(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

(11) **EP 4 501 138 A1**

(12) **EUROPEAN PATENT APPLICATION**
published in accordance with Art. 153(4) EPC

(43) Date of publication:
05.02.2025 Bulletin 2025/06

(21) Application number: **23843170.4**

(22) Date of filing: **02.06.2023**

(51) International Patent Classification (IPC):
A24B 15/167 *(2020.01)* ***A24B 15/32*** *(2006.01)*
A24B 15/24 *(2006.01)* ***A24B 15/30*** *(2006.01)*
A24B 15/28 *(2006.01)* ***A24F 40/10*** *(2020.01)*
A24F 40/42 *(2020.01)* ***A24F 40/50*** *(2020.01)*

(52) Cooperative Patent Classification (CPC):
A24B 15/167; A24B 15/24; A24B 15/28; A24B 15/30; A24B 15/32; A24F 40/10; A24F 40/42; A24F 40/50

(86) International application number:
PCT/KR2023/007560

(87) International publication number:
WO 2024/019313 (25.01.2024 Gazette 2024/04)

(84) Designated Contracting States:
AL AT BE BG CH CY CZ DE DK EE ES FI FR GB GR HR HU IE IS IT LI LT LU LV MC ME MK MT NL NO PL PT RO RS SE SI SK SM TR
Designated Extension States:
BA
Designated Validation States:
KH MA MD TN

(30) Priority: **20.07.2022 KR 20220089831**

(71) Applicant: **KT&G Corporation**
Daedeok-gu
Daejeon 34337 (KR)

(72) Inventors:
- **JUNG, Yongmi**
  Daejeon 34128 (KR)
- **JUNG, Hwa Chul**
  Daejeon 34128 (KR)
- **KIM, Moonwon**
  Daejeon 34128 (KR)
- **SHIN, Jun Won**
  Daejeon 34128 (KR)
- **SHIN, Han Jae**
  Daejeon 34128 (KR)
- **LEE, Young Chul**
  Daejeon 34128 (KR)

(74) Representative: **Ter Meer Steinmeister & Partner Patentanwälte mbB**
Nymphenburger Straße 4
80335 München (DE)

(54) LIQUID-TYPE INHALATION FORMULATION FOR USE IN SURFACE WAVE ATOMIZER, AND CARTRIDGE AND AEROSOL-GENERATING APPARATUS COMPRISING SAME

(57) The present invention is directed to a liquid-type inhalation formulation for a surface wave atomizer, and a cartridge and an aerosol-generating apparatus comprising same, wherein the inhalation formulation has a viscosity of 1.0-120 mPa·s at 20°C and comprises at least one selected from the group consisting of propylene glycol, glycerin, and physiological saline, the content of the glycerin being 50 wt% or more relative to the total weight of the propylene glycol, glycerin, and physiological saline.

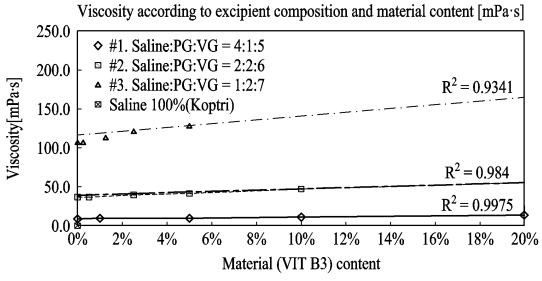

FIG. 1

EP 4 501 138 A1

Description

Technical Field

[0001] The present disclosure relates to a liquid-type inhalation formulation for use in a surface wave atomizer, and a cartridge and an aerosol-generating apparatus including the same.

Background Art

[0002] As an alternative to overcome disadvantages of combustible tobacco, a method of generating an aerosol by heating an aerosol generating material in a cigarette or a cartridge is widely used, instead of a method of generating an aerosol by burning a cigarette, and there is an increasing demand for this method. Accordingly, research on a heating-type (non-combustible) cigarette or a heating-type (non-combustible) aerosol generating system has been actively conducted.

[0003] Specifically, an aerosol generating system has a similar structure as a combustible cigarette of the related art and generates mainstream smoke containing an aerosol by heating an aerosol generating material in a heating-type (non-combustible) cigarette or a cartridge with a heater or ultrasonic vibration.

[0004] An electrical heating-type aerosol-generating apparatus for boiling and vaporizing a liquid among liquid-type aerosol-generating apparatuses has high thermal conductivity and high atomization efficiency. However, there is a possibility of altering functional inhalation materials in the liquid. For example, the release of harmful components such as aldehyde from a high-temperature heat may pose a major health risk.

[0005] Meanwhile, an example of a method of atomization without boiling includes a method of using ultrasonic waves of the related art. However, this method also causes a temperature rise in the process of causing vibration, and even when a cooling method is used to lower the temperature, it is difficult to continuously perform stable atomization without failure using a liquid having a high viscosity, and the method causes high power consumption for atomization and has low efficiency due to a low speed.

[0006] Therefore, it is currently required to develop a liquid-type inhalation formulation using a surface wave (surface acoustic wave (SAW)) atomizer capable of continuously and stably generating an aerosol while causing atomization with vibration without a temperature rise and failure issues of a liquid having a high viscosity, and a cartridge and a liquid-type aerosol-generating apparatus including the same.

