adding an aqueous sugar solution after the step S1 (S2);
- adding oil to the composition (S3); and
- compressing the composition (S4).

[0022] Further, the present disclosure may provide a combustible heat source for a smoking article, which is manufactured by the above method.

[0023] In addition, the present disclosure may provide a smoking article comprising the combustible heat source.

[0024] Hereinafter, the present disclosure will be described in more detail.

[0025] The combustible heat source composition according to the present disclosure is characterized in that it comprises a carbon powder and an organic binder, and is used by adding an aqueous sugar solution to the composition. In general heat source manufacturing, since the carbon powder is used, solid phase components are also used for the rest of the materials. However, an aqueous sugar solution is used in the present disclosure so that sugar is evenly dispersed in the heat source, thereby enabling stable combustion transition due to this.

[0026] Preferably, the aqueous sugar solution in the composition may be contained in an amount of 5 to 15% by weight, more preferably 5 to 10% by weight so as to have an ignition time of within 30 seconds and a combustion duration

time of about 3 minutes.

[0027] The aqueous sugar solution is prepared by mixing sugar and water at a weight ratio of 7:3 to 5:5, and it is preferable to use sugar in an amount greater than or equal to that of water. More preferably, an aqueous sugar solution prepared by mixing them at a weight ratio of 6:4 in which sugar and water can be evenly dispersed may be used.

[0028] The sugar is a sugar alcohol, and may include sorbitol, xylitol, mannitol, maltitol, lactitol, erythritol, reduced palatinose, reduced starch syrup, or the like. Preferably, mannitol with low hygroscopicity is used since it is suitable for being used in the heat source.

[0029] The ignition accelerator may be used by adding potassium nitrate to sugar. The potassium nitrate may be contained in an amount of 5 to 15% by weight.

[0030] The charcoal is used as a fuel that is ignited as a main material of a heat source and maintains combustion. The charcoal is preferably contained in an amount of 40% by weight or more based on 100% by weight of the solid content, and may maintain the temperature necessary for smoking for 3 minutes or more by being contained in an amount of 40% by weight or more.

[0031] In the present disclosure, a heat source may be manufactured by adding a polyhydric alcohol as oil to the composition. Since the polyhydric alcohol is added, combustible vaporization may be possible after ignition of the heat source, and thus ignitability and combustion persistency may be improved. The polyhydric alcohol assists combustion, and may be glycerin or propylene glycol. The polyhydric alcohol may be used in an amount of 1 to 5 parts by weight based on 100 parts by weight of the solid content. It has excellent ignitability and combustion persistency within the above range, and more preferably, when used in an amount of 1 to 3 parts by weight, rapid ignition and stable combustion progress are possible.

[0032] The heat source may be ignited within 30 seconds, and combustion may last for 140 seconds or more. The heat source having the ignition time and the combustion time may have a diameter of 5 to 10 mm and a length of 8 to 15 mm, but is not limited thereto.

[0033] As one embodiment of the present disclosure, one or more binders may be combined in the heat source. Preferably, one or more binders are organic binders. Known suitable organic binders are not limited thereto, but include carboxymethylcellulose (CMC), guar gum, methylcellulose (MC), hydroxypropyl methylcellulose (HPMC), and combinations thereof.

[0034] Additionally, a combustible heat source for use in a smoking article according to the present disclosure may comprise one or more additives to enhance the properties of the combustible heat source. Suitable additives include additives that promote consolidation of the combustible heat source (e.g., sintering aids), additives that promote ignition of the combustible heat source (e.g., oxidizers such as perchlorates, chlorates, nitrates, peroxides, permanganates, zirconium, and combinations thereof), additives that promote combustion of the combustible heat source (e.g., potassium, and potassium salts such as potassium citrate), and additives that promote decomposition of one or more gases produced by combustion of the combustible heat source (e.g., catalysts such as CuO, Fe₂O₃, and Al₂O₃).

