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(54) FILTER FOR SMOKING ARTICLE COMPRISING LYOCELL TOW, AND SMOKING ARTICLE COMPRISING SAME

(57) Provided are a smoking article filter and a smoking article including the same. The smoking article filter includes lyocell tow including lyocell fibers and a phenol reducing material dispersed in the lyocell tow, wherein the phenol reducing material includes polyethylene glycol (PEG), the polyethylene glycol (PEG) has a weight average molecular weight (MW) in a range of 500 to 700, and the content of the polyethylene glycol (PEG) relative to a weight of the lyocell tow ranges from 1 wt% to 30 wt%.

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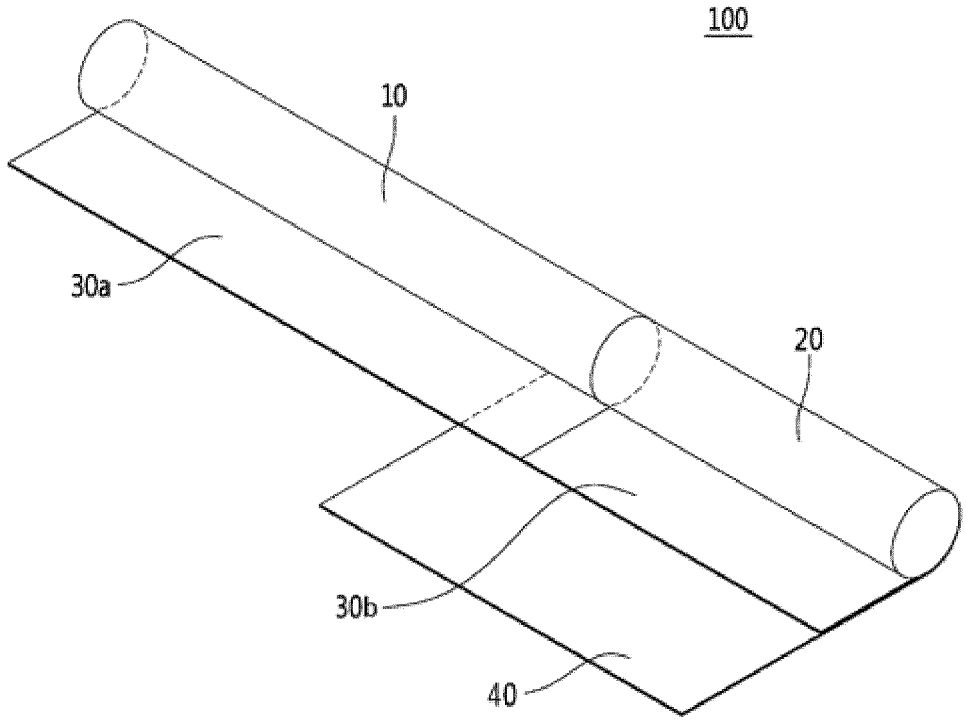
FIG. 1



Description

[Technical Field]

[0001] The present invention relates to a smoking article filter in which polyethylene glycol (PEG) is added as a phenol reducing material to lyocell tow and a smoking article including the smoking article filter.

[Background Art]

[0002] Typical cigarette filters include cellulose acetate tow formed by extracting cellulose from wood pulp and acetylating the extracted cellulose. Also, cigarette filters are assembled into cigarette products, distributed to consumers, provided for smoking, and then finally discarded after smoking is completed. Also, some cigarette filters are directly discarded as manufacturing residue from a cigarette filter manufacturing plant. This cigarette filter waste is collected as refuse and landfilled for disposal. In addition, in some cases, smoked cigarettes are left in the natural environment without being collected as refuse.

[0003] Accordingly, in recent years, research for replacing cellulose acetate tow with an eco-friendly material to protect the natural environment and reduce costs has been carried out. For example, the development of tow using lyocell fibers in which the cellulose itself is fiberized, unlike cellulose acetate, is in progress.

[0004] In manufacturing a smoking article filter, a phenol reducing material that can specifically reduce phenols generated during smoking is added to reduce phenols in mainstream smoke. Conventionally, it is known that polyethylene glycol (PEG), triethyl citrate (TEC), triacetin (TA), and the like are added as a phenol reducing material to cellulose acetate tow. In a case where a phenol reducing material composed of PEG and TEC is added to cellulose acetate which is hydrophobic, there is a problem in that the phenol reducing material also serves as a plasticizer for cellulose acetate fibers and causes the cellulose acetate fibers, which are hydrophobic, to bond to each other, thus reducing biodegradability.

[0005] Meanwhile, in a case where a phenol reducing material such as polyethylene glycol (PEG) or triethyl citrate (TEC) is added to lyocell fibers, the lyocell fibers, which are hydrophilic, are not plasticized. Accordingly, adding a phenol reducing material such as polyethylene glycol (PEG) or triethyl citrate (TEC) to lyocell fibers has been found to reduce phenols in mainstream smoke while not degrading biodegradability.

[0006] Meanwhile, in the case where a phenol reducing material is added to lyocell fibers to reduce phenols in mainstream smoke, there is a need for optimal design of a phenol reducing material that maintains the physical properties of a smoking article filter and has the best phenol reducing performance.

[Disclosure]

[Technical Problem]

[0007] One object of the present invention is to provide a smoking article filter in which polyethylene glycol (PEG), whose content and/or molecular weight are/is designed to be optimal, is added to lyocell tow to constitute the smoking article filter, thereby more effectively removing components such as phenols present in cigarette smoke during smoking and having excellent biodegradability.

[0008] Another object of the present invention is to provide a smoking article including a smoking article filter in which polyethylene glycol (PEG), whose content and/or molecular weight are/is designed to be optimal, is added to lyocell tow to constitute the smoking article filter, thereby more effectively removing components such as phenols present in cigarette smoke during smoking and having excellent biodegradability.