Disclosure of the Invention

Technical Goals

[0007] Therefore, in order to overcome the problems and/or limitations of existing technologies as described above, an object of the present disclosure is to provide a liquid-type inhalation formulation for use in a surface wave atomizer, and a cartridge and an aerosol-generating apparatus including the same.

[0008] However, goals to be achieved are not limited to those described above, and other goals not mentioned above are clearly understood by one of ordinary skill in the art from the following description.

Technical Solutions

[0009] According to an embodiment of the present disclosure, there is provided a liquid-type inhalation formulation for a surface wave atomizer, in which

a viscosity at 20°C is 1.0 to 120 mPa·s,
the liquid-type inhalation formulation includes one or more selected from a group consisting of propylene glycol, glycerin, and physiological saline, and
a content of the glycerin is 50 wt% or more with respect to a total weight of the propylene glycol, the glycerin, and the physiological saline.

[0010] According to an aspect of the present disclosure, there is provided a cartridge including the liquid-type inhalation formulation described above.

[0011] According to another aspect of the present disclosure, there is provided an aerosol-generating apparatus including:

a cartridge including the liquid-type inhalation formulation described above; and
a control unit.

Effects of the Invention

[0012] When the liquid-type inhalation formulation for use in the surface wave atomizer according to an aspect of the present disclosure is used, stable atomization may be continuously performed up to a range of higher viscosity, and therefore, a liquid having a viscosity in a wide range may be used in the aerosol-generating apparatus. Furthermore, the use of the liquid-type inhalation formulation of the present disclosure may provide a sufficient amount of atomization and facilitate pulmonary delivery. In addition, a flavoring agent may be mixed into the liquid-type inhalation formulation, and a functional material (solid-phase or liquid-phase material) may be mixed with physiological saline for inhalation.

[0013] The cartridge and the aerosol-generating apparatus including the liquid-type inhalation formulation for use in the surface wave atomizer according to an aspect of the present disclosure uses a surface wave to stably and continuously perform atomization even with a liquid having a high viscosity using vibration without failure and a temperature rise of the liquid.

[0014] It should be understood that the effects of the present disclosure are not limited to the above-described effects, but are construed as including all effects that may be inferred from the configurations and features described in the following description or claims of the present disclosure.

Brief Description of Drawings

[0015]

FIG. 1 is a diagram illustrating a change of a viscosity (20°C) according to a composition of a liquid-type inhalation formulation for a surface wave atomizer and a content of a functional material (VIT B3) according to an embodiment of the present disclosure.

FIG. 2 is a diagram illustrating a change of a surface tension (25°C) according to a composition of a liquid-type inhalation formulation for a surface wave atomizer and a content of a functional material (VIT B3) according to an embodiment of the present disclosure.

FIG. 3 is a diagram illustrating a change of a liquid density (25°C) according to a composition of a liquid-type inhalation formulation for a surface wave atomizer and a content of a functional material (VIT B3) according to an embodiment of the present disclosure.

Best Mode for Carrying Out the Invention

[0016] Hereinafter, embodiments will be described in detail with reference to the accompanying drawings. However, various alterations and modifications may be made to the embodiments. Here, the embodiments are not construed as limited to the disclosure. The embodiments should be understood to include all changes, equivalents, and replacements within the idea and the technical scope of the disclosure.

[0017] The terminology used herein is for the purpose of describing particular embodiments only and is not to be limiting of the embodiments. The singular forms "a", "an", and "the" are intended to include the plural forms as well, unless the context clearly indicates otherwise. It will be further understood that the terms "comprises/comprising" and/or "includes/including" when used herein, specify the presence of stated features, integers, steps, operations, elements, and/or components, but do not preclude the presence or addition of one or more other features, integers, steps, operations, elements, components and/or groups thereof.

[0018] Unless otherwise defined, all terms including technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which the embodiments belong. It will be further understood that terms, such as those defined in commonly-used dictionaries, should be interpreted as having a meaning that is consistent with their meaning in the context of the relevant art and will not be interpreted in an idealized or overly formal sense unless expressly so defined herein.

[0019] When describing the embodiments with reference to the accompanying drawings, like reference numerals refer to like components and a repeated description related thereto will be omitted. In the description of embodiments, detailed description of well-known related structures or functions will be omitted when it is deemed that such description will cause ambiguous interpretation of the present disclosure.

[0020] In addition, the terms first, second, A, B, (a), and (b) may be used to describe constituent elements of the embodiments. These terms are used only for the purpose of discriminating one component from another component, and the nature, the sequences, or the orders of the components are not limited by the terms.

[0021] A component, which has the same common function as a component included in any one embodiment, will be described by using the same name in other embodiments. Unless otherwise mentioned, the descriptions of an embodiment may be applicable to other embodiments and thus, repeated descriptions will be omitted for conciseness.

[0022] According to an embodiment of the present disclosure, there is provided a liquid-type inhalation formulation for

use in a surface wave atomizer, wherein the liquid-type inhalation formulation has a viscosity of 1.0 to 120 mPa·s at 20°C, and includes one or more selected from a group consisting of propylene glycol, glycerin, and physiological saline, and a content of the glycerin is 50 wt% or more with respect to a total weight of the propylene glycol, the glycerin, and the physiological saline.

