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KUUMASAUMAUTUVA SULKUPAPERI

Värmeförseglingsbart barriärpapper

HEAT-SEALING BARRIER PAPER

(56) Viitejulkaisut - Anförda publikationer - References cited
WO-A1-00/05311; WO-A1-2008/141771; WO-A1-2009/117040;

HEAT-SEALING BARRIER PAPER

Description

The present invention relates to the field of packaging papers.

Plastics films are widely used in flexible packaging because they have the water vapor barrier properties necessary for good preservation of perishable products or products which have a limited shelf life.

Papers are materials manufactured from fibers which are generally cellulose, and therefore of plant origin. They are naturally porous and gas permeable and cannot, as such, be used for this application.

However, combining papers with other materials (plastics, aluminum, etc.) to obtain the barriers necessary for the packaging of various products and notably perishable foodstuffs is known. In this case the paper substrate is subjected to transformation operations which include, for example, coating of covering layers made of dispersed polymers, extrusion coating of molten polymers or lamination with plastics films or aluminum. The cost of this paper-based composite with barrier properties has become expensive.

Document US 2 653 870 A discloses a method for manufacturing packaging paper.

Packaging made from barrier papers manufactured in-line are disclosed in application WO2011/056130. In-line manufacturing is understood as manufacturing using a single production tool comprising all the elements useful for producing the paper.

However, the proposed barrier level is limited to measurement conditions that are not very restrictive (temperate, i.e. 25 °C, 75 % relative humidity). The barrier level is measured by water vapor permeability, a low barrier signifying high water vapor permeability. It is known in the literature that “tropical” conditions (i.e., 38 °C, 90 % relative humidity) are much more severe than temperate conditions, and therefore the barrier measured under temperate conditions is much lower.

The term “barrier paper” should be understood to mean a non-porous paper, comprising a fibrous substrate covered with one or more layers, sufficiently impervious to water vapor to oppose the penetration thereof into the packaging, in an amount likely to affect the shelf life of the product or the integrity of the product contained therein.

The invention relates in particular, but not exclusively, to water vapor barrier papers having a water vapor permeability of at most 150 g/m^2/24 h and, preferably, less than 100 g/m^2/24h, measured according to standard ASTM F1249 under so-called tropical conditions of 38 °C and 90 % relative humidity.

It is advantageous that the barrier paper is also heat-sealable, in order to allow the formation of the packaging by sealing the paper to itself.

Manufacturing heat-sealable papers involves, for example, depositing a cover layer of a heat-sealing polymer on a cellulose substrate. Such a cover layer has a fairly strong tackiness when not dry and must be able to be dried completely before the paper is rolled up on itself, to prevent the various turns of the reel from sticking together.

The application of this cover layer is generally carried out off-line during one or more transformation steps, which makes it possible to have a good coating quality, to benefit from a paper at room temperature at the time of coating, which allows the cover layer not to penetrate too much into the fibrous support, and to be able to adapt the transit time of the web in the ovens, at a speed, for example, of approximately 200 m/min, so that the time of exposure to these heating means is sufficient to completely dry, in depth, the heat-sealing cover layer.

Documents US 2004/121079 A1, WO 2010/052571 A2, US 2014/113080 A1 and WO 2009/112255 A1 disclose papers which are treated off-line.

Papers which offer a water vapor barrier and are optionally heat-sealing are generally manufactured, in the prior art, during transformation operations and have, as standard, cover layers of 10 to 30 g/m^2 when dry, which are deposited in one or more thicknesses using different coating means (air knife, reverse gravure,

Meyer bar or rod, or any other coating process) or by applying a thick layer using curtain coating.

The off-line transformation of a paper to give it water vapor barrier and heat-sealability properties is therefore an additional step in paper manufacturing which significantly increases its cost and which limits the development of paper in flexible packaging in favor of packaging using plastics films. There is therefore an economic need to improve the productivity of water vapor barrier and heat-sealing paper manufacturing.

The invention relates to the development of a paper having, when manufactured in-line, water vapor barrier and heat-sealability properties. This barrier and heat-sealing paper can be used to manufacture packaging by sealing the paper to itself.

