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

(11) EP 3 495 554 A1

# (12) EUROPEAN PATENT APPLICATION

(43) Date of publication:
**12.06.2019 Bulletin 2019/24**

(21) Application number: **17206022.0**

(22) Date of filing: **07.12.2017**

(51) Int Cl.:
***D21H 27/00*** *(2006.01)* ***A24D 1/02*** *(2006.01)*
***D21H 17/67*** *(2006.01)* ***D21H 19/38*** *(2006.01)*

(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 MK MT NL NO PL PT RO RS SE SI SK SM TR**
Designated Extension States:
**BA ME**
Designated Validation States:
**MA MD TN**

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## (54) SMOKING ARTICLE PAPER WRAPPER WITH AMORPHOUS MAGNESIUM CARBONATE

(57) A wrapper (40) for a smoking article (10) includes paper includes a cellulosic fiber sheet and amorphous anhydrous magnesium carbonate (80).

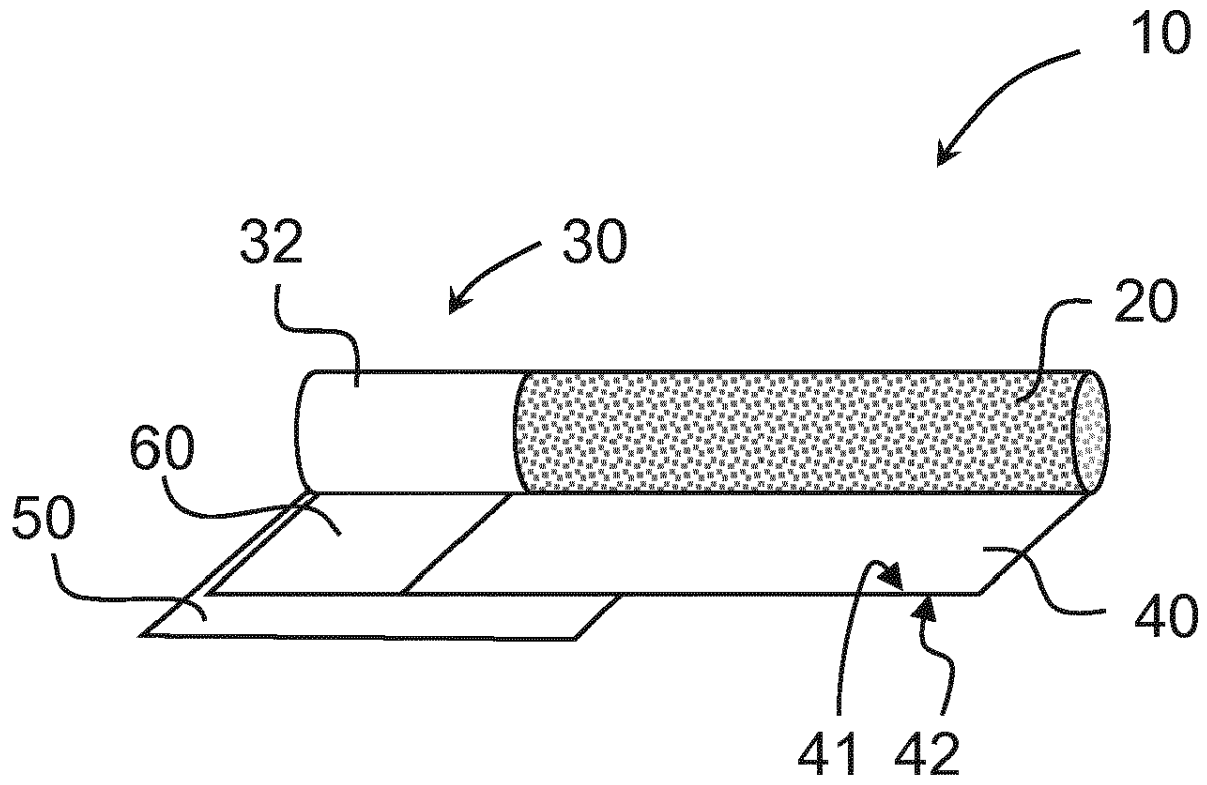


FIG. 1

EP 3 495 554 A1

## Description

**[0001]** This disclosure relates to smoking articles containing amorphous magnesium carbonate. In particular, this disclosure relates to smoking article wrappers containing amorphous anhydrous magnesium carbonate having a high surface area.

**[0002]** Combustible smoking articles, such as cigarettes, typically have shredded tobacco (usually in cut filler form) surrounded by a paper wrapper forming a tobacco rod. A cigarette is employed by a smoker by lighting one end of the cigarette and burning the tobacco rod. The smoker then receives mainstream smoke by drawing on the opposite end or mouth end of the cigarette, which typically contains a filter. The filter is positioned to entrap some constituents of mainstream smoke before the mainstream smoke is delivered to a smoker and may contain activated carbon for adsorbing smoke constituents. Some smoke (referred to as side stream smoke) also enters the environment around the cigarette without going through the filter.