[0023] An atomizer refers to an operation of vaporizing a liquid as liquid droplets in a gas. For example, the atomizer may be implemented as an electrical heater including a coil for resistance (Joule) heating, resistive wires formed in different shapes, or a susceptor for induction heating, and a capillary tube or a porous element having working performance adjacent to the heater, which absorbs a liquid from a liquid storage and delivers the liquid to the electrical heater.

[0024] Surface waves may be spread along a surface of a liquid, the energy is concentrated mainly on a surface of a medium such that an amplitude exponentially decreases inside the medium along with a distance from the surface. The characteristics of the surface waves may be used to generate an aerosol on the liquid surface. The energy orientation concentration characteristic may increase atomization efficiency and continuously and stably generate an aerosol with uniform particle size, and may be more suitable to atomize a cigarette solution having a high viscosity than ultrasonic waves. A frequency of the surface wave is generally 10 megahertz (MHz) to 500 megahertz (MHz), that is higher than a frequency of the ultrasonic wave. Thus, compared to ultrasonic waves, an aerosol generated by the surface waves has a smaller particle size, does not easily remain on the oral mucous or tongue surface, has a stronger inhalation strength, and smells thicker, mild, and soft.

[0025] The liquid-type inhalation formulation, which is an aerosol forming formulation, may be a mixture of diol and glycerin, and diol herein may be propylene glycol. In the present disclosure, propylene glycol may be understood as propane-1,2-diol, and glycerin may be understood as propane-1,2,3-triol.

[0026] For the stable atomization of an aerosol-generating apparatus, the viscosity of the liquid-type inhalation formulation is important. Normally, a viscosity of a liquid composition of 10 mPa·s or more may be considered as a high viscosity. When such a liquid composition having a high viscosity is used in an electrically heating-type or ultrasonic aerosol-generating apparatus, failure of the apparatus easily occurs or it is difficult to generate stable atomization.

[0027] A surface tension of the liquid-type inhalation formulation according to an embodiment of the present disclosure may be 50 to 70 dyne at 25°C. When the surface tension is higher than the above range (50 to 70 dyne), a size of a liquid droplet may be reduced. Meanwhile, in order to increase the surface tension, it is necessary to add a large amount of ethanol, which is harmful to the human body and causes danger during the process.

[0028] A density of the liquid-type inhalation formulation according to an embodiment of the present disclosure measured after storage at 25°C for a day may be 0.995 to 1.164 g/cc.

[0029] A mass ratio of the propylene glycol to the glycerin in the liquid-type inhalation formulation according to an embodiment of the present disclosure may be 1:3 to 1:5.

[0030] The ratio of the propylene glycol to the glycerin may affect the viscosity of the liquid-type inhalation formulation, and when the mass ratio of the propylene glycol to the glycerin is 1:3 to 1:5, the viscosity of the liquid-type inhalation formulation may be 1.0 to 120 mPa·s (20°C).

[0031] A mass ratio of the physiological saline to the glycerin in the liquid-type inhalation formulation may be 4:5 to 1:7, the mass ratio of the physiological saline to the glycerin may be desirably 4:5 to 2:6, and the density at 25°C may be 1.125 to 1.164 g/cc.

[0032] The physiological saline of the liquid-type inhalation formulation according to an embodiment of the present disclosure may include a functional inhalation material. The functional inhalation material may be a liquid or solid. The functional inhalation material may be included in an amount of 0 to 20 wt% with respect to the physiological saline. Examples of the functional inhalation material may include nicotine, caffeine, vitamin, natural extracts, and the like. Examples of the natural extracts may include rosemary, pine leaves, peppermint, spearmint, coffee, pineapple, chamomile, orange, eucalyptus, thyme, geranium, jasmine, lavender, lemongrass, pine needles, clover, sage, taxol, bergamot, basil, thyme, valerian, hyssop, tea tree, myrrh, juniper, and the like. However, the scope of the present disclosure is not limited to the examples listed above.

[0033] When propylene glycol is added to the liquid-type inhalation formulation according to an embodiment of the present disclosure, a flavoring agent may be mixed. The flavoring agent may be one or more selected from a group consisting of mint, chocolate, cocoa, coffee, licorice, coriander, vanillin, ethyl vanillin, maltol, ethyl maltol, eucalyptol, acetic acid, a breath freshener flavor, bergamot oil, rosemary, geranium oil, lemon oil, orange oil, lime oil, grapefruit oil, mint oil, ginger oil, isosweet, and a fruit flavor component, and is not limited to the listed materials. When the condition is odorless, propylene glycol may not be included.

[0034] The aerosol-generating apparatus according to an embodiment of the present disclosure may include a cartridge including the liquid-type inhalation formulation, and a control unit.

[0035] The aerosol-generating apparatus may refer to an apparatus that generates an aerosol using an aerosol forming material to generate an aerosol that may be inhaled through the mouth of a user directly to the lungs of the user. In a case of the aerosol-generating apparatus of the present disclosure, the liquid-type inhalation formulation may be aerosolized using a surface wave atomizer.