[0009] The objects of the present invention are not limited to those mentioned above, and other unmentioned objects can be clearly understood by those of ordinary skill in the art to which the present invention pertains from the description below.

[Technical Solution]

[0010] One embodiment for achieving the one object provides a smoking article filter including: lyocell tow including lyocell fibers; and a phenol reducing material dispersed in the lyocell tow, wherein the phenol reducing material includes polyethylene glycol (PEG), the polyethylene glycol (PEG) has a weight average molecular weight (MW) in a range of 500 to 700, and the content of the polyethylene glycol (PEG) relative to a weight of the lyocell tow ranges from 1 wt% to 30 wt%.

[0011] Also, the content of the polyethylene glycol (PEG) relative to the weight of the lyocell tow may range from 8 wt% to 24 wt%.

[0012] Also, the content of the polyethylene glycol (PEG) relative to the weight of the lyocell tow may range from 19 wt% to 21 wt%.

[0013] Also, the polyethylene glycol (PEG) may have a weight average molecular weight (MW) of 600.

[0014] Also, the smoking article filter may have a hardness in a range of 86% to 88%.

[0015] Also, the phenol reducing material may further include triethyl citrate (TEC).

[0016] One embodiment for achieving the another object provides a smoking article including: a smoking material portion; a filter portion; and a wrapper, wherein the filter portion includes lyocell tow including lyocell fibers; and a phenol reducing material dispersed in the lyocell tow, the phenol reducing material includes polyethylene glycol (PEG), the polyethylene glycol (PEG) has a weight average molecular weight (MW) in a range of 200 to 2,000, and the content of the polyethylene glycol (PEG) relative to a weight of the lyocell tow ranges from 1 wt% to 30 wt%.

[0017] Also, the content of the polyethylene glycol (PEG) relative to the weight of the lyocell tow may range from 19 wt% to 21 wt%.

[0018] Also, the smoking article filter may have a hardness in a range of 86% to 88%.

[Advantageous Effects]

[0019] According to a smoking article filter and a smoking article including the same according to one embodiment, it is possible to provide a lyocell filter to which lyocell tow, to which polyethylene glycol (PEG) is added as a phenol reducing material, is applied, and in this way, components such as phenols present in cigarette smoke can be more effectively removed during smoking.

[0020] Also, since polyethylene glycol (PEG) does not act as a plasticizer for lyocell tow, which is hydrophilic, despite being added to the lyocell tow, it is possible to provide a smoking article filter having excellent biodegradability while having phenol reducing performance and a smoking article including the smoking article filter.

[0021] In addition, by designing an optimal weight average molecular weight and/or optimal content of a phenol reducing material added to lyocell tow, components such as phenols present in cigarette smoke can be more effectively removed during smoking while physical properties of the smoking article filter are maintained.

[0022] Advantageous effects according to the technical spirit of the present disclosure are not limited to those mentioned above, and other unmentioned advantageous effects can be clearly understood by those of ordinary skill in the art from the description above.

[Description of Drawings]

[0023]

FIG. 1 is a view illustrating a schematic configuration of a smoking article according to one embodiment of the present invention.

FIG. 2 is a graph showing results of measuring a hardness of a smoking article filter according to an amount of a solution containing water that is added to a smoking article filter manufactured by applying lyocell tow.

FIG. 3 is a graph showing results of measuring a hardness of a smoking article filter according to an amount of a solution containing polyethylene glycol (PEG) and water that is added to a smoking article filter manufactured by applying lyocell tow.

[Modes of the Invention]

[0024] Hereinafter, exemplary embodiments of the present disclosure will be described in detail with reference to the accompanying drawings. Advantages and features of the present disclosure and methods of achieving the same should become clear with embodiments described in detail below with reference to the accompanying drawings. However, the technical spirit of the present disclosure is not limited to the following embodiments and may be implemented in various different forms. The following embodiments are only provided to make the technical spirit of the present disclosure complete and completely inform those of ordinary skill in the art to which the present disclosure pertains of the scope of the present disclosure. The technical spirit of the present disclosure is defined only by the scope of the claims.

[0025] In assigning reference numerals to components of each drawing, it should be noted that the same reference numerals are assigned to the same components wherever possible even when the components are illustrated in different drawings. Also, in describing the present disclosure, when it is determined that the detailed description of a known related configuration or function may obscure the gist of the present disclosure, the detailed description thereof will be omitted.

[0026] Unless otherwise defined, all terms including technical or scientific terms used herein have the same meaning as commonly understood by those of ordinary skill in the art to which the present disclosure pertains. Terms defined in commonly used dictionaries should not be interpreted in an idealized or overly formal sense unless expressly so defined herein. Terms used herein are for describing the embodiments and are not intended to limit the present disclosure. In the specification, a singular expression includes a plural expression unless the context clearly indicates otherwise.

[0027] Also, in describing components of the present disclosure, terms such as first, second, A, B, (a), and (b) may be used. Such terms are only used for distinguishing one component from another component, and the essence, order, sequence, or the like of the corresponding component is not limited by the terms. In a case in which a certain component is described as being "connected," "coupled," or "linked" to another component, it should be understood that, although the component may be directly connected or linked to the other component, still another component may also be "connected," "coupled," or "linked" between the two components.

[0028] The terms "comprises" and/or "comprising" used herein do not preclude the presence or addition of one or more components, steps, operations, and/or devices other than those mentioned.

[0029] First, some terms used herein will be clarified.

[0030] In the present specification, "smoking article" may refer to any product that can be smoked or any product that can provide a smoking experience, regardless of whether the product is based on tobacco, tobacco derivatives, expanded tobacco, reconstituted tobacco, or tobacco substitutes. For example, smoking articles may include products that can be smoked, such as cigarettes, cigars, and cigarillos.