**[0003]** Crystalline magnesium carbonate is a known filler in cigarette wrappers. In order to achieve a reduction of side stream smoke, at least about 15 wt-% of crystalline magnesium carbonate is utilized as a filler in wrapper paper. This high amount of magnesium carbonate either causes the total amount of fillers in the wrapper paper to be very high (e.g., above about 40 % by weight), or replaces some of the other inorganic fillers, such as calcium carbonate. Both the very high amount of fillers and replacing other fillers may negatively impact the characteristics of the cigarette.

**[0004]** It would be desirable to provide a wrapper for a smoking article with reduced side stream smoke while maintaining the characteristics of the cigarette wrapper. It would be desirable to provide a filler for smoking article wrappers that limits the amount of total fillers needed in the wrapper to reduce the side stream smoke. It would be desirable to provide a filler for smoking article wrappers that may provide moisture stability to the wrapper and wrapped tobacco substrate.

**[0005]** Various aspects of the present invention provide a wrapper paper for a smoking article. The wrapper includes an amorphous magnesium carbonate within the wrapping paper or disposed on a surface of the wrapping paper. A smoking article includes a smokable material and the wrapper paper disposed about the smokable material. The amorphous magnesium carbonate preferably is mesoporous and may be hygroscopic.

**[0006]** A wrapper for a smoking article includes paper comprising a cellulosic fiber sheet and amorphous anhydrous magnesium carbonate at about 0.1 % to about 5 % by weight of the paper.

**[0007]** The wrapper for a smoking article may include paper and a first filler comprising calcium carbonate at about 25 % to about 35 % by weight of the paper, and a second filler comprising amorphous anhydrous magnesium carbonate at about 0.1 % to about 5 % by weight of the paper.

**[0008]** The wrapper for a smoking article may include paper, and one or more fillers comprising amorphous anhydrous magnesium carbonate at about 0.1 % to about 20 % by weight of the paper. The fillers have a total concentration of about 15 % to about 40 % by weight of the paper.

**[0009]** The amorphous magnesium carbonate may be disposed on a surface of the wrapper. The amorphous magnesium carbonate may be selectively disposed on a surface of the wrapper. The amorphous magnesium carbonate may be selectively patterned on the on a surface of the wrapper. The amorphous magnesium carbonate may be selectively absent from a portion or region of the wrapper. The amorphous magnesium carbonate may be selectively absent from a portion or region of the wrapper that circumscribes the filter of the smoking article. The amorphous magnesium carbonate may be selectively disposed on an inner surface of the wrapper disposed about smokable material.

**[0010]** The amorphous magnesium carbonate may have a high surface area (that is, a BET surface area) that may be greater than about 60 $m^2/g$. The amorphous magnesium carbonate may be porous. The pore size of the amorphous magnesium carbonate may be characterized as generally microporous (about 2 nm or less) or generally mesoporous (about 2 nm to about 50 nm). The amorphous magnesium carbonate is preferably mesoporous. The amorphous magnesium carbonate may have a cumulative pore volume of at least about 0.018 $cm^3/g$. The amorphous magnesium carbonate may have an average particle size of less than about 10 $\mu$m.

**[0011]** Advantageously, combining the amorphous magnesium carbonate (also referred herein as x-ray amorphous anhydrous magnesium carbonate) with a wrapper for a smoking article may reduce the amount of side stream smoke without negatively impacting performance characteristics of the cigarette, such as appearance of ash, and taste and burning characteristics. Advantageously, the amorphous anhydrous magnesium carbonate is effective at lower concentrations than crystalline magnesium carbonate, allowing the total amount of inorganic fillers to be kept low (that is, below typical levels of crystalline magnesium carbonate). Advantageously, the amorphous anhydrous magnesium carbonate may be hygroscopic and absorb excess humidity or release contained water to maintain moisture levels within the smoking article. Advantageously, the amorphous anhydrous magnesium carbonate may exhibit a light or white color that may match the color of a wrapper. Advantageously, the amorphous anhydrous magnesium carbonate may be selectively disposed on one surface of the wrapper, as placing the amorphous anhydrous magnesium carbonate in regions in most need of this material, and reducing the overall amount utilized on the wrapper. In addition, the amorphous magnesium carbonate may by generally recognized as safe (GRAS) by regulatory authority and be environmentally friendly.

**[0012]** The phrase "BET surface area" refers to specific surface area determined from a Brunauer-Emmet-Teller ("BET") analysis of nitrogen adsorption isotherms.

**[0013]** The phrase "x-ray amorphous" refers to an amorphous material form that may be characterized using x-ray diffraction. The terms "x-ray amorphous" and "amorphous" are used here interchangeably.

**[0014]** X-ray amorphous anhydrous magnesium carbonate, also called x-ray amorphous magnesium carbonate or amorphous magnesium carbonate here, is described in U.S. Patent No. US9,580,330 (Stromme et al.).

**[0015]** The term "hygroscopic" refers to a material property of attracting and holding water molecules from the surrounding environment, usually at normal or room temperature. This may be achieved through either absorption or adsorption.

**[0016]** The term "smoking article" includes cigarettes, cigars, cigarillos and other articles in which a smokable material, such as a tobacco is surrounded by a wrapper paper and is lit and combusted to produce smoke.