Regardless of the way in which the heat-sealing layer is applied, in-line or off-line, there is the problem of facilitating depositing of the heat-sealing layer and more generally of any cover layer, heat-sealing or not, which is applied to a fibrous substrate.

It is generally desirable for the cover layer to not penetrate too deeply into the fibrous substrate, in order to reduce the amount of paper applied when this layer is polymer-based. Furthermore, less penetration of the cover layer makes it easier to create a barrier film.

The use of a Yankee cylinder is a first solution to reduce surface porosity.

A second option is the use of a calender before any treatment of the paper.

Another option is to provide for the presence of a pre-layer to reduce the porosity of the paper.

Another option is to combine one or the other of the preceding options.

Certain hydrophobic and highly film-forming latexes can be used in the formulation of the pre-layer.

However, the hydrophobic nature of the pre-layer may then pose a wettability problem during the application of the cover layer when the latter is aqueous,

leading to a non-perfectly homogeneous coverage of the pre-layered fibrous substrate by the cover layer, notably in the case of an in-line method having a high sheet speed. Additionally, the surface energy of the pre-layer must be sufficiently different from that of the cover layer, while respecting the well-known rules of wettability in order to reduce the risk of wetting defects.

As a result, there remains a need to satisfactorily address the problem of the applicability of the cover layer.

The invention meets this need, according to one of its aspects, by virtue of a paper according to claim 1.

The presence, in the pre-layer according to this aspect of the invention, of a lamellar filler having a form factor of at least 15 and of a finer, in particular non-lamellar, particulate filler, the particle size of which, at 80 wt.%, is less than 2 μm (measured according to the SediGraph method ISO 13317-3), makes it possible to obtain a relatively high barrier level, regardless of the hydrophobic nature or not of the binder.

It is known that lamellar fillers contribute to increasing the barrier effect by virtue of the tortuosity that they provide, as taught, for example, by the document Imerys Technical Guide, Pigments for Paper, May 2008. The presence according to this aspect of the invention of at least one finer, in particular non-lamellar, particulate filler increases this effect. A tentative explanation is that this filler, by interfering between the lamellar particles, hinders the movement of water molecules, in particular around the lamellar particles, even more. Document WO 2009/117040 A1 discloses lamellar clay fillers.

Due to the barrier effect linked to the particular choice of fillers present in the pre-layer, a greater freedom exists as to the kind of the binder used.

It is thus possible to use, in particular, any paper binder without a particular barrier property, thereby obtaining the dual-fold advantage of low water vapor permeability for the pre-layer and good wettability with respect to the cover layer.

The invention makes it possible to have a barrier effect reinforced with the pre-layer, which allows a reduction in the quantity of cover layer to be applied or, for

an equal quantity of cover layer, it enables the barrier level of the paper to be further increased, which may prove useful for papers which must be impervious to water vapor. The decrease in the quantity of cover layer required, due to the stronger barrier power of the pre-layered paper, facilitates its drying and may make the coating thereof easier during the in-line manufacturing of the paper.

The paper of the invention is preferably produced on a paper machine from a fibrous substrate consisting of cellulose fibers and optionally of synthetic fibers.

Cellulose fibers are generally a mixture of short fibers and long fibers.

Additives such as sizing agents, wet strength agents, retention agents, or defoamers can be added.

The paper may also contain paper fillers such as titanium dioxide, kaolin, calcium carbonate or talc, inter alia.

The paper is preferably a packaging paper.

The present description also comprises a pre-layered paper. The pre-layered paper can be uncalendered.

The present disclosure also comprises a precoating composition for manufacturing paper according to the invention, comprising a binder in the form of latex and a dispersion of a mixture of lamellar filler(s) having a form factor of at least 15 and finer filler(s) of which the particle size, at 80 wt.%, is less than 2 µm.

Another object of the invention is packaging according to claim 12.

Another object of the invention is a method for manufacturing paper according to claim 13.

Pre-layer

The pre-layer can be identical to the cover layer or be a pigment layer as defined below.

The pre-layer preferably consists of a mixture of at least one latex and fillers also sometimes referred to as “pigments”.

US 4 018 647 A discloses examples of latex.