[0036] The cartridge may generally include a liquid storage containing the liquid-type inhalation formulation.

[0037] The liquid storage may have a cylindrical shape with a hollow formed therein, and the hollow may be an inlet. The inlet may provide steam to a user.

[0038] The control unit may generally include a battery that supplies power to operate the aerosol-generating apparatus, a controller that controls driving of a system, and the like. The power may be delivered from the battery to activate a heater included in the atomizer, the heater may vaporize a liquid delivered from the liquid storage, and the vaporized liquid may be inhaled by a user.

[0039] Hereinafter, the present disclosure will be described in detail with reference to examples, however, the present disclosure is not limited to the following examples.

Experimental Example 1: Measurement of viscosity and observation of atomization of liquid-type inhalation formulation

[0040] The inventors measured a viscosity of the liquid-type inhalation formulation at 20°C using a Brookfield Viscometer. A spindle was used 0 times, a rotation speed was set to 4 to 100 rpm, and a water bath was used to maintain a temperature. This process was repeated three times, and the analysis was requested to a polymer testing and research Institute and self-analysis was performed (crossed check). The results are shown in Table 1 below and FIG. 1.

[Table 1]

Viscosity (mPa·s)	Functional material content (wt%)								
	0	0.25	0.5	1	1.25	2.5	5	10	20
Example 1	9.3			9.6			10.3	11.6	14.0
Example 2	39.5		39.6			40.4	43.3	47.3	
Example 3	114.9	118.0			120.2	124.0	127.7		
Comparative Example	1.3								

Example 1 - A liquid-type inhalation formulation in which a mass ratio of saline:propylene glycol (PG):glycerin (VG) is 4:1:5.
Example 2 - A liquid-type inhalation formulation in which a mass ratio of saline:propylene glycol (PG):glycerin (VG) is 2:2:6.
Example 3 - A liquid-type inhalation formulation in which a mass ratio of saline:propylene glycol (PG):glycerin (VG) is 1:2:7.
Comparative Example - A liquid-type inhalation formulation including only saline.

[0041] When the viscosity exceeds 120 mPa·s, a large number of large liquid droplets having a diameter of 200 μm or more may be generated. It is estimated that the large number of large liquid droplets are generated, because, in order to vibrate a surface of a liquid having a high viscosity, more wave energy is required, which increases irregularity of surface vibration. The large liquid droplets may adhere to an inner wall of an airflow tube to block an airflow path, or may be discharged to the outside of the airflow tube to cause discomfort to a smoker, and may disturb smooth spraying. There may be a difficulty of storage according to changes in a temperature and humidity.

[0042] In addition, in order to observe whether stable atomization occurs within the range of the viscosity described above, a surface wave common element used for frequency filtering of a smartphone and a solution that wets a tobacco paper filter were used. As a result of the atomization of the solution, it was confirmed that a uniform aerosol was continuously and stably generated within the range of the viscosity described above. Therefore, the liquid-type inhalation formulation according to the present disclosure may realize stable and continuous atomization up to a range of a high viscosity of 120 mPa·s.

Example 2: Observation of surface tension of liquid-type inhalation formulation

[0043] In order to obtain results of Table 2 below, the measurement was performed using a tensiometer (plate type) at 25°C. The results are shown in Table 2 below and FIG. 2.

[Table 2]

Surface tension (dyne)	Functional material content (wt%)								
	0	0.25	0.5	1	1.25	2.5	5	10	20
Example 1	57.0			57.0			57.2	57.4	57.3
Example 2	50.8		50.7			50.5	50.9	51.1	
Example 3	49.5	50.0			50.1	50.4	51.3		
Comparative Example	64.2								

Example 3: Observation of density of liquid-type inhalation formulation

[0044] In order to measure a density of the liquid-type inhalation formulation at 25°C, a volume of a liquid having a certain volume was measured with a measuring cylinder, a weight thereof was measured and calculated up to four valid numbers, and results thereof are shown in Table 3 below and FIG. 3.

[Table 3]

Density (g/cc)	Functional material content (wt%)								
	0	0.25	0.5	1	1.25	2.5	5	10	20
Example 1	1.125			1.128			1.134	1.135	1.142
Example 2	1.152		1.155			1.158	1.159	1.164	
Example 3	1.178	1.183			1.183	1.184	1.183		
Comparative Example	0.995								

[0045] While the embodiments are described with reference to drawings, it will be apparent to one of ordinary skill in the art that various alterations and modifications in form and details may be made in these embodiments without departing from the spirit and scope of the claims and their equivalents. For example, suitable results may be achieved if the described techniques are performed in a different order, and/or if components in a described system, architecture, device, or circuit are combined in a different manner, and/or replaced or supplemented by other components or their equivalents.

[0046] Therefore, other implementations, other embodiments, and equivalents to the claims are also within the scope of the following claims.

Claims

1. A liquid-type inhalation formulation for a surface wave atomizer, wherein

a viscosity at 20°C is 1.0 to 120 mPa·s,
the liquid-type inhalation formulation comprises one or more selected from a group consisting of propylene glycol, glycerin, and physiological saline, and
a content of the glycerin is 50 wt% or more with respect to a total weight of the propylene glycol, the glycerin, and the physiological saline.