[0031] In the present specification, "smoking material" may refer to any type of material that may be used in a smoking article.

[0032] In the present specification, "upstream" or "upstream direction" may refer to a direction moving away from an oral region of a smoker, and "downstream" or "downstream direction" may refer to a direction approaching the oral region of the smoker.

[0033] In the present specification, "longitudinal direction" may refer to a direction corresponding to a longitudinal axis of a smoking article.

[0034] Hereinafter, various embodiments of the present disclosure will be described in detail with reference to the accompanying drawings.

[0035] FIG. 1 is a view illustrating a schematic configuration of a smoking article according to one embodiment of the present invention.

[0036] Throughout the specification, "smoking article" may refer to anything capable of generating an aerosol, such as tobacco (cigarettes) and cigars. The smoking article may include an aerosol-generating material or an aerosol-forming substrate. Also, the smoking article may include a solid material based on tobacco raw materials, such as reconstituted tobacco leaves, shredded tobacco, and reconstituted tobacco. A smoking material may include volatile compounds.

[0037] Also, throughout the specification, "upstream" or "upstream direction" refers to a direction moving away from an oral region of a user smoking a smoking article 100, and "downstream" or "downstream direction" refers to a direction approaching the oral region of the user smoking the smoking article 100. For example, in the smoking article 100 illustrated in FIG. 1, a smoking material portion 10 is disposed upstream or in an upstream direction of a smoking article filter portion 20 (a smoking article filter 20 or a filter portion 20).

[0038] Further, in the specification, a case where the smoking article 100 is a combustion-type cigarette is described as an example. However, the present invention is not limited thereto, and the smoking article 100 may also be a heating-type cigarette or the like that is used together with an aerosol generation device (not illustrated) such as an electronic cigarette device.

[0039] The present invention relates to the smoking article filter 20 (or the smoking article filter portion 20) included in the smoking article 100, and the smoking article filter 20 according to one embodiment of the present invention includes lyocell tow including lyocell fibers and a phenol reducing material added to the lyocell tow.

[0040] In one embodiment, the phenol reducing material corresponds to a substance that can specifically reduce phenols generated during smoking, and the phenol reducing material may at least include polyethylene glycol (PEG). In some embodiments, the phenol reducing material may further include triethyl citrate (TEC). However, the phenol reducing material additionally added to polyethylene glycol (PEG) is not limited thereto and may be any other substance as long as the substance can reduce phenols generated during smoking.

[0041] The lyocell fibers are eco-friendly fibers made of cellulose extracted from wood pulp. The lyocell tow refers to a bundle formed by cross-connecting adjacent lyocell fibers.

[0042] In some embodiments, the lyocell fibers may have a shaped cross-section. The shaped cross-section is defined as a cross-section having a shape including a plurality of protrusions instead of having a circular shape. For example, a cross-section having a shape in which a plurality of protrusions extend from the center may be referred to as "shaped cross-section."

[0043] In some embodiments, the lyocell fibers may have a Y-shaped cross-section with three protrusions branching from the center, a cross-shaped cross-section with four protrusions, a star-shaped cross-section with five protrusions, or an O-shaped cross-section, but the present invention is not limited thereto.

[0044] In some embodiments, the phenol reducing material may be uniformly dispersed in lyocell tow and may be distributed throughout the entire region of the lyocell tow constituting the smoking article filter. Although the present invention is not limited thereto, the phenol reducing material at least including polyethylene glycol (PEG) may be applied on surfaces of lyocell fibers constituting the lyocell tow, and despite the phenol reducing material including polyethylene glycol

(PEG) being applied on the surfaces of the lyocell fibers, polyethylene glycol may not act as a plasticizer between the lyocell fibers.

[0045] The smoking article filter to which lyocell tow is applied according to the present invention includes a phenol reducing material including polyethylene glycol (PEG) that is dispersed in the lyocell tow and thus may have a greater effect of reducing phenols generated during smoking, compared to a smoking article filter to which the phenol reducing material is not added.

[0046] In some embodiments, polyethylene glycol (PEG) included in the phenol reducing material has a weight average molecular weight (MW) in a range of 50 to 10,000, 50 to 2,500, 200 to 2,000, 500 to 700, or a weight average molecular weight (MW) of 600.

[0047] In a case where the phenol reducing material dispersed in the lyocell tow of the smoking article filter includes polyethylene glycol (PEG), phenol reducing performance may vary according to a molecular weight of the polyethylene glycol (PEG). Specifically, in a case where polyethylene glycol (PEG) dispersed in the lyocell tow has a weight average molecular weight (MW) in the above-mentioned range, phenol reducing performance of the smoking article filter manufactured using the lyocell tow may be excellent. Preferably, in a case where polyethylene glycol (PEG) dispersed in the lyocell tow has a weight average molecular weight (MW) of 600, phenol reducing performance of the smoking article filter manufactured using the lyocell tow may be the best, but a molecular weight of the polyethylene glycol (PEG) is not limited thereto.

[0048] In some embodiments, in a case where the phenol reducing material includes polyethylene glycol (PEG), the content of polyethylene glycol (PEG) relative to the weight of the lyocell tow may range from 1 wt% to 30 wt%, 2 wt% to 28 wt%, 4 wt% to 25 wt%, 8 wt% to 24 wt%, 13 wt% to 23 wt%, 18 wt% to 22 wt%, 19 wt% to 21 wt% or may be 20 wt%. In a case where the phenol reducing material includes polyethylene glycol (PEG) in the above-mentioned range, phenol reducing performance may be excellent while physical properties of the smoking article filter are maintained.