**[0017]** As used herein, the term "smoke" is used to describe an aerosol produced by a smoking article. An aerosol produced by a smoking article may be, for example, smoke produced by combustible smoking articles, such as cigarettes.

**[0018]** The term "side stream smoke" is used here to refer to smoke emitted from a smoking article that enters the air surrounding the smoking article directly without passing through the filter.

**[0019]** The terms "wrapper paper" and "wrapper" are used here to refer to sheets of material that are used to wrap around at least a part of the smoking article, such as the smokable material, tobacco substrate, and the filter. The wrapper may include paper made from cellulosic fiber sheet and fillers.

**[0020]** The term "grammage" is used to refer to the weight of a sheet material, for example, paper (such as wrapper paper), and is expressed in units of mass per (planar) surface area (such as, $g/m^2$).

**[0021]** The term "filler" is used here to refer to materials that may be used in various parts of the smoking article, such as in the wrapper or the smokable material. The filler may be inert or may be intended to perform a function, such as absorbing or adsorbing constituents from smoke or from air surrounding the smoking article either during use (during smoking or consumption) or during storage.

**[0022]** The terms "upstream" and "downstream" are relative terms, and are used here to refer to positions along the smoking article relative to the flow of air or smoke within the smoking article. The upstream end of the smoking article is the lit end, and the downstream end of the smoking article is the mouth end.

**[0023]** All scientific and technical terms used herein have meanings commonly used in the art unless otherwise specified. The definitions provided herein are to facilitate understanding of certain terms used frequently herein.

**[0024]** As used herein, the singular forms "a", "an", and "the" encompass embodiments having plural referents, unless the content clearly dictates otherwise.

**[0025]** As used herein, "or" is generally employed in its sense including "and/or" unless the content clearly dictates otherwise. The term "and/or" means one or all of the listed elements or a combination of any two or more of the listed elements.

**[0026]** As used herein, "have", "having", "include", "including", "comprise", "comprising" or the like are used in their open-ended sense, and generally mean "including, but not limited to". It will be understood that "consisting essentially of", "consisting of", and the like are subsumed in "comprising," and the like.

**[0027]** The words "preferred" and "preferably" refer to embodiments of the invention that may afford certain benefits, under certain circumstances. However, other embodiments may also be preferred, under the same or other circumstances. Furthermore, the recitation of one or more preferred embodiments does not imply that other embodiments are not useful, and is not intended to exclude other embodiments from the scope of the disclosure, including the claims.

**[0028]** A wrapper for a smoking article includes paper comprising a cellulosic fiber sheet and amorphous anhydrous magnesium carbonate at about 0.1 % to about 5 wt-%.

**[0029]** A smoking article includes a smokable material and an optional filter downstream of the smokable material, and a wrapper surrounding at least a portion of the smokable material. The wrapper includes one or more fillers containing amorphous magnesium carbonate. The amorphous magnesium carbonate may reduce the amount of side stream smoke without negatively impacting characteristics of the cigarette, such as appearance of ash and taste and burning characteristics.

**[0030]** The amorphous magnesium carbonate used in or on the wrapper may be hygroscopic and is able to physically adsorb water. Physical adsorption of water does not form hydrated forms of the amorphous magnesium carbonate. The amorphous and hygroscopic magnesium carbonate may physically adsorb at least about 0.6 mmol water/g, or at least 1 mmol water/gram, or at least 2 mmol water/gram, at a relative humidity of about 3 % at room temperature (about 27 °C) and 1 Atm (approximately 101 kPa). The amorphous and hygroscopic magnesium carbonate may physically adsorb at least about 1.5 mmol water per gram of amorphous magnesium carbonate, or at least 2 mmol water/gram, or at least 4 mmol water/gram, at a relative humidity of about 10 % at room temperature (about 27 °C) and 1 Atm (approximately 101 kPa). The amorphous and hygroscopic magnesium carbonate may physically adsorb at least about 10 mmol water/gram, or at least 15 mmol water/gram, or at least 20 mmol water/gram, at a relative humidity of about 90 % at room temperature (about 27 °C) and 1 Atm (approximately 101 kPa).

**[0031]** The amorphous and hygroscopic magnesium

carbonate may physically desorb or release the bound water either when the material is heated or when the relative humidity (surrounding the amorphous and hygroscopic magnesium carbonate) is lowered. The amorphous and hygroscopic magnesium carbonate may physically desorb or release up to about 15 % wt, or up to about 20 % wt, or up to about 25 % wt of its bound water content when the relative humidity is lowered from 95 % to 5 % at room temperature (about 27 °C) and 1 Atm (approximately 101 kPa). Thus, the amorphous and hygroscopic magnesium carbonate may absorb excess humidity or release contained water to maintain moisture levels within the smoking article.

**[0032]** BET analysis of surface area (BET surface area) may be done using a $N_2$ adsorption isotherm at -196 ºC obtained in a volumetric Autosorb-6B apparatus (available from Quantachrome Instruments in Boynton Beach, FL), generally as described in (i) Gregg SJ, Sing KSW, Adsorption, Surface Science and Porosity, Academic Press, New York (1982); (ii) Rouquerol F, Rouquerol J, Sing K, Adsorption by powders and porous solids. Principles, methodology and applications, Academic Press (1999); and (iii) Linares-Solano et al., Tanso 1998: 185:316-325. For example, the specific surface area may be determined according to ISO 9277 (2010): Determination of the specific surface area of solids by gas adsorption - BET method. Methods for determining specific surface area of microporous materials (type I isotherms) provided in an annex of ISO 9277 (2010) may be particularly useful for determining specific surface area.