[0035] In addition, the combustible heat source may further comprise an ignition aid. As used in the present disclosure, the term 'ignition aid' is used to denote a substance that releases one or both of energy and oxygen during ignition of a combustible heat source, wherein the rate of release of one or both of the energy and oxygen by the substance is not limited by ambient oxygen diffusion. That is, during ignition of a combustible heat source, the rate of release of one or both of energy and oxygen by the substance is almost independent of the rate at which ambient oxygen can reach the substance. As used in the present disclosure, the term 'ignition aid' is also used to denote an elemental metal that releases energy during ignition of a combustible heat source, wherein the ignition temperature of the elemental metal is lower than about 500°C, and the combustion heat of the elemental metal is at least about 5 kJ/g. The ignition aid is an alkali metal salt of carboxylic acid (an alkali metal citrate salt, an alkali metal acetate salt, an alkali metal succinate salt, or the like), an alkali metal halide salt (an alkali metal chloride salt or the like), an alkali metal carbonate salt, or an alkali metal phosphate salt, which is believed to modify carbon combustion.

[0036] Embodiments of suitable oxidizers are not limited thereto, by include nitrates such as, for example, potassium nitrate, calcium nitrate, strontium nitrate, sodium nitrate, barium nitrate, lithium nitrate, aluminum nitrate, and iron nitrate; nitrite; other organic and inorganic nitro compounds; chlorates such as, for example, sodium chlorate, and potassium chlorate; perchlorates such as, for example, sodium perchlorate; chlorites; bromates such as, for example, sodium bromate and potassium bromate; perbromates; bromites; borates such as, for example, sodium borate and potassium borate; ferrates such as, for example, barium ferrate; ferrites; manganates such as, for example, potassium manganate; permanganates such as, for example, potassium permanganate; organic peroxides such as, for example, benzoyl peroxide and acetone peroxide; inorganic peroxides such as, for example, hydrogen peroxide, strontium peroxide, magnesium peroxide, calcium peroxide, barium peroxide, zinc peroxide, and lithium peroxide; hyperoxides such as, for example, potassium hyperoxide and sodium hyperoxide; iodates; periodates; iodites; sulfates; sulfites; other sulfoxides; phosphates; phosphinates; phosphites; and phosphonates.

[0037] The ignition and combustion performances of the combustible heat source are advantageously improved, but undesirable decomposition and reaction products during the use of a smoking article may be produced by comprising

ignition and combustion additives. For example, nitrates contained in the combustible heat source to assist ignition are decomposed so that nitrogen oxides may be formed. Containing a combustible heat source in a smoking article according to the present disclosure advantageously substantially prevents or suppresses decomposition and reaction products from entering the air drawn through the smoking article according to the present disclosure during its use.

[0038] Combustible carbonaceous heat sources for use in a smoking article according to the present disclosure may be manufactured as described in the conventional art known to those skilled in the art.

[0039] A combustible carbonaceous heat source for use in a smoking article according to the present disclosure is preferably formed by mixing one or more carbon-containing materials with one or more binders and other additives (if contained), and preforming the mixture into the desired shape. The mixture of one or more carbon-containing materials, one or more binders, and optional other additives may be pre-formed into a desired shape by using any suitable known ceramic forming methods such as, for example, slip casting, extrusion, injection molding, and mold compression. In certain preferred embodiments, the mixture is pre-formed into a desired shape by pressurization, extrusion, or a combination thereof.

[0040] Preferably, the mixture of one or more carbon-containing materials, one or more binders, and other additives is pre-formed into an elongate rod. However, it will be understood that the mixture of one or more carbon-containing materials, one or more binders, and other additives may be pre-formed into other desired shapes.

[0041] In one embodiment of the present disclosure, the combustible heat source may preferably have a porosity between about 20% and about 80%, more preferably between about 20% and about 60%. More preferably, the combustible heat source may have a porosity between about 50% and about 70% when measured, for example, by mercury porosimetry or helium pycnometry. The required porosity may be easily achieved while the method for manufacturing the heat source is being performed using conventional methods and techniques.

[0042] Advantageously, a combustible heat source for use in a smoking article according to the present disclosure have an apparent density between about 0.6 g/cm³ and about 1 g/cm³.

[0043] Preferably, the combustible heat source has a mass between about 300 mg and about 500 mg, more preferably between about 400 mg and about 450 mg.

[0044] Preferably, the combustible heat source has a length between about 7 mm and about 17 mm, more preferably between about 7 mm and about 15 mm, and most preferably between about 7 mm and about 13 mm.

[0045] Preferably, the combustible heat source has a diameter between about 5 mm and about 9 mm, more preferably between about 7 mm and about 8 mm.