The latex according to the invention preferably has a Tg (glass transition temperature) measured according to the ASTM E1356 standard below 25 °C and more preferably below 10 °C. The latex can be chosen from the following chemical latexes: styrene-butadiene, styrene-acrylic, acrylics, butyl-acrylate, butyl-acrylate-styrene-acrylonitrile, etc., and more particularly from styrene-butadiene emulsions.

The dry latex content is preferably at least 15 parts relative to the dry fillers (100 parts), preferably at least, or even more than, 25 parts, and better still 30 parts, per 100 parts filler.

The fillers preferably consist of a mixture of lamellar filler(s) and finer, in particular non-lamellar, fillers.

The lamellar filler(s) are particles in the form of lamellae having a form factor (ratio between greatest length and thickness) of greater than or equal to 15, more preferably of at least 40, and even more preferably of at least 60.

The pre-layer comprises a binder and a mixture of lamellar filler(s) having a form factor of at least 15 and finer, in particular non-lamellar, filler(s), of which the particle size, at 80 wt.%, is less than 2 μm (measured according to the SediGraph method ISO 13317-3).

In order to have a mixture of lamellar filler(s) and finer filler(s), of which the particle size, at 80 wt.%, is less than 2 μm, the particle size, at 80 wt.%, of lamellar filler(s) may for example be greater than or equal to 2 μm. According to another example, less than 80 wt.% of lamellar particles may be less than 2 μm.

In other words, in order to have fillers finer than the lamellar filler(s), the finer fillers may, according to a first example, have a smaller particle size than that of the lamellar fillers with an equivalent weight distribution. According to a second example, they may have a greater weight distribution for the same particle size than that of the lamellar fillers.

The finer fillers can be chosen from all the other pigments used in papermaking that meet the required size conditions.

The percentage of lamellar fillers relative to the sum of the fillers can vary from 10 to 90 %, preferably from 40 to 90 %, and more preferably still from 60 to 90 %.

The lamellar fillers can be chosen, for example, from kaolin and talc, and mixtures thereof.

Between 30 wt.% and 80 wt.% of lamellar particles can have a size of less than or equal to 2 µm (measured according to the SediGraph method ISO 13317-3).

The particles of the lamellar filler(s) are in particular oriented substantially in parallel with the surface of the substrate.

The particles of the finer filler(s) can be chosen from calcium carbonate, barium sulphate, silica, titanium dioxide or mixtures thereof, etc. They are characterized by a particle size, at 80 wt.%, of less than 2 microns, measured according to the SediGraph method ISO 13317-3

The finer fillers can also be chosen from any other pigment, including kaolin, of sufficient fineness, in particular having a particle size, at 95 wt.%, of less than 2 microns, measured according to the SediGraph method ISO 13317-3.

The binder is preferably chosen from the above-mentioned latexes but other binders or co-binders such as PVOH, starch or CMC, etc. can be used. The binder can comprise a chemical polymer not present in the cover layer.

Cover layer

The polymers used to obtain the vapor barrier and the heat-sealability are chosen from PVdC (polyvinylidene chloride)-based copolymers. The cover layer is substantially filler-free and/or the cover layer is the only layer covering the pre-layer.

These polymers are applied pure or as a mixture with fillers. The term “pure” is understood to mean without particulate filler. It is optionally possible to add other products to the dispersion of polymers, such as pH control agents, rheological agents (viscosity agents, for example), anti-foaming agents or wettability agents.

The use of fillers within the cover layer can in particular help to reduce the risk of the turns of the reel from sticking together.

Manufacturing

Preferably, the cover layer is applied in-line.

The invention makes it possible for good levels of water vapor barrier with cover layer weights not exceeding 10 g/m^2 when dry to be obtained.

Despite the relatively high feeding speed of the paper imposed by an industrial papermaking machine, for example of approximately 400 m/mn, in-line coating of a composition intended to form the heat-sealing cover layer is possible, provided that sufficient drying capacity is used to dry the layer before the winding operation. In particular, a relatively low cover layer weight can facilitate in-line drying, while providing sufficient barrier properties.