**[0033]** The amorphous magnesium carbonate material may be characterized utilizing various techniques well known in the art. Different suitable methods may be employed individually or in combination to confirm and quantify the amorphous magnesium carbonate content of the material. These methods include, but are not limited to, XPS (x-ray photoelectron spectroscopy), Raman spectroscopy, XRD (x-ray diffraction), FTIR (Fourier transform infrared spectroscopy), NMR spectroscopy (nuclear magnetic resonance spectroscopy), ICP-MS (inductively coupled plasma mass spectrometry), EDS (energy-dispersive X-ray spectroscopy), TEM (transmission electron microscopy) ED (electron diffraction) and TGA (Thermogravimetric analysis). Raman spectroscopy may be employed to reveal the presence of amorphous magnesium carbonate (by the presence of the so-called Boson peak at low wavenumbers which is characteristic for amorphous materials, and the distinctive carbonate peak at about 1100 $cm^{-1}$).

**[0034]** XPS analysis may be employed to confirm the presence and determine the amount of magnesium carbonate in a material by first determining the magnesium carbonate content in the material by conducting an elemental analysis, and then performing a resolved spectrum analysis to distinguish between crystalline and amorphous magnesium carbonate (the electron binding energy in the magnesium 2s orbital of amorphous magnesium carbonate is expected to be about 90.7 eV, while the binding energy generally is expected to be about 91.5 eV or higher for crystalline magnesium carbonates).

**[0035]** XRD analysis may be employed for crystal phase determination of the constituents of a material. For example, XRD analysis may be used to quantify the amorphous magnesium carbonate content in relation to the crystalline content. In particular, the presence of amorphous magnesium carbonate can be confirmed by XRD. In an XRD measurement, amorphous magnesium carbonate gives rise to either broad halos or noisy flat signals in the 2θ window between about 10° and about 20°, as well as between about 25° and about 40°, when the diffractometer uses CuKa radiation. In contrast, crystalline materials (e.g., materials other than amorphous magnesium carbonate, including impurities or other elements introduced on purpose), will give rise to peaks in the XRD pattern.

**[0036]** The amorphous magnesium carbonate may have a BET surface area greater than about 60 $m^2/g$, greater than about 100 $m^2/g$, greater than about 240 $m^2/g$, greater than about 350 $m^2/g$, or greater than about 600 $m^2/g$. The BET surface area may be up to about 1500 $m^2/g$, or up to about 1200 $m^2/g$. Preferably the BET surface area of the amorphous magnesium carbonate is as high as practically feasible. The BET surface area may range from about 240 $m^2/g$ to about 1500 $m^2/g$, or from about 600 $m^2/g$ to about 1500 $m^2/g$.

**[0037]** The amorphous magnesium carbonate is porous. The pore size of the amorphous magnesium carbonate may be characterized as generally microporous (pore diameter about 2 nm or less) or generally mesoporous (pore diameter about 2 nm to about 50 nm). The pore diameter of at least about 98 % of the pores in the amorphous magnesium carbonate may be less than about 10 nm (nanometers), or less than about 6 nm.

**[0038]** The pores in the amorphous magnesium carbonate have a cumulative volume of pores. The cumulative volume of pores with a diameter smaller than about 10 nm may be at least about 0.018 $cm^3/g$, at least about 0.02 $cm^3/g$, preferably at least about 0.4 $cm^3/g$, and more preferably at least about 0.8 $cm^3/g$. The cumulative volume of pores with a diameter smaller than about 10 nm may be up to about 1.5 $cm^3/g$, more preferably up to about 2 $cm^3/g$, or most preferably up to about 3 $cm^3/g$. The pore size distribution and the cumulative volume of pores may be determined by density functional theory (DFT) calculations on the adsorption isotherm. As appreciated by the skilled person, the unique distribution of micro- and mesopores may be described with other parameters and may be based on other types of measurements than those described here.

**[0039]** The amorphous magnesium carbonate in or on the wrapper may reduce the amount of side stream smoke emitted from the smoking article during smoking. The amorphous magnesium carbonate may reduce the amount of side stream smoke by, for example, adsorption of water and maintaining a low water content of the wrapper, thus resulting in improved combustion and reduced

smoke. The amorphous magnesium carbonate may also reduce side stream smoke, or reduce the amount of components in the side stream smoke by binding, absorbing, or adsorbing smoke constituents such as formaldehyde and benzene.

**[0040]** Amorphous magnesium carbonate is available in various particle sizes. The amorphous magnesium carbonate used in the wrapper may have an average particle size (e.g., diameter) of less than 10 micrometers, or preferably less than 5 micrometers, or more preferably less than 3 micrometers, and greater than about 100 nm. The amorphous magnesium carbonate used in the wrapper may have an average particle size in a range from about 1 to 3 micrometers, or about 2 micrometers.