[0046] Preferably, the combustible heat source has a substantially uniform diameter. However, the combustible heat source is alternatively tapered so that the diameter of the rear portion of the combustible heat source is greater than the diameter of the front portion thereof. In such embodiments, the rear portion of the combustible heat source has a widthwise directional cross-sectional area of at least about 60% of the widthwise directional cross-sectional area of the smoking article.

[0047] It is particularly preferred that the combustible heat source is substantially cylindrical. The combustible heat source may be, for example, a substantially circular cross-sectional cylinder or tapered cylinder shape, or a substantially elliptical cross-sectional cylinder or tapered cylinder shape.

[0048] Accordingly, the combustible heat source may be used in a combustible heat source-applied smoking article.

[0049] The "smoking article" may mean any smokeable product or any product that can provide a smoking experience regardless of whether or not it is based on tobacco, tobacco derivatives, expanded tobacco, reconstituted tobacco, or tobacco substitutes. For example, the smoking article may mean a smokeable article capable of generating an aerosol, such as a cigarette, cigar, cigarillo, or the like.

[0050] The smoking article may comprise a combustible heat source composed of the composition, a medium part, a thermally conductive wrapper, cigarette paper, a cooling part, a filter part, etc., and the combustible heat source; the medium part; the cooling part; and the filter part may be aligned in order based on the longitudinal direction, but the order can be freely changed except for the case where the combustible heat source is located upstream. In addition to this, additional configurations may be further included or one or more of the above-described configurations may be omitted. The smoking article may have a diameter of, for example, 4 mm to 10 mm, and a circumference of 14 mm to 29 mm. In addition, the smoking article may have a length of 45 mm to 100 mm.

[0051] The medium part may include, for example, at least one of cut tobacco, cut reconstituted tobacco leaves, cigarette leaves, expanded tobacco, and nicotine extract. The medium part may contain a nicotine component. In addition to the medium part, an aerosol-generating material may be further contained. The aerosol-generating material may include polyhydric alcohols, esters of polyhydric alcohols such as glycerol mono-, di- or triacetate, and aliphatic esters of mono-, di- or esters of polycarboxylic acids such as dimethyl dodecanedioate and dimethyl tetradecanedioate. More specifically, the aerosol-generating material may include, for example, at least one of glycerin, propylene glycol, ethylene glycol, dipropylene glycol, diethylene glycol, triethylene glycol, tetraethylene glycol, and oleyl alcohol. For example, the medium part may include cut reconstituted tobacco leaves immersed in glycerin. However, this is an example and the present disclosure is not necessarily limited to the description described above.

[0052] The medium part may have a length between about 5 mm and about 20 mm, more preferably between about 8 mm and about 12 mm. The medium part is surrounded by paper or other wrapper and may be in the form of a plug or part containing a material capable of releasing volatile compounds in response to heating. As described above, when the medium part is in the form of a plug or part, the entire plug or part including any wrapper is considered to be the medium part.

[0053] The cooling part may contain a cooling material. The cooling part includes a tubular hollow body with an open end, and may cool airflow passing through the heat source and the medium part. The cooling part may be made of a polymer material or a biodegradable polymer material and may have a cooling function. For example, the cooling part may be paper, cardboard, plastic, and may be, for example, cellulose acetate, ceramic, and a combination thereof. Additionally, the cooling part may include a corrugated sheet of material selected from the group consisting of metal foil, polymeric material, and substantially non-porous paper or cardboard. In certain embodiments, the aerosol cooling element may also include a corrugated sheet of material selected from the group consisting of polyethylene (PE), polypropylene (PP), polyvinyl chloride (PVC), polyethylene terephthalate (PET), polylactic acid (PLA), cellulose acetate (CA), and aluminum foil. The cooling part may have a length between about 5 mm and about 30 mm, more preferably between about 8 mm and about 25 mm, but the length may be freely adjusted in consideration of the temperature of heat generated from a heatable heat source.

[0054] The filter part contains a filter material, and the shape of the filter part is not limited. For example, the filter part may be a cylinder-type rod or a tube-type rod including a hollow therein. Alternatively, the filter part may be a recess-type rod. If the filter part is composed of a plurality of segments, at least one of the plurality of segments may be manufactured in a different shape. For example, the filter part may include a fibrous phase, a filament phase, or a filter tow including both thereof, containing at least one of polymer, paper, cellulose acetate, activated carbon, and carbon, but is not limited thereto. The filter part, for example, may have a length of 5 to 20 mm.