[0049] In some embodiments, the smoking article filter including the lyocell tow in which the phenol reducing material is dispersed has a hardness of 70% or more. In an exemplary embodiment, the hardness of the smoking article filter may range from 70% to 90%, 75% to 90%, 80% to 90%, 85% to 90%, or 86% to 88%. The hardness of the smoking article filter is a numerical value of a degree to which a diameter of the smoking article filter is maintained when the smoking article filter is pressed with a force of a certain level in a direction perpendicular to the longitudinal direction of the smoking article filter and may be a percentage value of a ratio of a diameter of the smoking article filter after the force is applied to a diameter of the smoking article filter before the force is applied.

[0050] Hereinafter, the configurations of the present invention and the advantageous effects according thereto will be described in more detail using examples and comparative examples. However, the examples are merely for describing the present invention in more detail, and the scope of the present invention is not limited to these examples.

Example 1

[0051] Using filter manufacturing equipment manufactured by TYM Co., Ltd. (whose operational mechanism is the same as cellulose acetate (CA) tow filter manufacturing equipment), PEG 200 was added onto lyocell tow by being injected 20 mg/rod, and then the lyocell tow having PEG 200 dispersed therein was wrapped with wrapping paper to manufacture a smoking article filter having a length of 108 mm, a circumference of 24.2 mm, and a resistance to draw of 410 mmH_2O.

Example 2

[0052] A smoking article filter was manufactured in the same manner as in Example 1 except that PEG 400, instead of PEG 200, was used in a phenol reducing material.

Example 3

[0053] A smoking article filter was manufactured in the same manner as in Example 1 except that PEG 600, instead of PEG 200, was used in a phenol reducing material.

Example 4

[0054] A smoking article filter was manufactured in the same manner as in Example 1 except that PEG 1000, instead of PEG 200, was used in a phenol reducing material.

Example 5

[0055] A smoking article filter was manufactured in the same manner as in Example 1 except that PEG 2000, instead of

PEG 200, was used in a phenol reducing material.

Comparative Example 1

[0056] A smoking article filter was manufactured in the same manner as in Example 1 except that a phenol reducing material was not injected onto the lyocell tow.

Experimental Example 1: Evaluation of phenol reducing performance according to molecular weight of polyethylene glycol (PEG)

[0057] Smoking articles were manufactured using the smoking article filters of Comparative Example 1 and Examples 1 to 5, smoke components emitted during smoking using the cigarette smoking machine HAUNI LX20 manual (linear type) as a smoking device were collected using a Cambridge filter pad (CFP), and in order to extract substances from the smoke components collected on the CFP, 30 mL of 1% acetic acid was added and then stirred, the substances were filtered using a 0.45 μm PVDF syringe filter, phenols in the smoke of each smoking article filter were measured and analyzed using an Alliance HPLC-FLD analysis device of Waters Corporation, and results thereof are shown in Table 1 below.

[Table 1]

	Primary		Secondary	
	Phenol (μg)	Cresols (μg)	Phenol (μg)	Cresols (μg)
Comparative Example 1	36.7	29.7	43.4	35.4
Example 1 (PEG 200)	30.7	26.1		
Example 2 (PEG 400)	27.9	23.8		
Example 3 (PEG 600)	19.3	18.1	29.9	26.0
Example 4 (PEG 1000)			37.4	31.6
Example 5 (PEG 2000)			39.1	32.2

[0058] As shown in Table 1 above, the amount of delivered phenol decreased in the smoking article filters of Examples 1 to 5 manufactured using the lyocell tow in which the phenol reducing material including PEG was dispersed, compared to the smoking article filter of Comparative Example 1 in which the phenol reducing material was not dispersed in the lyocell tow. Specifically, it can be seen that Examples 1 to 5 have an effect of reducing the amount of delivered phenol or cresols by 50% or less compared to Comparative Example 1.

[0059] Also, it can be seen that a phenol reducing effect varies according to the molecular weight of PEG included in the phenol reducing material. Specifically, it can be seen that the amount of delivered phenol or cresols significantly decreased in the case of Example 3 in which PEG 600 was included, compared to Comparative Example 1 and Examples 1, 2, 4, and 5.

Example 6

[0060] Using filter manufacturing equipment manufactured by TYM Co., Ltd. (whose operational mechanism is the same as cellulose acetate (CA) tow filter manufacturing equipment), 3 wt% of PEG 600 relative to the weight of lyocell tow was injected and added onto the lyocell tow, and then the lyocell tow was wrapped with wrapping paper to manufacture a smoking article filter.

Example 7

[0061] A smoking article filter was manufactured in the same manner as in Example 6 except that content of added PEG 600 included in a phenol reducing material was 8 wt%, instead of 3 wt%, relative to the weight of the lyocell tow.

Example 8

[0062] A smoking article filter was manufactured in the same manner as in Example 6 except that content of added PEG 600 included in a phenol reducing material was 13 wt%, instead of 3 wt%, relative to the weight of the lyocell tow.

Example 9

[0063] A smoking article filter was manufactured in the same manner as in Example 6 except that content of added PEG 600 included in a phenol reducing material was 20 wt%, instead of 3 wt%, relative to the weight of the lyocell tow.

Example 10

[0064] A smoking article filter was manufactured in the same manner as in Example 6 except that content of added PEG 600 included in a phenol reducing material was 30 wt%, instead of 3 wt%, relative to the weight of the lyocell tow.

Comparative Example 2

[0065] A smoking article filter was manufactured in the same manner as in Example 6 except that a phenol reducing material was not injected onto the lyocell tow.

Experimental Example 2: Evaluation of phenol reducing performance according to content of polyethylene glycol (PEG)

[0066] Smoking articles were manufactured using the smoking article filters of Comparative Example 2 and Examples 6 to 10, smoke components emitted during smoking using the cigarette smoking machine HAUNI LX20 manual (linear type) as a smoking device were collected using a Cambridge filter pad (CFP), and in order to extract substances from the smoke components collected on the CFP, 30 mL of 1% acetic acid was added and then stirred, the substances were filtered using a 0.45 μm PVDF syringe filter, phenols in the smoke of each smoking article filter were measured and analyzed using an Alliance HPLC-FLD analysis device of Waters Corporation, and results thereof are shown in Table 2 below.