2. The liquid-type inhalation formulation of claim 1, wherein a surface tension at 25°C is 50 to 70 dyne.

3. The liquid-type inhalation formulation of claim 1, wherein a density at 25°C is 0.995 to 1.164 g/cc.

4. The liquid-type inhalation formulation of claim 1, wherein a mass ratio of the propylene glycol to the glycerin is 1:3 to 1:5.

5. The liquid-type inhalation formulation of claim 4, wherein a mass ratio of the physiological saline to the glycerin is 4:5 to 1:7.

6. The liquid-type inhalation formulation of claim 4,
wherein a mass ratio of the physiological saline to the glycerin is 4:5 to 2:6, and a density at 25°C is 1.125 to 1.164 g/cc.

7. The liquid-type inhalation formulation of claim 1,
wherein the physiological saline comprises a functional inhalation material.

8. The liquid-type inhalation formulation of claim 7,
wherein the functional inhalation material is included in an amount of 0 to 20 wt% with respect to the physiological saline.

9. The liquid-type inhalation formulation of claim 7,
wherein the functional inhalation material comprises one or more selected from a group consisting of nicotine, caffeine, vitamin, and natural extracts.

10. The liquid-type inhalation formulation of claim 9,
wherein the natural extracts comprises one or more selected from a group consisting of rosemary, pine leaves, peppermint, spearmint, coffee, pineapple, chamomile, orange, eucalyptus, thyme, geranium, jasmine, lavender, lemongrass, pine needles, clove, sage, taxol, bergamot, basil, thyme, valerian, hyssop, tea tree, myrrh, juniper, and the like.

11. The liquid-type inhalation formulation of claim 1,
wherein the propylene glycol comprises a flavoring agent.

12. The liquid-type inhalation formulation of claim 11,
wherein the flavoring agent comprises one or more selected from a group consisting of mint, chocolate, cocoa, coffee, licorice, coriander, vanillin, ethyl vanillin, maltol, ethyl maltol, eucalyptol, acetic acid, a breath freshener flavor, bergamot oil, rosemary, geranium oil, lemon oil, orange oil, lime oil, grapefruit oil, mint oil, ginger oil, isosweet, and a fruit flavor component.

13. A cartridge comprising the liquid-type inhalation formulation of one of claims 1 to 12.

14. An aerosol-generating apparatus comprising:

a cartridge comprising the liquid-type inhalation formulation of one of claims 1 to 12; and
a control unit.

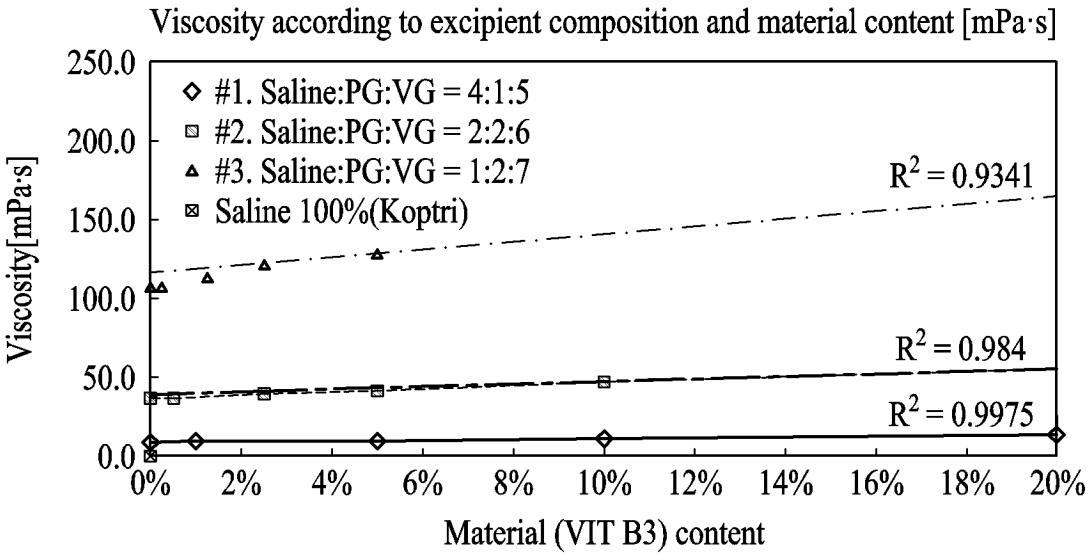
Viscosity according to excipient composition and material content [mPa·s]
Viscosity[mPa·s]
250.0
200.0
150.0
100.0
50.0
0.0
#1. Saline:PG:VG = 4:1:5
#2. Saline:PG:VG = 2:2:6
#3. Saline:PG:VG = 1:2:7
Saline 100%(Koptri)
R2 = 0.9341
R2 = 0.984
R2 = 0.9975
0%
2%
4%
6%
8%
10%
12%
14%
16%
18%
20%
Material (VIT B3) content