**[0041]** The use of the term "diameter" in the context of particles of amorphous magnesium carbonate may be considered to refer to the average of the largest cross dimension (e.g., length, width, or height) of the particles within a population of particles. In some cases, a parameter given as the "diameter" is a range based on the sizes of sieves through which a population of particles of amorphous magnesium carbonate may pass, with the smallest tested sieve through which all of the particles pass being the "maximum diameter," and the largest tested sieve through which the particles do not pass being the "minimum diameter."

**[0042]** The amorphous magnesium carbonate material may be pure (that is 100 %) amorphous magnesium carbonate or may include crystalline magnesium carbonate to form a mixture of amorphous magnesium carbonate and crystalline magnesium carbonate. The amorphous magnesium carbonate may be utilized as a pure material or may be combined with other material such as crystalline magnesium carbonate to form a mixture of amorphous and crystalline magnesium carbonate. The amorphous and crystalline magnesium carbonate material may have at least about 10 % wt, or at least 25 % wt, or at least 50 % wt, or at least 75 % wt, or at least 90 % wt, or at least 99 % wt of amorphous magnesium carbonate. The amorphous and crystalline magnesium carbonate material may have up to about 10 % wt, or up to 25 % wt, or up to 50 % wt, or up to 75 % wt, or up to 90 % wt, or up to 99 % wt crystalline magnesium carbonate material. The amorphous and crystalline magnesium carbonate material may include from about 25 % to about 75 % wt amorphous magnesium carbonate, and from about 75 % to about 25 % wt crystalline magnesium carbonate. The amorphous and crystalline magnesium carbonate material may include from about 75 % to about 99 % wt amorphous magnesium carbonate, and from about 1 % to about 25 % wt crystalline magnesium carbonate. The amorphous and crystalline magnesium carbonate material may include from about 90 % to about 99 % wt amorphous magnesium carbonate, and from about 1 % to about 10 % wt crystalline magnesium carbonate.

**[0043]** The amorphous magnesium carbonate may exhibit a light color or a white color. The light or white color may provide or assist with maintaining visual aesthetics of the wrapper. The amorphous magnesium carbonate may have a color that is similar to the color of the wrapper. This may be particularly advantageous when the amorphous magnesium carbonate is disposed on a surface or only a portion of the surface of the wrapper. The amorphous magnesium carbonate may be difficult to see and may blend in with the wrapper whether in or on the wrapper.

**[0044]** The amorphous magnesium carbonate may be colored with a dye or pigment. The dye or pigment preferably is a food grade dye or pigment. The amorphous magnesium carbonate may be colored green, yellow, red, blue, orange or purple, or any shade thereof.

**[0045]** The wrapper may contain or include any useful amount of amorphous magnesium carbonate. The wrapper may contain amorphous magnesium carbonate at about 0.1 % to about 20 % by weight of the paper, about 1 % to about 15 % by weight of the wrapper, or from about 2 % to about 10 % by weight of the wrapper, or from about 3 % to about 10 % by weight of the wrapper, or from about 5 % to about 20 % by weight of the wrapper, or from about 5 % to about 15 % by weight of the wrapper, or from about 5 % to about 10 % by weight of the wrapper. In some cases, the wrapper includes amorphous magnesium carbonate at about 0.1 % to about 5 % by weight of the paper, or from about 0.3 % to about 5 % by weight of the paper, or from about 0.5 % to about 5 % by weight of the paper, or from about 1 % to about 5 % by weight of the paper. In some cases, the wrapper includes amorphous magnesium carbonate at about 5 % to about 20 % by weight of the paper, or from about 5 % to about 15 % by weight of the paper, or from about 5 % to about 10 % by weight of the paper.

**[0046]** The mass of amorphous magnesium carbonate in or on the wrapper of a single smoking article depends on the concentration of the amorphous magnesium carbonate in the wrapper and the size of the wrapper. The amount of amorphous magnesium carbonate in or on the wrapper of a regular size smoking article may range from about 1 mg to about 50 mg, or from about 5 mg to about 35 mg, or from about 10 mg to about 20 mg.

**[0047]** A smoking article may have a diameter from about 5 mm and about 9 mm. A regular size smoking article may have a diameter of about 8 mm. The length of the wrapper may be from about 60 mm to about 110 mm.

**[0048]** The wrapper may also contain other adsorbents, absorbents, and fillers. For example, the wrapper may contain calcium carbonate or activated carbon. The wrapper may contain up to 40 %, or up to 35 %, or up to 30 % calcium carbonate by weight of the paper. In one embodiment, the wrapper may contain from about 25 % to about 40 %, or from about 25 % to about 38 %, or from about 25 % to about 35 %, or about 30 %, calcium carbonate by weight of the paper. In a certain embodiment, the wrapper may include paper, and a first filler comprising calcium carbonate at about 25 % to about 35 % by

weight of the paper, and a second filler comprising amorphous anhydrous magnesium carbonate at about 0.1 % to about 5 % by weight of the paper. In one embodiment the wrapper may include from about 0.1 % to about 5 % citrate by weight of the paper.