[Table 2]

	Phenol (μg)	Cresols (μg)
Comparative Example 2	51.3	39.5
Example 6 (PEG 600 3 wt%)	33.8	28.3
Example 7 (PEG 600 8 wt%)	24.9	23.1
Example 8 (PEG 600 13 wt%)	20.9	20.1
Example 9 (PEG 600 20 wt%)	19.8	19.2
Example 10 (PEG 600 30 wt%)	12.4	-

[0067] As shown in Table 2 above, the amount of delivered phenol decreased in the smoking article filters of Examples 6 to 10 manufactured using the lyocell tow in which the phenol reducing material including PEG 600 was dispersed, compared to the smoking article filter of Comparative Example 2 in which the phenol reducing material was not dispersed in the lyocell tow.

[0068] Also, it can be seen that a phenol reducing effect varies according to the content of PEG 600 included in the phenol reducing material. Specifically, it can be seen that the amount of delivered phenol or cresols significantly decreased in the cases of Examples 9 and 10 in which content of PEG 600 was 20 wt% and 30 wt%, respectively, relative to the weight of the lyocell tow, compared to Comparative Example 2 and Examples 6 to 8.

[0069] Meanwhile, when manufacturing a smoking article filter by applying lyocell tow in which a phenol reducing material including PEG is dispersed, although phenol reducing performance is improved with an increase in content of PEG, it was confirmed that, when content of PEG is too high, there is a problem in that the phenol reducing material spreads to filter wrapping paper, causing the filter wrapping paper to become wet, or an ink spreading phenomenon occurs, causing a decrease in quality of the smoking article filter. Therefore, it can be seen that phenol reducing performance is the best while physical properties of the smoking article filter are maintained in the case of Example 9 in which the content of PEG 600 is 20 wt% relative to the weight of the lyocell tow.

Manufacture Example 1

[0070] Lyocell tow including lyocell fibers was wrapped with general porous wrapping paper having a basis weight of 21 gsm, and then a solution containing water was injected into the lyocell fibers to manufacture a smoking article filter.

Manufacture Example 2

[0071] Lyocell tow including lyocell fibers was wrapped with general porous wrapping paper having a basis weight of 21 gsm, and then a solution containing PEG and water was injected into the lyocell fibers to manufacture a smoking article filter.

Experimental Example 3: Evaluation of hardness of smoking article filter according to application of polyethylene glycol (PEG)

[0072] Smoking article filters were manufactured in the same manner as in Manufacture Example 1 and Manufacture Example 2 except for varying the amount of solution injected into the lyocell tow, and a hardness of the manufactured smoking article filters was evaluated.

[Calculation Formula 1]

$$\text{Filter hardness (\%)} = [D-a]/D\times 100$$

[0073] Here, D represents a filter diameter (mm), and a represents a distance (mm) the filter moves downward (is pressed) due to a 300-g weight. Measured values necessary to calculate the hardness of the cigarette filter may be obtained using a device generally used in the art, and for example, DHT 200TM of Filtrona Co., Ltd. may be used. In measuring hardness, the applied force takes into account a force actually applied when a smoker holds a cigarette. A hardness value of 85% or more obtained through the cigarette filter according to one embodiment of the present invention is technically significant in that it shows that hardness can be secured at a level that allows the cigarette filter according to one embodiment of the present invention, which uses lyocell tow, which is an eco-friendly material, to replace the conventional cigarette filter made of cellulose acetate.

[0074] Specifically, the results of measuring the hardness of a smoking article filter according to the amount of a solution injected into lyocell tow when the solution contained water is shown in the graph of FIG. 2, and the results of measuring the hardness of a smoking article filter according to the amount of a solution injected into lyocell tow when the solution contained water and PEG is shown in the graph of FIG. 3.

[0075] Referring to FIG. 2, it can be seen that, when water is injected into a smoking article filter to which lyocell tow is applied, the hardness of the smoking article filter decreases linearly as the amount of injected water increases. This may be considered to be due to the hardness of the smoking article filter decreasing as water (moisture) permeates through lyocell fibers constituting the hydrophilic lyocell tow or permeates between the lyocell fiber structures, causing the lyocell fiber structure to change due to an external force.

[0076] Referring to FIG. 3, it can be seen that, when a solution containing PEG and water is injected into a smoking article filter to which lyocell tow is applied, despite an increase in the amount of injected solution, the hardness of the smoking article filter is maintained in a range of 86% to 88%. Accordingly, since a decrease in the hardness of the smoking article filter does not occur despite PEG being dispersed as a phenol reducing material in the lyocell tow, the smoking article filter according to the present invention may have excellent phenol reducing performance while physical properties of the smoking article filter are maintained.

[0077] Also, it was confirmed that, between a case where a filter having a length of 60 mm and a circumference of 24.2 mm is manufactured using lyocell fibers to have a resistance to draw of 240 mmH2O and a case where the filter is manufactured using paper, the amount of added PEG is greater in the case where paper is used compared to the case where lyocell fibers are used. That is, since the amount of PEG added to implement the same resistance to draw is smaller when lyocell fibers are used compared to when paper is used, the amount of phenol reducing material for manufacturing a smoking article filter may be reduced, and manufacturing costs may be reduced.

[0078] The above-described smoking article filter may be applied to a smoking article. FIG. 1 is a view illustrating a schematic configuration of a smoking article according to one embodiment of the present invention. The smoking article 100 includes the smoking material portion 10 and the filter portion 20, and the above-described smoking article filter is applied to the filter portion 20 of the smoking article 100. In the smoking article 100, the smoking material portion 10 is positioned upstream of the filter portion 20.