[0055] In addition to this, the filter may further comprise a tipping paper in contact with the mouth, which surrounds the filter material. The tipping paper may have one or more perforations formed therein.

[0056] The filter part may be manufactured to generate flavor. As an example, a flavoring liquid may be sprayed onto the filter material, and a separate fiber coated with the flavoring liquid may be inserted into the filter part.

[0057] The cooling part and the filter part may contain an aerosol modifier. For example, one or more of the cooling part, filter part, and tipping paper of the smoking article according to the present disclosure may contain one or more aerosol modifiers. Suitable aerosol modifiers may not be limited thereto, but may include a flavoring agent and a chemesthetic agent. The flavoring agent is used to describe any substance that, when used, imparts taste, aroma, or both thereof to aerosols generated by a tobacco material and an aerosol-generating material of the smoking article.

[0058] In addition, the cigarette paper is composed of cellulose fibers obtained from wood, flax, or other materials, and may be wrapped around a medium part, wrapped around the entire smoking article comprising the medium part, or wrapped around a part except for the filter part. The base paper of the cigarette paper may have a thickness of about 30 μm to about 100 μm , and the base paper may have a basis weight of about 15 g/m^2 to about 80 g/m^2 .

[0059] The smoking article according to the present disclosure may also comprise downstream one or more aerosol modifiers that are both a flavoring agent and a chemesthetic agent. For example, one or more of the cooling part and filter part of the smoking article according to the present disclosure may contain menthol or another flavoring agent that provides a cooling object sensory effect.

[0060] In addition, the smoking article comprising the combustible heat source may comprise a thermally conductive wrapper surrounding the combustible heat source and the medium part. The thermally conductive wrapper may completely surround the heat source and the medium part, partially surround a portion of the heat source and the medium part, or entirely surround a portion of the heat source and the medium part. The thermally conductive wrapper transfers heat generated from a combustible heat source to a smoking article material, and the wrapper may include metal foil wrappers such as an aluminum foil wrapper, a steel wrapper, an iron foil wrapper, and a copper foil wrapper; and metal alloy foil wrappers, and is not limited to the material as long as it is a material capable of efficiently transferring heat.

[0061] A metal barrier may be formed between the heatable heat source and the medium part. Here, the metal barrier may prevent direct contact of a combustible heat source part with the medium part, and may prevent some out of components generated in the combustible heat source part from moving to the medium part.

[0062] The thickness of the barrier may be appropriately adjusted to obtain good smoking performance. In a specific embodiment, the barrier may have a thickness between about 10 microns and about 500 microns. The barrier may include one or more metallic materials that are substantially thermally stable and non-combustible at the temperatures obtained by the combustible heat source upon ignition and combustion. Suitable materials are known in the art and are not limited thereto, but they include aluminum, copper, stainless steel, and combinations thereof.

[0063] Hereinafter, Embodiments will be described in detail with reference to the accompanying drawings. However, since various changes can be made to the Embodiments, the scope of rights of the patent application is not restricted or limited by these Embodiments. It should be understood that all changes, equivalents or substitutes to the Embodiments are included within the scope of rights.

[0064] Terms used in the Embodiments are used only for descriptive purposes and should not be construed as an intention of limiting the present disclosure. Singular expressions include plural expressions unless the context clearly dictates otherwise. In this specification, terms such as "include" or "have" are intended to designate that there is a feature, number, step, operation, component, part, or combination thereof described in the specification, but it should be understood that the presence or addition of one or more other features, numbers, steps, operations, components, parts, or combinations thereof is not precluded.

[0065] Unless defined otherwise, all terms used herein, including technical or scientific terms, have the same meaning as commonly understood by a person of ordinary skill in the art to which the Embodiments belong. Terms such as those defined in commonly used dictionaries should be interpreted as having a meaning consistent with the meaning in the context of the related art, and unless explicitly defined in the present application, they should not be interpreted in an ideal or excessively formal meaning.

[0066] In addition, in the description with reference to the accompanying drawings, the same reference numerals are given to the same components regardless of reference numerals, and overlapping descriptions thereof will be omitted. In describing Embodiments, if it is determined that a detailed description of a related known technology may unnecessarily obscure the gist of the Embodiments, the detailed description will be omitted.