The in-line method makes it possible for productivity to be increased by eliminating the handling operations associated with off-line treatment.

After drying the fibrous substrate, the paper sheet can pass over a Yankee cylinder in order to improve the surface condition of the sheet and thus the distribution of the first layer.

The sheet can then be treated in a size-press or any other equipment of the same type. To avoid excessive penetration of the pre-layer into the fibrous support, a pigment composition can be used beforehand in order to make “pore filler”.

This pore filler composition can contain up to 20 parts relative to the dry fillers of dry binder such as latex, of a styrene-butadiene chemical nature for example, and up to 20 parts relative to the dry pigments of dry co-binders such as starch for example.

This composition preferably contains fillers which are generally less than 2 microns in size. These fillers can be selected, inter alia, from kaolins or calcium carbonates or mixtures thereof.

The pre-layer is applied to the support thus treated using any of the coating techniques that may be encountered on paper machines. This may be, notably, blade coating, rotogravure, reverse gravure or Meyer bar coating. The precoat layer is deposited with a dry layer weight preferably between 4 and 12 g/m^2.

This precoat layer is then dried without contact by one or more infrared ovens and/or one or more hot air ovens.

It is not necessary to have a very high level of satin-finish before the application of the top coat. A 150 second Bekk level is sufficient (measured according to ISO 5627 standard).

The water vapor barrier and heat-sealing covering layer is applied by coating using any of the coating techniques that may be encountered on paper machines. This may be, for example, blade coating, rotogravure, reverse gravure or Meyer bar coating. The cover layer is deposited with a dry layer weight of 10 g/m^2 at most.

This cover layer is then sufficiently dried to prevent the turns from sticking together at the winding reel, using one or more infrared ovens and/or one or more hot air ovens.

A coating on the opposite face can be carried out to reinforce the barrier and/or to provide other functionalities such as printability, curl correction, etc.

The paper thus produced can optionally be calendered in-line to reduce surface roughness before being wound.

The final grammage of the paper can be between 45 and 200 g/m^2.

The water vapor barrier measured according to ASTM F1249 at 38 °C and 90 % relative humidity is less than 150 g/m^2/24h, and preferably less than 100 g/m^2/24h.

Example 1:

A fibrous support having a grammage of 55 g/m^2 is produced on a paper machine operating at 400 m/min. The paper machine is equipped with a Yankee roller placed before the size-press.

The fibrous support is first rubbed then treated in-line on both sides by a size-press with a pigment pore filler composition, containing 100 parts of dry Amazon Premium kaolin (Cadam), and a mixture of Merifilm 104 starch (Tate&Lyle) and DL950 latex (Dow) at 20 parts dry relative to dry kaolin. The treatment applied is 5 g/m^2 when dry in total.

It is then coated using a Meyer bar coater with a pre-layer formulation containing a mixture of lamellar fillers and finer particulate fillers and a latex of styrene-butadiene chemical nature of Tg = 7 °C (DL950 from Dow Chemical) and dried without contact on an infrared oven and then a hot air oven. It is then wound on a reel without further treatment. The dry weight of the applied pre-layer is 7 g/m^2 and its formulation is given in the table below:

Material	Reference/Nature	Suppliers	Parts	wt.%
Topsperse GX-N	Dispersant	COATEX	0.2	0.2
Capim NP	Kaolin (platy filler)	IMERYS	60.0	45.5
Amazon Premium	Kaolin (finer filler)	CADAM	40.0	30.4
Bacote 20	Crosslinker	QUARRECHIM	1.5	1.1
Dl950/styrene-butadiene latex Tg 7°C	Styrene-butadiene latex Tg 7 °C	DOW	30.0	22.8

The particle size, at 97 wt.% Amazon Premium, measured according to the SediGraph method ISO 13317-3, is less than 2 microns.

The form factor of the Capim NP particles is 28.

The water vapor barrier is measured by a Mocon brand device, of the Permatran 3/61 type according to the ASTM F1249 standard at 38 °C and 90 % relative humidity to determine the barrier contribution of this pre-layer. It is measured at 334 +/-13 g/m^2/24h. After coating the cover layer, a barrier of less than 150 g/m^2/24 h is obtained.