[0079] The smoking material portion 10 may be filled with a smoking material such as raw tobacco leaves, reconstituted tobacco leaves, or a mixture of tobacco leaves and reconstituted tobacco leaves. A processed smoking material may be filled in the smoking material portion 10 in the form of a sheet or shredded tobacco. The smoking material portion 10 may have the form of a longitudinally extending rod whose length, circumference, and diameter are not particularly limited, but the length, circumference, and diameter may be adjusted to sizes generally used in the art in consideration of the amount of smoking material filled therein, user preferences, or the like. The smoking material portion 10 may include at least one

aerosol-generating material among glycerin, propylene glycol, ethylene glycol, dipropylene glycol, diethylene glycol, triethylene glycol, tetraethylene glycol, and oleyl alcohol. The smoking material portion 10 may contain other additives such as a flavoring agent, a wetting agent, and/or an acetate compound. The aerosol-generating material and the additive may be contained in the smoking material.

[0080] The filter portion 20 is disposed downstream of the smoking material portion 10 and serves as a filter through which an aerosol material generated in the smoking material portion 10 passes right before being inhaled by the user. The filter portion 20 may be manufactured using various materials or manufactured in various forms. The filter portion 20 according to one embodiment of the present invention basically includes the above-described cigarette filter including lyocell tow in which a plurality of lyocell fibers are bonded using a binder. The cigarette filter including the lyocell tow may replace all or part of the filter portion 20 of existing smoking articles, and when the cigarette filter replaces part of the filter portion 20, a filter material that is used conventionally may be used together. For example, a cellulose acetate filter, a hollow tube filter, or the like may be used as the conventional filter material.

[0081] The filter portion 20 is illustrated as a mono filter formed of a single filter in FIG. 1, but the present invention is not limited thereto. For example, the filter portion 20 may be provided as a dual filter, a triple filter, or the like, which includes two or more filters, in order to increase filter efficiency.

[0082] In some embodiments, when the filter portion 20 is provided as a dual filter, a triple filter, or the like, the filter (hereinafter, "lyocell filter") of the present invention that includes lyocell tow including lyocell fibers and a phenol reducing material dispersed in the lyocell tow may be applied as any one filter of the plurality of filters, and a cellulose acetate filter and/or a paper filter may be applied as the other or another filter of the plurality of filters. In this case, a length of the lyocell filter of the present invention may be 25% to 50% of the overall length of the filter portion 20. Also, although not illustrated, a crushable capsule (not illustrated) having a structure in which a liquid including a flavoring is wrapped with a film may be included in the filter portion 20.

[0083] The exterior of the smoking material portion 10 and the filter portion 20 may be wrapped with a wrapper 30a or 30b.

[0084] The smoking material portion 10 may be wrapped with a smoking material portion wrapper 30a. Some of the cigarette smoke generated in a typical combustion process of the smoking material portion 10 is released into the atmosphere through the smoking material portion wrapper 30a before passing through the cigarette filter, and sidestream smoke gives an unpleasant feeling to people exposed thereto. There have been various attempts to reduce sidestream smoke such as filling conventional cigarette paper with a filler such as magnesium oxide, titanium oxide, cerium oxide, aluminum oxide, calcium carbonate, and zirconium carbonate. However, when sidestream smoke is reduced by simply applying such a filler, tobacco smoke taste degradation, combustion interruption, ash integrity degradation, or the like may occur, and it is difficult to address the above-mentioned problem through suitable combinations of materials contained in the filler. A filler in which magnesium oxide (MgO and/or $Mg(OH)_2$) and calcium carbonate ($CaCO_3$) are mixed is applied to the smoking material portion wrapper 30a according to one embodiment of the present invention in order to prevent tobacco smoke taste degradation, ash integrity degradation, and combustion interruption while reducing sidestream smoke.

[0085] The filter portion 20 may be wrapped with a filter portion wrapper 30b. The filter portion wrapper 30b may be manufactured using grease-resistant wrapping paper, and an aluminum foil may be further included at an inner surface of the filter portion wrapper 30b.

[0086] The smoking material portion 10 wrapped with the smoking material portion wrapper 30a and the filter portion 20 wrapped with the filter portion wrapper 30b may be wrapped together with tipping paper 40. As illustrated in FIG. 1, the tipping paper 40 may be wrapped around at least a portion (for example, a partial downstream region) of the smoking material portion wrapper 30a and an outer periphery of the filter portion wrapper 30b. In other words, at least a portion of the smoking material portion 10 and the filter portion 20 may be further wrapped with the tipping paper 40 and physically combined. According to one embodiment of the present invention, the tipping paper 40 may be made of nonporous wrapping paper that has not been treated to be grease-resistant, but the present invention is not limited thereto. Also, the tipping paper 40 may include an incombustible material to prevent a phenomenon in which the filter portion 20 burns, but the present invention is not limited thereto.

[0087] Also, although not illustrated in the drawing, the smoking article 100 may further include a hollow tube structure which is a tubular structure including a hollow formed therein. The hollow tube structure may be disposed downstream of the lyocell filter.

[0088] In some embodiments, perforations may be formed in the hollow tube structure, but the present invention is not limited thereto. Perforations may not be formed in the hollow tube structure.

[0089] In some embodiments, when perforations are formed in the hollow tube structure, the perforations may be formed at a position spaced 10 mm to 15 mm from the downstream end of the smoking article 100 in the upstream direction.

[0090] Although embodiments of the present disclosure have been described above with reference to the accompanying drawings, those of ordinary skill in the art to which the present disclosure pertains should understand that the present disclosure may be embodied in other specific forms without changing the technical spirit or essential features thereof.