**[0049]** The total amount of fillers, adsorbents, and absorbents in the wrapper may be up to, or less than 40 wt %, up to 35 wt %, up to 30 wt %, up to 25 wt %, or up to 20 wt % by weight of the wrapper. The total amount of fillers in the wrapper may be from about 20 % to about 40 % by weight of the paper, or from about 25 % to about 35 % by weight of the paper. In one embodiment, the wrapper may contain about 0.1 % to about 20 %, or about 0.1 % to about 5 %, amorphous magnesium carbonate by weight of the paper such that the fillers have a total concentration of about 15 % to about 40 %, or from 30 % to 40 %, by weight of the paper.

**[0050]** The wrapper may have any suitable grammage and porosity. For example, the wrapper may have a grammage from about 20 to about 45 grams per square meter (gsm), and a porosity of about 5 to about 350 Coresta units (CU).

**[0051]** The amorphous magnesium carbonate may be applied to the wrapper by any useful method. For example, the amorphous magnesium carbonate may be embedded (or uniformly dispersed) in the wrapper by mixing the material with cellulosic pulp during the process of making the wrapper paper. Alternatively, the amorphous magnesium carbonate may be applied or disposed onto the surface of the wrapper. Any suitable application method may be used, including printing techniques, such as gravure, flexography, ink jet, or heliography; spraying; wetting; or immersion.

**[0052]** The amorphous magnesium carbonate may be applied to a surface of wrapper. When the amorphous magnesium carbonate is applied onto the surface (in inner, or outer surface, or both inner and outer surfaces) of the wrapper, the amorphous magnesium carbonate may be applied uniformly along the surface(s), or may be applied selectively onto certain regions of the surface(s) of the wrapper. For example, amorphous magnesium carbonate may be deposited to form a uniform or non-uniform pattern on the surface of the wrapper, or may be applied to form a gradient along the surface of the wrapper. The amorphous magnesium carbonate may be selectively applied to one surface of wrapper, leaving the opposing surface substantially free of the amorphous magnesium carbonate. In some embodiments, at least about 80%, or at least 90% of the total amount of amorphous magnesium carbonate may be disposed on the one surface (inner or outer) of the wrapper. This one coated surface may preferably form an inner surface of the wrapper that is formed into a cylinder circumscribing an amount of tobacco.

**[0053]** For example, the wrapper may be formed and then the amorphous magnesium carbonate is disposed onto one of the major surfaces of the wrapper forming a coated wrapper. This coated wrapper may then be formed into a cylinder where the coated surface forms the inner surface of this this cylinder. The inner surface forms or defines a smokable material cavity and the smokable material is disposed within the smokable material cavity. The coated wrapper may be formed into a cylinder and wrapped about smokable material. Smokable material (such as tobacco) may be surrounded by the coated inner surface. Providing the coated inner surface close to the smokable material may provide advantages such as humidity control to the smokable material and enhanced side stream smoke mitigation, as compared to having the amorphous magnesium carbonate on only the outer surface or dispersed within the paper thickness.

**[0054]** Selectively applying the amorphous magnesium carbonate allows concentrating the material into areas where it provides a greater impact on side stream smoke reduction, thus providing a greater benefit at a lower cost. In some embodiments, the amorphous magnesium carbonate material is applied only to areas of the wrapper that surround the smokable material of a tobacco rod of a smoking article or onto a surface that is closest to the smokable material of the tobacco rod. In some of these embodiments, the amorphous magnesium carbonate material is not applied to areas of the wrapper that surround the filter element of a smoking article.

**FIG. 1** is a schematic perspective view of an embodiment of a partially unrolled smoking article.

**FIG. 2** is a schematic cross-sectional view of an illustrative smoking article.

**[0055]** The schematic drawings are not necessarily to scale and are presented for purposes of illustration and not limitation. The drawings depict one or more aspects described in this disclosure. However, it will be understood that other aspects not depicted in the drawings fall within the scope and spirit of this disclosure.

**[0056]** Referring now to **FIG. 1,** a smoking article **10,** in this case a cigarette, is depicted. The smoking article **10** includes a rod **20.** The rod **20** may be a tobacco rod that includes smokable material, such as cut or loose tobacco material. The smoking article **10** further includes a mouth end filter **30** that includes filtration material **32,** or a plug of filtration material **32** such as cellulose acetate fibre tow or polylactic acid filter material. The depicted smoking article **10** includes plug wrap **60** surrounding the filter element **32,** a wrapper **40** surrounding the tobacco substrate, and tipping paper **50** joining the plug wrap **60** to the wrapper **40.**

**[0057]** **FIG. 2** is a cross-sectional view that illustrates a smoking article **10.** The smoking article **10** includes a rod **20** wrapped in a wrapper **40.** The wrapper **40** includes amorphous magnesium carbonate material or particles **80.** The amorphous magnesium carbonate material or particles **80** may be dispersed throughout the wrapper **40.** For example, the amorphous magnesium carbonate material or particles **80** may be embedded in the wrapper

material, and/or may be disposed on the surface (for example, inner surface **41** or outer surface **42**) of the wrapper **40.** Amorphous magnesium carbonate material or particles **80** may also be included in the plug wrap **60** or the tipping paper **50.**