Example 2

The fibrous support is first rubbed then treated in-line on both sides by a size-press with a pigment pore filler composition containing 100 parts dry of Amazon Premium kaolin (Cadam) and a mixture of Merifilm 104 starch (Tate&Lyle) and DL950 latex (Dow) at 20 parts dry relative to dry kaolin. The treatment applied is 5 g/m^2 when dry in total.

It is then coated using a Meyer bar coater with a formulation containing a mixture of lamellar fillers and finer particulate fillers and a latex of styrene-butadiene chemical nature of Tg = 7 °C (DL950 from Dow Chemical) and dried without contact on an infrared oven and then a hot air oven. It is then wound on a reel without further treatment. The dry weight of the applied pre-layer is 7 g/m^2 and its formulation is given in the table below:

Material	Reference/Nature	Suppliers	Parts	wt.%
Topsperse GX-N	Dispersant	COATEX	0.2	0.2
Capim NP	Kaolin (platy filler)	IMERYS	60.0	45.5
Hydrocarb 95	Calcium carbonate (finer filler)	OMYA	40.0	30.4
Bacote 20	Crosslinker	QUARRECHIM	1.5	1.1
DL950/Styrene-butadiene latex Tg 7 °C	Styrene-butadiene latex Tg 7 °C	DOW	30.0	22.8

The particle size, at 95 wt.% Hydrocarb 95, measured according to the SediGraph method ISO 13317-3, is less than 2 microns.

The water vapor barrier is measured by a Mocon brand device, of the Permatran 3/61 type according to the ASTM F1249 standard at 38 °C and 90 % relative humidity to determine the barrier contribution of this pre-layer. It is measured at 315 +/-9 g/m^2/24h. After coating the cover layer, a barrier of less than 150 g/m^2/24 h is obtained.

Example 3:

A paper is produced in-line under the same conditions as in Example 1. But following the deposition of the pre-layer, it is coated in-line with a cover layer consisting of a dispersion of PVdC copolymer (Diofan A297 from Solvay), and dried without contact on an infrared oven and then a hot air oven. It is then wound on a reel without further treatment and no sticking between turns is observed. The dry weight of the cover layer is 6.5 g/m^2.

The water vapor barrier is measured by a Mocon brand device, of the Permatran 3/61 type according to the ASTM F1249 standard at 38 °C and 90 % relative humidity. It is measured at 21.0 +/-2.4 g/m2/24h.

Sealing is then simulated on a laboratory heat sealer by bonding the face covered with the cover layer to itself at 110 °C, at 3 bar and for 0.5 seconds. Then the force necessary to detach the papers bonded on samples with a width of 15 mm is then measured at an angle of 90 degrees according to the Tappi T540 standard at a speed of 100 mm/min.

A sealing force of 3.5 N/15 mm is obtained.

The invention is not limited to the disclosed examples.

In summary, the invention may have one or more of the following advantageous features:

- the weight of the cover layer is strictly less than 10 g/m2 when dry,
- the cover layer consists of a heat-sealable polymer,
- the lamellar filler(s) and the finer filler(s) are of the same kind,
- the form factor of the lamellar filler particle(s) is of at least 40, more preferably of at least 60,
- the finer filler(s) are non-lamellar,
- the finer filler(s) are lamellar,
- the finer filler(s) have a particle size, at 95 wt.%, of less than 2 microns, measured according to the SediGraph method ISO 13317-3,