Therefore, the embodiments described above should be understood as being illustrative, instead of limiting, in all aspects. The protection scope of the present disclosure should be interpreted by the claims below, and any technical spirit within the scope equivalent to the claims should be interpreted as falling within the scope of rights of the technical spirit defined by the present disclosure.

Claims

1. A smoking article filter comprising:

   lyocell tow including lyocell fibers; and
   a phenol reducing material dispersed in the lyocell tow,
   wherein the phenol reducing material includes polyethylene glycol (PEG),
   the polyethylene glycol (PEG) has a weight average molecular weight (MW) in a range of 500 to 700, and
   the content of the polyethylene glycol (PEG) relative to a weight of the lyocell tow ranges from 1 wt% to 30 wt%.

2. The smoking article filter of claim 1, wherein the content of the polyethylene glycol (PEG) relative to the weight of the lyocell tow ranges from 8 wt% to 24 wt%.

3. The smoking article filter of claim 2, wherein the content of the polyethylene glycol (PEG) relative to the weight of the lyocell tow ranges from 19 wt% to 21 wt%.

4. The smoking article filter of claim 1, wherein the polyethylene glycol (PEG) has a weight average molecular weight (MW) of 600.

5. The smoking article filter of claim 1, wherein the smoking article filter has a hardness in a range of 86% to 88%.

6. The smoking article filter of claim 1, wherein the phenol reducing material further includes triethyl citrate (TEC).

7. A smoking article comprising:

   a smoking material portion;
   a filter portion; and
   a wrapper,
   wherein the filter portion includes lyocell tow including lyocell fibers and a phenol reducing material dispersed in the lyocell tow,
   the phenol reducing material includes polyethylene glycol (PEG),
   the polyethylene glycol (PEG) has a weight average molecular weight (MW) in a range of 200 to 2,000, and
   the content of the polyethylene glycol (PEG) relative to a weight of the lyocell tow ranges from 1 wt% to 30 wt%.

8. The smoking article of claim 7, wherein the content of the polyethylene glycol (PEG) relative to the weight of the lyocell tow ranges from 19 wt% to 21 wt%.

9. The smoking article of claim 8, wherein the smoking article filter has a hardness in a range of 86% to 88%.

FIG. 1

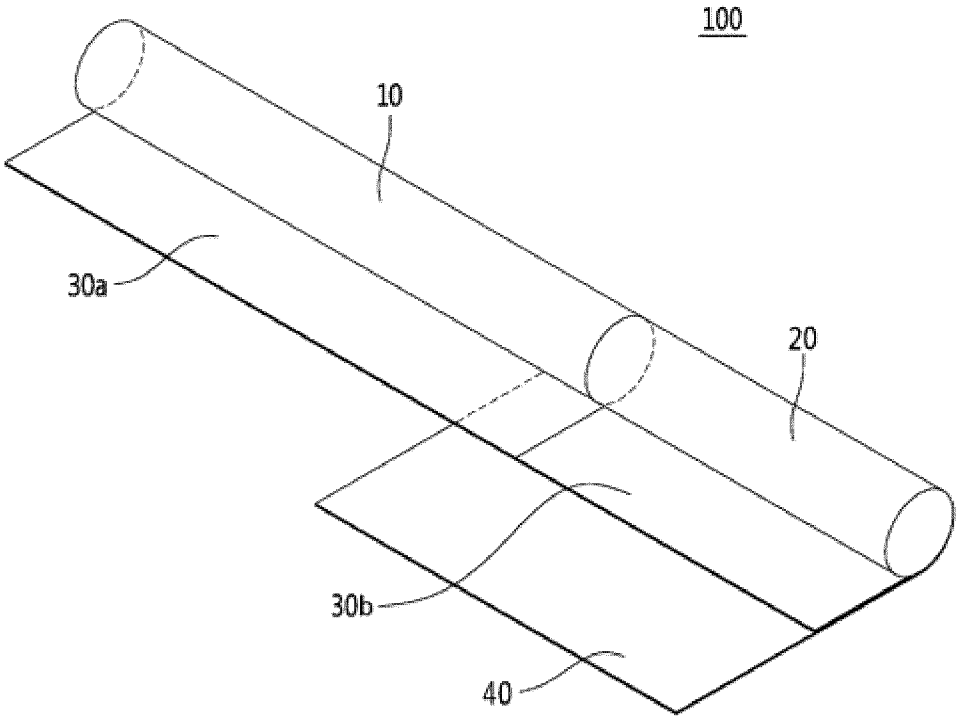
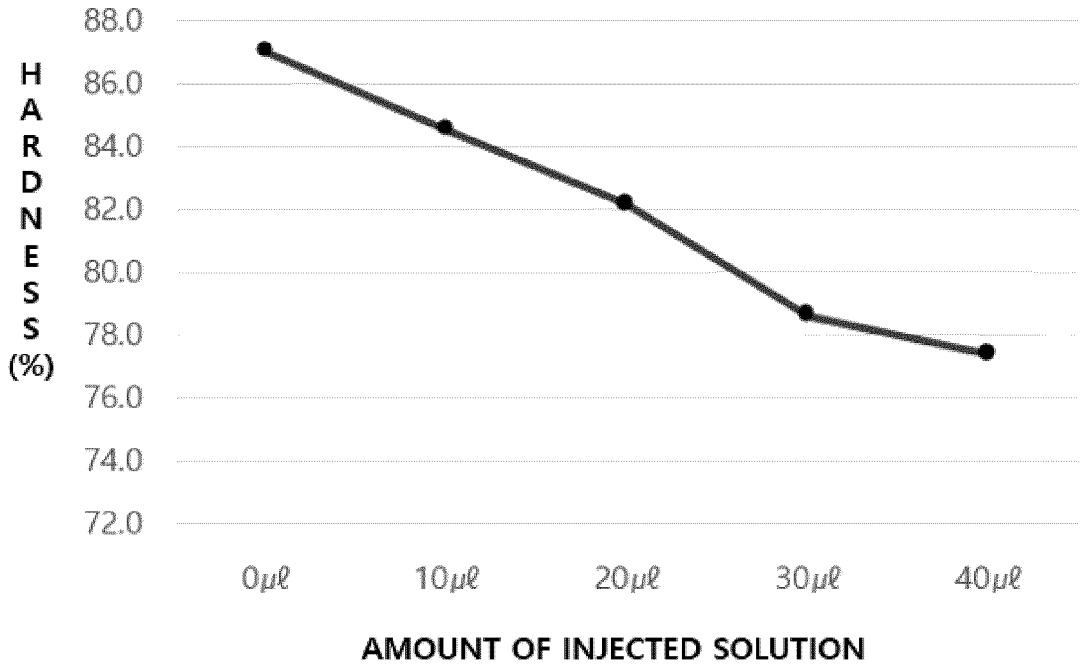