[Embodiment]

1. Manufacture of Combustible Heat Sources

[0067] According to the compositions shown in Table 1 below, combustible heat source compositions comprising charcoal, binder, potassium nitrate, and sugar were prepared. The heat sources were manufactured in the form of a cylinder with a diameter of 7 mm and a height of about 11 mm. Materials for manufacturing heat sources were prepared according to the mixing ratios and then mixed using an atmospheric pressure mixer (ARE-310 from THINKY). When mixing, each material was mixed at 1,500 RPM for 1 minute each time it was added.

[0068] An appropriate amount of oil (PG) was added to the mixed powder in parts by weight shown in Table 1 and mixed at 1,500 RPM for 5 minutes. The mixed samples were divided into about 0.6 g and pressed through a press to form pressed samples in a cylinder shape.

[0069] The pressed samples were dried in a drying oven at 80°C for 30 minutes.

[Table 1]

	Solid mixing ratio (% , weight basis)								
	Carbon powder	Binder	KNO ₃	Solid sugar	Aqueous sugar solution 1	Aqueous sugar solution 2	Aqueous sugar solution 3	Aqueous sugar solution 4	Sum
Embodiment 1	Balance	5	7.5	0	5	0	0	0	100
Embodiment 2	Balance	5	7.5	0	8	0	0	0	100
Embodiment 3	Balance	5	7.5	0	10	0	0	0	100
Embodiment 4	Balance	5	7.5	0	0	8	0	0	100
Embodiment 5	Balance	5	7.5	0	0	0	8	0	100
Comparative Embodiment 1	Balance	5	7.5	5	0	0	0	0	100
Comparative Embodiment 2	Balance	5	7.5	0	0	0	0	5	100

(continued)

	Solid mixing ratio (% , weight basis)								
	Carbon powder	Binder	KNO ₃	Solid sugar	Aqueous sugar solution 1	Aqueous sugar solution 2	Aqueous sugar solution 3	Aqueous sugar solution 4	Sum
Comparative Embodiment 3	Balance	5	7.5	0	3	0	0	0	100
Comparative Embodiment 4	Balance	5	7.5	0	20	0	0	0	100
Aqueous sugar solution 1 - sugar:water = 6:4, Aqueous sugar solution 2 - sugar:water = 7:3 Aqueous sugar solution 3 - sugar:water = 5:5 Aqueous sugar solution 4 - sugar:water = 4:6									

2. Confirmation of Combustion Results of Combustible Heat Sources

[0070] The manufactured heat sources were ignited and then burned to show the observation results in Table 2 below.

[Table 2]

	Ignitability	Combustion maintenance/surface combustion speed	Shape maintenance after combustion
Embodiment 1	○ Combustion started in 27s	Surface combustion (takes 180s)	○
Embodiment 2	○ Combustion started in 24s	Surface combustion (takes 175s)	○
Embodiment 3	○ Combustion started in 23s	Surface combustion (takes 174s)	○
Embodiment 4	○ Combustion started in 26s	Surface combustion (takes 181s)	○ (Confirming the slight sugar boiling phenomenon on the surface)
Embodiment 5	○ Combustion started in 27s	Surface combustion (takes 184s)	○ (Confirming the slight sugar boiling phenomenon on the surface)
Comparative Embodiment 1	○ Combustion started in 27s	△ Phenomena in which flames fly and sugar boils during combustion occur	× (Confirming cracks on the surface)
Comparative Embodiment 2	△ Combustion started in 48s	Surface combustion (takes 281s)	○
Comparative Embodiment 3	△ Combustion started in 48s	Surface combustion (takes 274s)	○

(continued)

	Ignitability	Combustion maintenance/surface combustion speed	Shape maintenance after combustion
Comparative Embodiment 4	△ Combustion started in 26s	× Sugar boiling and explosion	×

[0071] As can be confirmed from the results of Table 2, in the case of having the compositions as in Embodiments 1 to 5, good ignitability and combustibility were confirmed (FIG. 1). However, when sugar was contained at 7:3 and 5:5, a slight boiling phenomenon was confirmed on the surface.

[0072] Compared to this, as shown in FIG. 2, it was confirmed that the sugar boiling phenomenon and the flame flying phenomenon on the surface were observed in Comparative Embodiment 1 using solid sugar.

[0073] Further, in Comparative Embodiment 2 using an aqueous sugar solution having a high water content, good combustion was performed, but the start of combustion was late, and the surface combustion time took an excessively long time.