- the lamellar filler(s) are mineral filler(s),
- the finer filler(s) are mineral filler(s),
- the lamellar filler(s) are chosen from kaolins and talc and mixtures thereof,
- the finer filler(s) are chosen from kaolins, calcium carbonate, barium sulphate, silica, titanium dioxide and mixtures thereof,
- the finer filler(s) are chosen from kaolins,
- the weight of lamellar filler(s) is greater than that of the finer fillers,
- the percentage of lamellar filler(s), expressed in dry weight, relative to the sum of the fillers, expressed in dry weight, is between 10 and 90 %, preferably between 40 and 90 %, and more preferably still between 60 and 90 %,
- the binder has a glass transition temperature Tg of below or equal to 25 °C, and more preferably less than 10 °C,
- the binder is chosen from chemical latexes of styrene-butadiene, styrene-acrylic, acrylics, butyl acrylate, butyl arcylate-styrene-acrylonitrile, and mixtures thereof,
- the binder is chosen from chemical latexes of styrene-butadiene,
- the binder is introduced in latex form,
- the pre-layer comprises more than 25 parts dry binder relative to the weight of dry filler (100 parts), better 30 parts,
- the binder comprises a chemical polymer not present in the cover layer,
- the paper comprises a printability layer on the face of the substrate opposite to that bearing the pre-layer and the cover layer,
- the substrate bears two identical pre-layers on its opposite faces,
- the substrate bears two different pre-layers on its opposite faces,

- a pore filler composition is applied to the substrate, and the pre-layer is applied to the pore filler composition, the pore filler composition preferably being applied by a size-press or film-press,

- the grammage of the fibrous substrate is between 25 and 180 g/m2,

- the paper is heat-sealable, in particular starting from 90 °C, when sealing is carried out by hot pliers, at 3 bar and for 0.5 s,

- the water vapor permeability of the barrier paper is less than 100 g/m2/24h.

- between 30 wt.% and 80 wt.% by weight of lamellar particles have a size of less than or equal to 2 µm (measured according to the SediGraph method ISO 13317-3),

- the paper is heat-sealable, notably to itself, at a manufacturing rate greater than or equal to 40 bags per minute, on vertical VFFS (Vertical Form, Fill and Seal) packaging machines, along lines of longitudinal sealing of 330 mm per bag,

- the paper is heat-sealable to itself with a sealing force of greater than or equal to 2 N/15 mm, measured at an angle of 90 degrees according to the Tappi T540 standard at a speed of 100 mm/min, when the sealing is carried out by hot pliers, at 3 bar, and for 0.5 s,

- the temperature of the fibrous substrate during the application of the pre-layer is greater than or equal to 50 °C,

- the temperature of the fibrous substrate during the application of the cover layer is greater than or equal to 70 °C,

- the final grammage of the paper is between 45 and 200 g/m2.

The expression “comprising a” should be understood as being synonymous with “comprising at least one”.

KUUMASAUMAUTUVA SULKUPAPERI

PATENTTIVAATIMUKSET

1. Paperi, joka käsittää:

- kuitumaisen substraatin,

- esikerroksen, joka käsittää sideainetta ja seosta, jossa on muotokertoimeltaan vähintään 15 olevaa lamellaarista täyteainetta (-aineita) ja hienojakoisempaa täyteainetta (-aineita), erityisesti ei-lamellaarista täyteainetta (-aineita), jossa hiukkaskoko 80 paino-%:sti on alle 2 um (mitattuna ISO 13317-3 SediGraph -menetelmän mukaisesti), jolloin lamellaarisen täyteaineen kuivapaino on 3–58 % esikerroksen kokonaiskuivapainosta, jolloin hienojakoisemman täyteaineen kuivapaino on 3–58 % esikerroksen kokonaiskuivapainosta, esikerroksen käsittäessä vähintään 15 kuivaosaa sideainetta suhteessa täyteaineen kuivapainoon (100 osaa),

- vähintään yhden päällyskerroksen, joka on levitetty esikerrokseen, joka päällyskerros käsittää kuumasaumattavan polymeerin, jolloin päällyskerros ei olennaisesti sisällä täyteainetta ja/tai päällyskerros on ainoa kerros, joka peittää esikerroksen, jolloin päällyskerros käsittää PVdC-pohjaisen kopolymeerin, jolloin paperin vesihöyrynläpäisevyys on enintään 150 g/m^2/24 h ja edullisesti alle 100 g/m^2/24 h mitattuna ASTM F1249 -standardin mukaan niin sanotuissa trooppisissa olosuhteissa 38 °C:ssa ja 90 %:n suhteellisessa kosteudessa,

jolloin esikerroksen määrä on enintään 12 g/m^2 kuivapainosta, jolloin päällyskerroksen kuivapaino on enintään 10 g/m^2.