FIG. 1

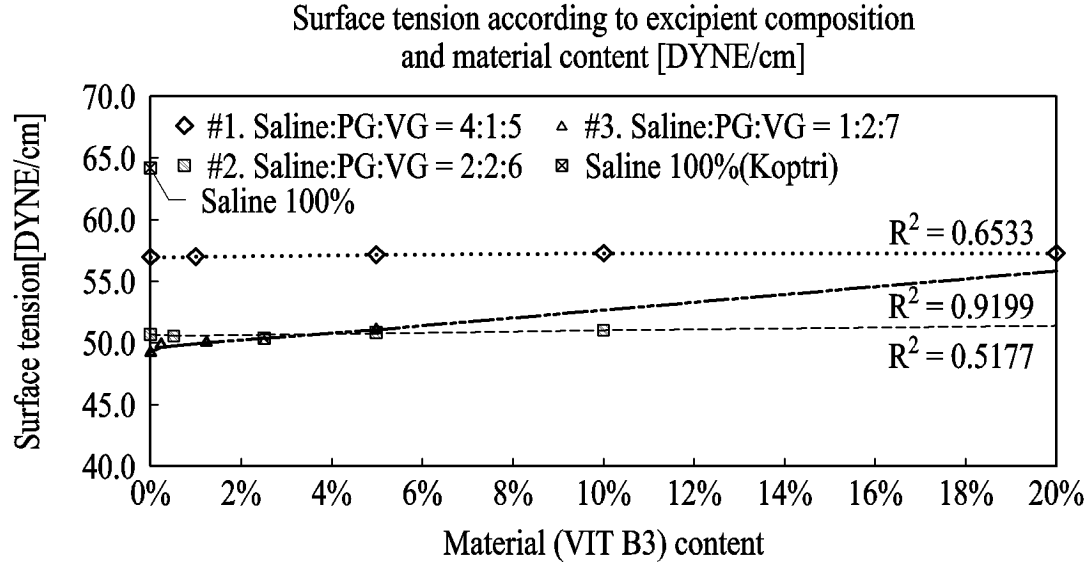
Surface tension according to excipient composition
and material content [DYNE/cm]
Surface tension[DYNE/cm]
70.0
65.0
60.0
55.0
50.0
45.0
40.0
#1. Saline:PG:VG = 4:1:5
#3. Saline:PG:VG = 1:2:7
#2. Saline:PG:VG = 2:2:6
Saline 100%(Koptri)
Saline 100%
R2 = 0.6533
R2 = 0.9199
R2 = 0.5177
0%
2%
4%
6%
8%
10%
12%
14%
16%
18%
20%
Material (VIT B3) content

FIG. 2

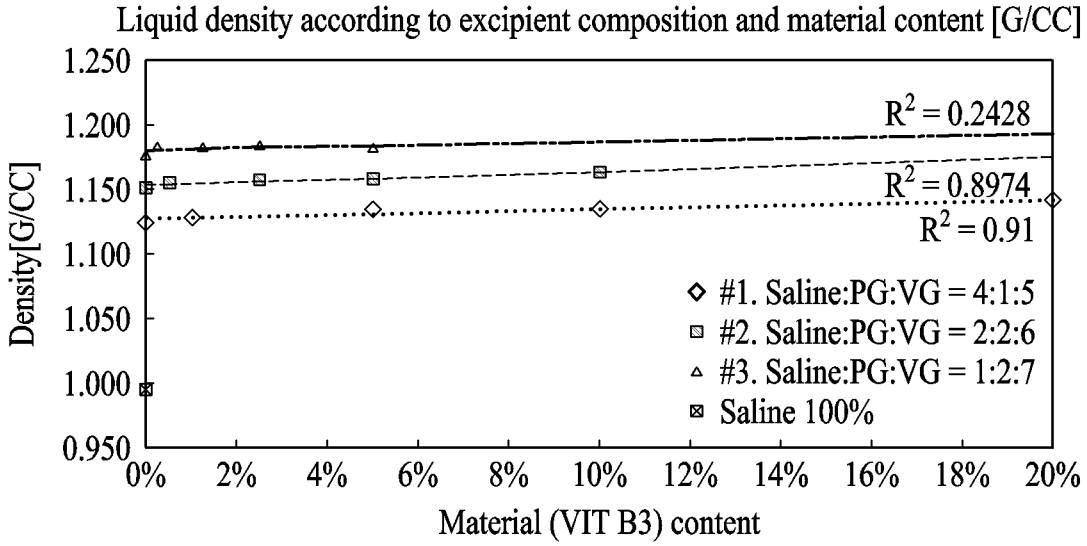
Liquid density according to excipient composition and material content [G/CC]
Density[G/CC]
1.250
1.200
1.150
1.100
1.050
1.000
0.950
0%
2%
4%
6%
8%
10%
12%
14%
16%
18%
20%
Material (VIT B3) content
R2 = 0.2428
R2 = 0.8974
R2 = 0.91
#1. Saline:PG:VG = 4:1:5
#2. Saline:PG:VG = 2:2:6
#3. Saline:PG:VG = 1:2:7
Saline 100%