**[0058]** In some embodiments, the wrapper includes amorphous anhydrous magnesium carbonate printed or disposed on the inner surface **41,** the outer surface **42,** or both, of the wrapper **40.** In one embodiment, the amorphous magnesium carbonate may be printed or disposed on only the outer surface **42** of the wrapper **40.** In one preferred embodiment, the amorphous magnesium carbonate may be printed or disposed on only the inner surface **41** of the wrapper **40.**

**[0059]** The wrapper of the present disclosure includes one or more fillers containing amorphous magnesium carbonate. The wrapper may be used to surround or contain smokable material of a tobacco rod of a smoking article. The amorphous magnesium carbonate may be embedded into the paper of the wrapper, or printed or disposed, on one or both major surfaces of the wrapper. The wrapper may be formed into a cylinder to round or contain smokable material of a tobacco rod of a smoking article. The amorphous magnesium carbonate may be dispersed throughout the thickness of the paper. The amorphous magnesium carbonate may be disposed onto an outer surface of the paper wrapping or containing the smokable material. The amorphous magnesium carbonate may be disposed onto an inner surface of the paper wrapping or containing the smokable material. The total amount of fillers, adsorbents, and absorbents in the wrapper may be up to, or less than, about 40 wt %, about 35 wt %, about 30 wt %, about 25 wt %, or about 20 wt % by weight of the wrapper. The wrapper may contain amorphous magnesium carbonate at about 0.1 % to about 20 % by weight of the paper, about 1 % to about 15 % by weight of the wrapper, or from about 2 % to about 10 % by weight of the wrapper, or from about 3 % to about 10 % by weight of the wrapper, or from about 5 % to about 20 % by weight of the wrapper, or from about 5 % to about 15 % by weight of the wrapper, or from about 5 % to about 10 % by weight of the wrapper. In some cases, the wrapper includes amorphous magnesium carbonate at about 0.1 % to about 5 % by weight of the paper, or from about 0.3 % to about 5 % by weight of the paper, or from about 0.5 % to about 5 % by weight of the paper, or from about 1 % to about 5 % by weight of the paper. In some cases, the wrapper includes amorphous magnesium carbonate at about 5 % to about 20 % by weight of the paper, or from about 5 % to about 15 % by weight of the paper, or from about 5 % to about 10 % by weight of the paper. The amorphous magnesium carbonate material may be pure amorphous magnesium carbonate or may be a mixture of amorphous magnesium carbonate and crystalline magnesium carbonate. The amorphous magnesium carbonate may have a BET surface area greater than about 60 $m^2/g$, greater than about 100 $m^2/g$, greater than about 240 $m^2/g$, greater than about 350 $m^2/g$, or greater than about 600 $m^2/g$. The BET surface area may be up to about 1500 $m^2/g$, or up to about 1200 $m^2/g$. The amorphous magnesium carbonate used in the wrapper may have an average particle size of less than 10 μm, or preferably less than 5 μm, or more preferably less than 3 μm. The cumulative volume of pores with a diameter smaller than about 10 nm in the amorphous magnesium carbonate may be at least about 0.018 $cm^3/g$, at least about 0.02 $cm^3/g$, preferably at least about 0.4 $cm^3/g$, and more preferably at least about 0.8 $cm^3/g$. The cumulative volume of pores with a diameter smaller than about 10 nm may be up to about 1.5 $cm^3/g$, more preferably up to about 2 $cm^3/g$, or most preferably up to about 3 $cm^3/g$. A smoking article comprising the wrapper, described herein, is disposed about smokable material, the wrapper and smokable material forming a tobacco substrate. The wrapper has an outer surface and an inner surface, the inner surface defining the smokable material cavity, the amorphous anhydrous magnesium carbonate may be disposed on the inner surface.

## Claims

1. A wrapper for a smoking article, the wrapper comprising:

   paper comprising a cellulosic fiber sheet; and
   amorphous anhydrous magnesium carbonate at about 0.1 % to about 5 % by weight of the paper.

2. A wrapper for a smoking article, the wrapper comprising:

   paper;
   a first filler comprising calcium carbonate at about 25 % to about 35 % by weight of the paper; and
   a second filler comprising amorphous anhydrous magnesium carbonate at about 0.1 % to about 5 % by weight of the paper.

3. A wrapper for a smoking article, the wrapper comprising:

   paper; and
   one or more fillers comprising amorphous anhydrous magnesium carbonate at about 0.1 % to about 20 % by weight of the paper, the one or more fillers having a total concentration of about 15 % to about 40 % by weight of the paper.

4. The wrapper according to any one of the preceding claims, wherein a total amount of fillers in the wrapper is less than about 40 % by weight of the paper, or from about 20 % to about 40 % by weight of the paper, or from about 25 % to about 35 % by weight

of the paper.

**5.** The wrapper according to any one of the preceding claims, wherein the amorphous anhydrous magnesium carbonate has a particle size of less than about 10 micrometers, or less than about 5 micrometers, or less than about 3 micrometers, or about 2 micrometers.

**6.** The wrapper according to any one of the preceding claims, wherein the amorphous anhydrous magnesium carbonate has a cumulative volume of pores, with a diameter of 10 nm or less, of at least about 0.018 $cm^3/g$, or at least about 0.02 $cm^3/g$, or at least about 0.4 $cm^3/g$, or at least about 0.8 $cm^3/g$.