[0074] Further, also in Comparative Embodiment 3 using 3% by weight of an aqueous sugar solution, the start of combustion was late, and surface combustion lasted for a long time, and in Comparative Embodiment 4 using 20% by weight of an aqueous sugar solution, ignition was good, but sugar boiling and explosion phenomena were confirmed.

[0075] Although the above-mentioned embodiments have been described by limited drawings, those skilled in the art may apply various technical modifications and alterations based on the above-mentioned description. For example, appropriate results can be achieved although described techniques are carried out in a different order from a described method, and/or described elements of a system, structure, apparatus, circuit, etc. are combined or mixed in a different form from the described method, or replaced or substituted with other elements or equivalents.

[0076] Therefore, other embodiments, other examples, and equivalents to patent claims belong to the scope of the patent claims to be described later.

Claims

1. A method for manufacturing a combustible heat source for a smoking article, the method comprising the steps of:

mixing a carbon powder and an organic binder (S1);

preparing a combustible heat source composition for a smoking article by adding an aqueous sugar solution after the step S1 (S2);

adding oil to the composition (S3); and

compressing the composition (S4).

2. The method of claim 1, wherein the aqueous sugar solution is contained in the composition in an amount of 5 to 15% by weight.

3. The method of claim 1, wherein the aqueous sugar solution is prepared by mixing sugar and water at a weight ratio of 7: 3 to 5: 5.

4. The method of claim 1, wherein the sugar is one or more sugar alcohols selected from the group consisting of sorbitol, xylitol, mannitol, maltitol, lactitol, erythritol, reduced palatinose, and reduced starch syrup.

5. The method of claim 1, wherein the ignition accelerator further comprises potassium nitrate.

6. The method of claim 1, wherein the carbon powder includes charcoal and graphite, and is contained in an amount of 40% by weight or more.

7. The method of claim 1, wherein the organic binder is one or more selected from the group consisting of carboxymethylcellulose (CMC), guar gum, methylcellulose (MC), and hydroxypropyl methylcellulose (HPMC).

8. A combustible heat source manufactured by the method of any one of claims 1 to 8.

9. The combustible heat source of claim 8, wherein the heat source is ignited within 30 seconds, and combustion lasts for 140 seconds or more.
10. A smoking article comprising the combustible heat source of claims 9.

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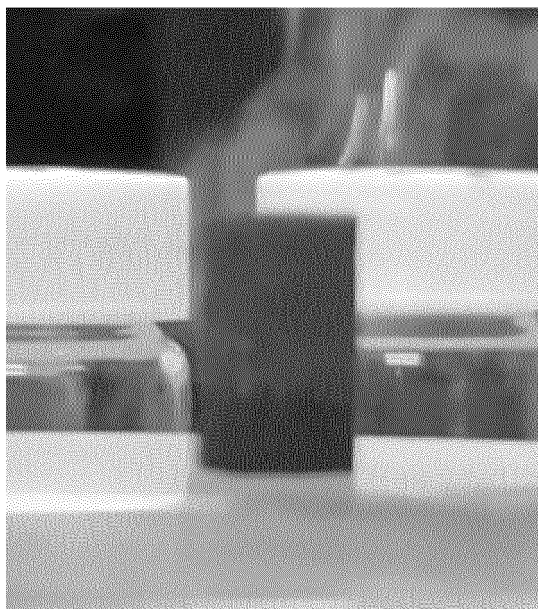


FIG. 1

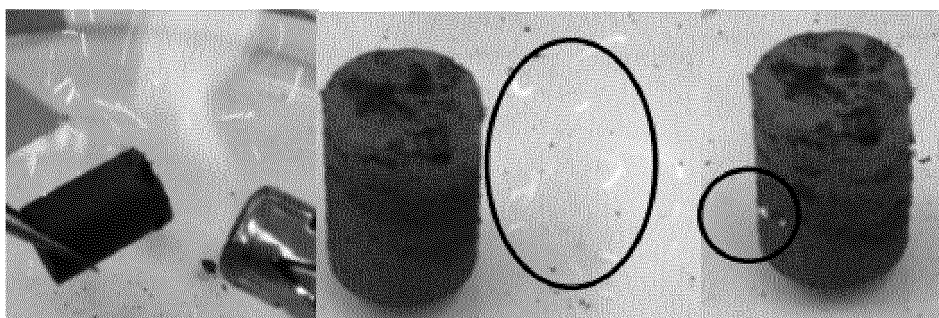


FIG. 2

INTERNATIONAL SEARCH REPORT

International application No.