FIG. 3

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2023/007560

A. CLASSIFICATION OF SUBJECT MATTER

A24B 15/167(2020.01)i; **A24B 15/32**(2006.01)i; **A24B 15/24**(2006.01)i; **A24B 15/30**(2006.01)i; **A24B 15/28**(2006.01)i; **A24F 40/10**(2020.01)i; **A24F 40/42**(2020.01)i; **A24F 40/50**(2020.01)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 15/167(2020.01); A24B 15/16(2006.01); A24F 40/10(2020.01); A24F 40/30(2020.01); A24F 47/00(2006.01); A61M 11/00(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: 표면파(surface wave), 아토마이저(atomizer), 액상(liquid type), 흡입제형(inhalation formulation), 점도(viscosity), 프로필렌 글리콜(propylene glycol), 글리세린(glycerin), 생리식염수(physiological saline), 표면장력(surface tension), 밀도(density), 카트리지(cartridge), 에어로졸(aerosol)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	KR 10-2018-0121777 A (PHILIP MORRIS PRODUCTS S.A.) 08 November 2018 (2018-11-08) See paragraphs [0072]-[0074] and [0099]-[0101]; and claims 1 and 9.	1-14
Y	KR 10-2021-0108390 A (PHILIP MORRIS PRODUCTS S.A.) 02 September 2021 (2021-09-02) See paragraphs [0023]-[0030] and [0125]-[0131] and [0143]; and claim 1.	1-14
A	KR 10-2021-0108385 A (PHILIP MORRIS PRODUCTS S.A.) 02 September 2021 (2021-09-02) See entire document.	1-14
A	KR 10-2021-0099659 A (R. J. REYNOLDS TOBACCO COMPANY) 12 August 2021 (2021-08-12) See entire document.	1-14
A	KR 10-2018-0079298 A (PHILIP MORRIS PRODUCTS S.A.) 10 July 2018 (2018-07-10) See entire document.	1-14

☐ Further documents are listed in the continuation of Box C. ☑ See patent family annex.

* Special categories of cited documents:
"A" document defining the general state of the art which is not considered to be of particular relevance
"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

Date of the actual completion of the international search	Date of mailing of the international search report
01 September 2023	**04 September 2023**

Name and mailing address of the ISA/KR	Authorized officer
Korean Intellectual Property Office **Government Complex-Daejeon Building 4, 189 Cheongsa-ro, Seo-gu, Daejeon 35208**	
Facsimile No. **+82-42-481-8578**	Telephone No.

Form PCT/ISA/210 (second sheet) (July 2022)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2023/007560

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
KR 10-2018-0121777 A	08 November 2018	AU 2017-243763 A1	09 August 2018
		AU 2017-243763 B2	06 October 2022
		BR 112018067723 A2	08 January 2019
		CA 3013531 A1	05 October 2017
		CN 108697178 A	23 October 2018
		EP 3435794 A1	06 February 2019
		EP 3435794 B1	09 September 2020
		EP 3744188 A1	02 December 2020
		IL 261511 A	31 October 2018
		IL 261511 B	01 December 2021
		JP 2019-513353 A	30 May 2019
		JP 2021-104024 A	26 July 2021
		JP 2023-075119 A	30 May 2023
		JP 6855502 B2	07 April 2021
		JP 7232279 B2	02 March 2023
		MX 2018011468 A	10 January 2019
		MY 191692 A	07 July 2022
		PH 12018501818 A1	17 June 2019
		PL 3435794 T3	11 January 2021
		RU 2018136258 A	14 May 2020
		RU 2018136258 A3	14 May 2020
		RU 2020137530 A	04 December 2020
		RU 2740373 C2	13 January 2021
		SG 11201808263 A	30 October 2018
		TW 201735805 A	16 October 2017
		TW I732833 B	11 July 2021
		UA 125292 C2	16 February 2022
		US 11717845 B2	08 August 2023
		US 2017-0280771 A1	05 October 2017
		WO 2017-167521 A1	05 October 2017
		ZA 201804616 B	29 May 2019
KR 10-2021-0108390 A	02 September 2021	BR 112021009726 A2	17 August 2021
		BR 112021010222 A2	24 August 2021
		BR 112021010284 A2	17 August 2021
		BR 112021010593 A2	24 August 2021
		BR 112021010614 A2	24 August 2021
		CN 113163845 A	23 July 2021
		CN 113163845 B	28 April 2023
		CN 113163846 A	23 July 2021
		CN 113163846 B	28 April 2023
		CN 113163847 A	23 July 2021
		CN 113163847 B	10 January 2023
		CN 113163848 A	23 July 2021
		CN 113163848 B	20 June 2023
		CN 113242696 A	10 August 2021
		CN 113242696 B	28 April 2023
		EP 3905897 A1	10 November 2021
		EP 3905898 A1	10 November 2021
		EP 3905899 A1	10 November 2021
		EP 3905900 A1	10 November 2021

Form PCT/ISA/210 (patent family annex) (July 2022)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2023/007560