2. Patenttivaatimuksen 1 mukainen paperi, jossa päällyskerroksen paino on ehdottomasti alle 10 g/m^2, jolloin päällyskerros koostuu edullisesti kuumasaumattavasta polymeeristä, jolloin lamellaarinen täyteaine (-aineet) ja hienojakoisempi täyteaine (-aineet) ovat edullisesti samanluonteisia.

3. Jonkin edellisen patenttivaatimuksen mukainen paperi, jossa lamellaarisen täyteaineen hiukkasten muotokerroin on vähintään 40, edullisemmin vähintään 60, jolloin hienojakoisemman täyteaineen (-aineiden) hiukkaskoko 95 paino-%:sti on

alle 2 mikronia mitattuna ISO 13317-3 SediGraph -menetelmän mukaisesti, lamellaarisen täyteaineen (-aineiden) ollessa edullisesti mineraalia ja/tai hienojakoisemman täyteaineen (-aineiden) ollessa edullisesti mineraalia.

4. Jonkin edellisen patenttivaatimuksen mukainen paperi, jossa lamellaarinen täyteaine (-aineet) valitaan kaoliinien ja talkin ja niiden seosten joukosta.

5. Jonkin edellisen patenttivaatimuksen mukainen paperi, jossa hienojakoisempi täyteaine (-aineet) valitaan kaoliinien, kalsiumkarbonaatin, bariumsulfaatin, piidioksidin, titaanidioksidin ja niiden seosten joukosta.

6. Jonkin edellisen patenttivaatimuksen mukainen paperi, jossa lamellaarisen täyteaineen paino on suurempi kuin hienojakoisempien täyteaineiden paino, jolloin lamellaarisen täyteaineen (-aineiden) prosenttiosuus kuivapainona ilmaistuna suhteessa täyteaineiden kokonaismäärään kuivapainona ilmaistuna on edullisesti 10–90 %, edullisesti 40–90 % ja vielä edullisemmin 60–90 %.

7. Jonkin edellisen patenttivaatimuksen mukainen paperi, jossa sideaineen lasittumislämpötila T_g on enintään 25 °C ja edullisesti alle 10 °C, jolloin sideaine valitaan edullisesti kemiallisista styreenibutadieeni-, styreeniakryyli-, akryyli-, butyyliakrylaatti-, butyyliarkylaatti-styreeniakrylonitriililatekseista ja niiden seoksista, jolloin sideaine valitaan erityisesti kemiallisista styreenibutadieenilatekseista.

8. Jonkin edellisen patenttivaatimuksen mukainen paperi, joka käsittää esikerroksessa enemmän kuin 25 kuivaosaa sideainetta suhteessa täyteaineen kuivapainoon (100 osaa), vielä paremmin 30 osaa, jolloin sideaine sisältää edullisesti kemiallista polymeeriä, jota ei ole päällyskerroksessa.

9. Jonkin edellisen patenttivaatimuksen mukainen paperi, jossa kuitumaisen substraatin neliömassa on 25–180 g/m^2.

10. Jonkin edellisen patenttivaatimuksen mukainen paperi, jolloin paperi on kuumasaumattavissa, erityisesti 90 °C:sta alkaen, kun saumaus suoritetaan kuumilla puristimilla, 3 baarin paineessa ja 0,5 s ajan.

11. Jonkin edellisen patenttivaatimuksen mukainen paperi, jolloin paperin lopullinen neliömassa on 45–200 g/m^2.

12. Pakkaus, joka käsittää minkä tahansa patenttivaatimuksista 1–11 mukaista paperia, jolloin paperi on edullisesti kuumasaumattu itsensä päälle, sisältäen edullisesti elintarviketuotteen.

13. Menetelmä jonkin patenttivaatimuksista 1–11 mukaisen paperin valmistamiseksi, jolloin kuitumaiseen substraattiin levitetään koostumusta, joka käsittää sideainetta lateksin muodossa ja dispersion seoksesta, jossa on muotokertoimeltaan vähintään 15 olevaa lamellaarista täyteainetta (-aineita) ja hienojakoisempaa täyteainetta (-aineita), jossa hiukkaskoko 80 paino-%:sti on alle 2 um.