**7.** The wrapper according to any one of the preceding claims, wherein the amorphous anhydrous magnesium carbonate has a specific surface area of at least about 60 $m^2/g$, or at least about 100 $m^2/g$, or at least about 240 $m^2/g$, or at least about 350 $m^2/g$, or at least about 600 $m^2/g$, and up to about 1500 $m^2/g$.

**8.** The wrapper according to any one of preceding claims, wherein the amorphous anhydrous magnesium carbonate is present from about 0.1 % to about 5 % by weight of the paper, or from about 0.3 % to about 5 % by weight of the paper, or from about 0.5 % to about 5 % by weight of the paper, or from about 1 % to about 5 % by weight of the paper.

**9.** The wrapper according to any one of the preceding claims, wherein the amorphous anhydrous magnesium carbonate is contained within the paper.

**10.** The wrapper according to any one of the preceding claims, wherein the amorphous anhydrous magnesium carbonate is disposed on a surface of the paper.

**11.** The wrapper according to claim 10, wherein the amorphous anhydrous magnesium carbonate is printed on a surface of the paper.

**12.** The wrapper according to any one of the preceding claims, wherein
the amorphous anhydrous magnesium carbonate is present on or in the paper in a range from about 1 % to about 5 % by weight of the paper, and
calcium carbonate is present in the paper in a range from about 25 % to about 40 %, or from about 25 % to about 38 %, or from about 25 % to about 35 %, by weight of the paper.

**13.** The wrapper according to any one of the preceding claims, further comprising from about 0.1 % to about 5 % citrate by weight of the paper.

**14.** The wrapper according to any one of the preceding claims, wherein the wrapper has a grammage from about 20 to about 45 grams per square meter and a porosity of about 5 to about 350 Coresta units.

**15.** A smoking article comprising the wrapper according to any one of the preceding claims, disposed about smokable material, the wrapper and smokable material forming a tobacco substrate.

**16.** The smoking article according to claim 15, wherein the wrapper has an outer surface and an inner surface, the inner surface defining the smokable material cavity and the smokable material disposed in the smokable material cavity, the amorphous anhydrous magnesium carbonate is disposed on the inner surface.

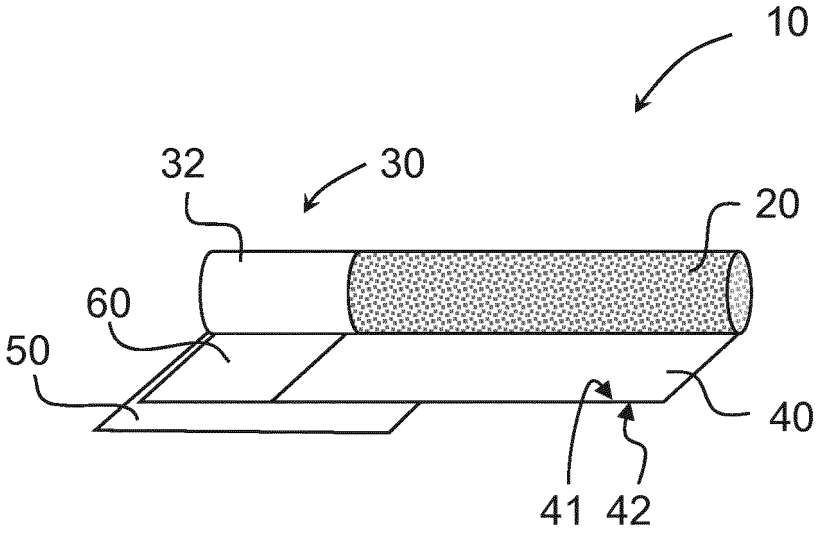


FIG. 1

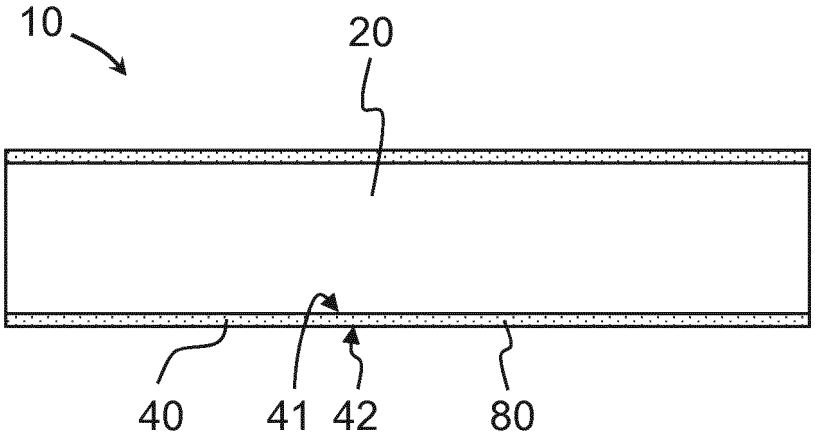


FIG. 2

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# EUROPEAN SEARCH REPORT

Application Number
EP 17 20 6022

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