PCT/KR2022/019004

A. CLASSIFICATION OF SUBJECT MATTER A24B 15/16(2006.01)i; A24D 1/22(2020.01)i; A24B 15/30(2006.01)i; A24B 15/28(2006.01)i 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 15/16(2006.01); A24B 15/18(2006.01); A24B 15/40(2006.01); A24D 1/08(2006.01); A24F 47/00(2006.01)																		
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched Korean utility models and applications for utility models: IPC as above Japanese utility models and applications for utility models: IPC as above																		
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used) eKOMPASS (KIPO internal) & keywords: 가연성 열원(combustible heat source), 흡연 물품(smoking article), 탄소 분말(carbon powder), 유기 바인더(organic binder), 설탕 수용액(sugar aqueous solution), 유분(oil)																		
C. DOCUMENTS CONSIDERED TO BE RELEVANT																		
<table border="1"> <thead> <tr> <th>Category*</th> <th>Citation of document, with indication, where appropriate, of the relevant passages</th> <th>Relevant to claim No.</th> </tr> </thead> <tbody> <tr> <td>X</td> <td>KR 10-2047720 B1 (PHILIP MORRIS PRODUCTS S.A.) 25 November 2019 (2019-11-25) See paragraphs [0006], [0025]-[0052], [0125]-[0130] and [0202]-[0206]; and claim 13.</td> <td>1-10</td> </tr> <tr> <td>A</td> <td>KR 10-2014-0146601 A (PHILIP MORRIS PRODUCTS S.A.) 26 December 2014 (2014-12-26) See entire document.</td> <td>1-10</td> </tr> <tr> <td>A</td> <td>KR 10-2015-0048869 A (PHILIP MORRIS PRODUCTS S.A.) 07 May 2015 (2015-05-07) See entire document.</td> <td>1-10</td> </tr> <tr> <td>A</td> <td>KR 10-2020-0030365 A (KT & G CORPORATION) 20 March 2020 (2020-03-20) See entire document.</td> <td>1-10</td> </tr> <tr> <td>A</td> <td>US 2012-0138074 A1 (CANTRELL, Daniel Verdin et al.) 07 June 2012 (2012-06-07) See entire document.</td> <td>1-10</td> </tr> </tbody> </table>	Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.	X	KR 10-2047720 B1 (PHILIP MORRIS PRODUCTS S.A.) 25 November 2019 (2019-11-25) See paragraphs [0006], [0025]-[0052], [0125]-[0130] and [0202]-[0206]; and claim 13.	1-10	A	KR 10-2014-0146601 A (PHILIP MORRIS PRODUCTS S.A.) 26 December 2014 (2014-12-26) See entire document.	1-10	A	KR 10-2015-0048869 A (PHILIP MORRIS PRODUCTS S.A.) 07 May 2015 (2015-05-07) See entire document.	1-10	A	KR 10-2020-0030365 A (KT & G CORPORATION) 20 March 2020 (2020-03-20) See entire document.	1-10	A	US 2012-0138074 A1 (CANTRELL, Daniel Verdin et al.) 07 June 2012 (2012-06-07) See entire document.	1-10
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☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.																		
<table border="0"> <tr> <td> * Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "D" document cited by the applicant in the international application "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 </td> <td> "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 </td> </tr> </table>	* Special categories of cited documents: "A" document defining the general state of the art which is not considered to be of particular relevance "D" document cited by the applicant in the international application "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																
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<table border="1"> <tr> <td>Date of the actual completion of the international search 07 March 2023</td> <td>Date of mailing of the international search report 08 March 2023</td> </tr> </table>	Date of the actual completion of the international search 07 March 2023	Date of mailing of the international search report 08 March 2023																
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<table border="1"> <tr> <td> Name and mailing address of the ISA/KR Korean Intellectual Property Office Government Complex-Daejeon Building 4, 189 Cheongsaro, Seo-gu, Daejeon 35208 Facsimile No. +82-42-481-8578 </td> <td> Authorized officer Telephone No. </td> </tr> </table>	Name and mailing address of the ISA/KR Korean Intellectual Property Office Government Complex-Daejeon Building 4, 189 Cheongsaro, Seo-gu, Daejeon 35208 Facsimile No. +82-42-481-8578	Authorized officer Telephone No.																
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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

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