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
		EP 3905901 A1	10 November 2021
		JP 2022-515021 A	17 February 2022
		JP 2022-515983 A	24 February 2022
		JP 2022-516149 A	24 February 2022
		JP 2022-516895 A	03 March 2022
		JP 2022-516896 A	03 March 2022
		KR 10-2021-0108384 A	02 September 2021
		KR 10-2021-0108394 A	02 September 2021
		KR 10-2021-0109548 A	06 September 2021
		KR 10-2021-0110314 A	07 September 2021
		MX 2021007623 A	11 August 2021
		MX 2021007624 A	11 August 2021
		MX 2021007625 A	11 August 2021
		MX 2021007626 A	11 August 2021
		MX 2021007627 A	11 August 2021
		US 2022-0053817 A1	24 February 2022
		US 2022-0071269 A1	10 March 2022
		US 2022-0071270 A1	10 March 2022
		US 2022-0079210 A1	17 March 2022
		US 2022-0079211 A1	17 March 2022
		WO 2020-141176 A1	09 July 2020
		WO 2020-141177 A1	09 July 2020
		WO 2020-141178 A1	09 July 2020
		WO 2020-141180 A1	09 July 2020
		WO 2020-141184 A1	09 July 2020
KR 10-2021-0108385 A	02 September 2021	BR 112021010163 A2	17 August 2021
		CN 113163844 A	23 July 2021
		EP 3902415 A1	03 November 2021
		JP 2020-103251 A	09 July 2020
		JP 2022-516869 A	03 March 2022
		JP 6926060 B2	25 August 2021
		US 2022-0087305 A1	24 March 2022
		WO 2020-136061 A1	02 July 2020
KR 10-2021-0099659 A	12 August 2021	AU 2020-203694 A1	25 June 2020
		AU 2020-203694 B2	23 June 2022
		AU 2020-204130 A1	09 July 2020
		AU 2020-204130 B2	13 January 2022
		AU 2022-202033 A1	14 April 2022
		BR 112018010507 A2	13 November 2018
		BR 112018010507 B1	06 December 2022
		BR 122020013981 B1	17 May 2022
		CA 3005788 A1	01 June 2017
		CA 3005788 C	08 November 2022
		CN 106572705 A	19 April 2017
		CN 112890286 A	04 June 2021
		EP 3145349 A1	29 March 2017
		EP 3145349 B1	03 July 2019
		EP 3145349 B2	12 October 2022
		EP 3379955 A1	03 October 2018
		ES 2748666 T5	28 December 2022

Form PCT/ISA/210 (patent family annex) (July 2022)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2023/007560

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)	Publication date (day/month/year)
		ES 2861812 T3	06 October 2021
		ES 2923767 T3	30 September 2022
		HU E046902 T2	30 March 2020
		HU E053168 T2	28 June 2021
		JP 2017-515493 A	15 June 2017
		JP 2021-104022 A	26 July 2021
		JP 2022-037185 A	08 March 2022
		JP 2023-065382 A	12 May 2023
		JP 6193514 B2	06 September 2017
		JP 6404418 B2	10 October 2018
		JP 7001762 B2	20 January 2022
		JP 7096767 B2	06 July 2022
		KR 10-1957819 B1	13 March 2019
		KR 10-2017-0007441 A	18 January 2017
		KR 10-2018-0083424 A	20 July 2018
		KR 10-2019-0026977 A	13 March 2019
		KR 10-2105803 B1	28 April 2020
		KR 10-2196722 B1	30 December 2020
		KR 10-2471453 B1	28 November 2022
		PL 3145349 T3	31 March 2020
		PL 3379955 T3	05 September 2022
		PL 3527088 T3	26 July 2021
		RU 2016146392 A	21 June 2018
		RU 2016146392 A3	20 August 2018
		RU 2018122666 A	25 December 2019
		RU 2019111173 A	14 June 2019
		RU 2685854 C2	23 April 2019
		RU 2733625 C2	05 October 2020
		UA 124086 C2	21 July 2021
		UA 126329 C2	21 September 2022
		US 2015-0335070 A1	26 November 2015
		US 2016-0073695 A1	17 March 2016
		US 2017-065000 A1	09 March 2017
		US 2022-061131 A1	24 February 2022
		WO 2017-089939 A1	01 June 2017
		WO 2017-089939 A8	21 December 2017
		ZA 202107110 B	22 February 2023
KR 10-2018-0079298 A	10 July 2018	CA 3003056 A1	11 May 2017
		CN 108135274 A	08 June 2018
		CN 108135274 B	07 January 2022
		EP 3370551 A1	12 September 2018
		EP 3370551 B1	30 December 2020
		EP 3782680 A1	24 February 2021
		IL 258142 A	31 May 2018
		IL 258142 B	01 August 2022
		JP 2019-502364 A	31 January 2019
		JP 2021-184718 A	09 December 2021
		MX 2018004861 A	01 August 2018
		RU 2018120358 A	04 December 2019
		RU 2018120358 A3	04 December 2019

Form PCT/ISA/210 (patent family annex) (July 2022)

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/KR2023/007560

Patent document cited in search report	Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
		RU	2020101181	A	10 April 2020
		RU	2713326	C2	04 February 2020
		TW	201715976	A	16 May 2017
		TW	I724044	B	11 April 2021
		US	2017-0119059	A1	04 May 2017
		WO	2017-076590	A1	11 May 2017

Form PCT/ISA/210 (patent family annex) (July 2022)