100
10
30a
20
30b
40

FIG. 2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86.0
84.0
82.0
80.0
78.0
76.0
74.0
72.0
HARDNESS (%)
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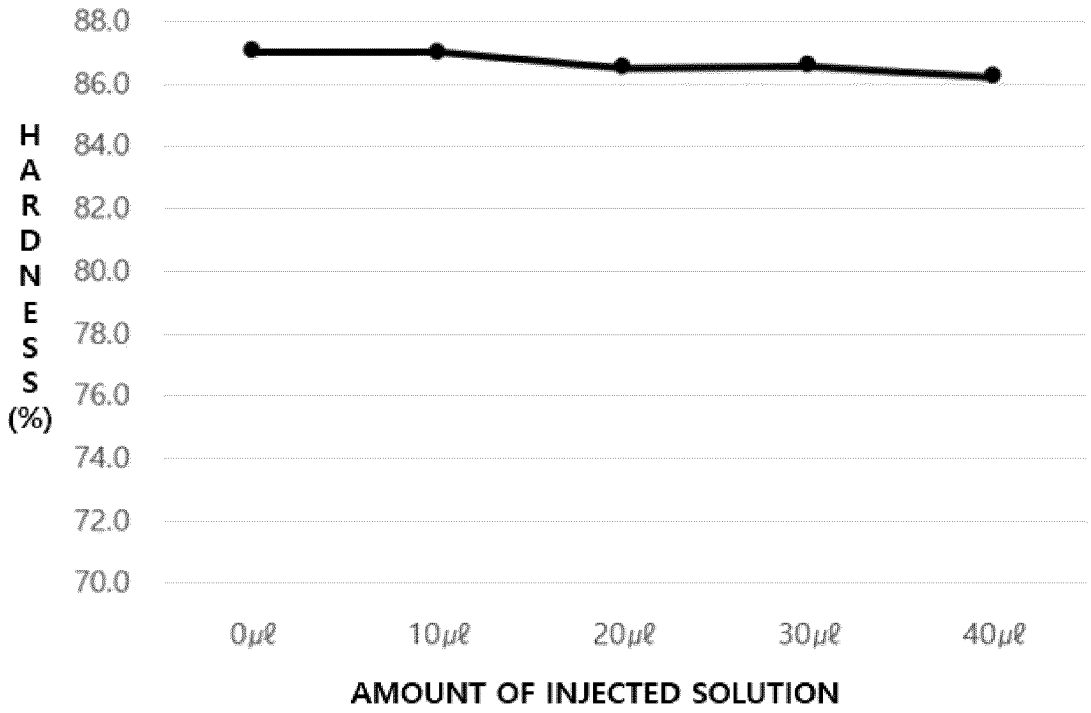
10μℓ
20μℓ
30μℓ
40μℓ
AMOUNT OF INJECTED SOLUTION

FIG. 3


88.0
86.0
84.0
82.0
80.0
78.0
76.0
74.0
72.0
70.0
HARDNESS (%)
0μℓ
10μℓ
20μℓ
30μℓ
40μℓ
AMOUNT OF INJECTED SOLUTION

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2024/001513

A. CLASSIFICATION OF SUBJECT MATTER

A24D 3/06(2006.01)i; **A24D 3/10**(2006.01)i; **A24D 3/02**(2006.01)i; **A24D 3/04**(2006.01)i; **A24D 1/04**(2006.01)i; **A24D 1/02**(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)

A24D 3/06(2006.01); A24D 3/02(2006.01); A24D 3/04(2006.01); A24D 3/08(2006.01); A24D 3/10(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: 라이오셀 (lyocell), 필터 (filter), 섬유 (fiber), 페놀 (phenol), 분산 (dispensing)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	KR 10-2029981 B1 (KT & G CORPORATION) 08 October 2019 (2019-10-08) See paragraphs [0050] and [0075]; claims 1, 6, 10, 13, 15 and 17; and figures 1-3.	1-9
Y	JP 2015-523079 A (PHILIP MORRIS PRODUCTS S.A.) 13 August 2015 (2015-08-13) See claims 6-7; and figures 1-2.	1-9
A	KR 10-2006-0081267 A (KT & G CORPORATION) 12 July 2006 (2006-07-12) See entire document.	1-9
A	WO 2022-263029 A1 (DELFORTGROUP AG) 22 December 2022 (2022-12-22) See entire document.	1-9
A	WO 2022-018180 A1 (DELFORTGROUP AG) 27 January 2022 (2022-01-27) See entire document.	1-9

☐ 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
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"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
21 May 2024	**22 May 2024**
Name and mailing address of the ISA/KR **Korean Intellectual Property Office** **Government Complex-Daejeon Building 4, 189 Cheongsa-ro, 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.
PCT/KR2024/001513

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