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(54) **Package comprising detergent**

Verpackung mit einem Reinigungsmittel

Emballage comportant un détergent

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WO-A-03/010067
WO-A-2006/020789
WO-A-2006/079416
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The file contains technical information submitted after the application was filed and not included in this specification

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Description

FIELD OF THE INVENTION

[0001] This invention relates to bag, especially for use in storing particulate products such as, but not limited to, detergent, pet food, coffee, cereal etc., wherein the bag comprises thin, shaped particles.

BACKGROUND OF THE INVENTION

[0002] For many years aesthetic particles have been incorporated into products for improving the aesthetics of the product. Traditionally, these aesthetic particles are coloured particles for example as described in WO 97/33965. They may also be in the form of noodles as described in US 6,747,000. Aesthetic particles may also be introduced in particulate products, such as detergent composition, as a signal for the consumer that a specific technical benefit is to be expected with the product.

[0003] As new products are marketed there is a need for new visual signals to distinguish them from other products. The consumer is also seeking for new compositions having an attractive appearance. Accordingly, there is always a need for new aesthetics particles to be introduced in particulate products.

[0004] Thin, shaped particles are especially suitable for those purposes. However, such particles tends to be fragile due to their thinness and may break during shipping and handling at the store.

[0005] Accordingly, there is a need to provide products comprising thin, shaped particles which can better sustain shipment and storage conditions.

SUMMARY OF THE INVENTION

[0006] The inventors have discovered that the above mentioned problem can be alleviated with the use of bags comprising a material having a 2% secant tensile modulus of at least 100 MPa as measured according to ASTM D882 and a thickness of at least 30 microns.

[0007] Accordingly, the present invention meets the aforementioned needs by providing a bag comprising a material having a 2% secant tensile modulus of at least 100 MPa as measured according to ASTM D882 and a thickness of at least 30 microns and containing a composition comprising:

- thin, shaped particles having a main length, a, of at least 1.5 mm,
- base granules having an average geometric mean particle diameter, of at most 0.8*a mm (80% of the main length of the thin, shaped particle), or even at most 0.6*a mm, or even 0.4*a mm.

[0008] The thin, shaped particles to base granules weight ratio may be less than 0.1, or even less than 0.01.

[0009] According to one of its aspect, the invention relates to a composition comprising:

- thin, shaped particles having a main length, a, of at least 1.5 mm,
- base granules having an average geometric mean particle diameter, of at most 0.8*a mm (80% of the main length of the thin, shaped particle),

wherein the weight ratio of thin, shaped particles to base granules is of less than 0.1, or even less than 0.01.

[0010] The composition may be comprised in a bag, especially a bag comprising a material having a 2% secant tensile modulus of at least 100 MPa as measured according to ASTM D882 and a thickness of at least 30 microns.

[0011] The thin shaped particles may be concave and/or the base granules may be substantially convex.

[0012] Without wishing to be bound by theory, it seems that the smaller base granules tend to surround and support the thin, shaped particles resulting, in the specific ratio of the invention, of a better protection of the concave, thin, shaped particles.

DETAILED DESCRIPTION OF THE INVENTION

Thin, shaped particles

[0013] Thin, shaped particles may be understood as 3 dimensional particles having a first dimension x, a second dimension y and a third dimension z in the Cartesian planes and the maximum dimension in the second and third planes is at least 3 times the dimension in the first plane.

[0014] The thin, shaped particles have a main length, a, of at least 1.5 mm or even at least 3 mm. The main length, a, is to be understood as the longest length.

[0015] The thin, shaped particles to base granules weight ratio may be less than 0.1, or even less than 0.01.

[0016] The thin, shaped particle may be shaped like any letter of the alphabet, stars, triangles, squares, pentagons, hexagons, heptagons, octagons, non-geometric shapes including for example shapes of animals, birds or other living things, cartoons, flowers, moons, discs, crosses and any other desired shape as disclosed in WO 2006/079416 or GB 2 358 403.

[0017] The thin, shaped particles may be concave. A concave particle is a geometric solid in which at least 50% of the pairs of points lying on or within the surface of the solid cannot be connected by a straight line which is totally contained within the solid or surface thereof. Familiar examples of concave particles are particles having a ring or horseshoe shape as well as thin curved particles. Concave particles may be even more fragile.

[0018] The thin, shaped particles may be of any suitable material. The particles may comprise a material selected from gum Arabic, hydroxypropylmethylcellulose; sodium casinate, and soap. In particular, the particles comprise from 60% to 99% by weight of soaps of C_8-C_{20}

fatty acids. Typically the particles comprise from 0.1 % to 20% by weight of water. Preferred particles also comprise an inorganic salt, for example from 0.05% to 5% by weight of an inorganic salt, preferably sodium chloride. Preferred particles also comprise glycerine, typically from 0.01 % to 10% by weight of glycerine. Such soap-containing particles will typically comprise less than 5% by weight of free fatty acids. Such particles have been found to provide highly satisfactory shaped particles, for example providing an excellent balance between low deformability during cutting, good dissolution and frangibility. The presence of glycerine in the particles may be particularly advantageous as it may also improve the colouring of the particles if a colorant is incorporated.

[0019] The thin, shaped particles may further comprise any adjunct ingredient as stated below.

[0020] The thin, shaped particles are preferably coloured.

[0021] When used herein the term "cutting direction" refers to the direction in which the blade moves through the first article while forming the thin, shaped particle. The "cutting plane" refers to the plane parallel to the cutting direction. The "length of the thin, shaped particle" refers to the length of the thin, shaped particle in the direction normal to the cutting plane and, when extruded, preferably the length of material extruded before the cutting step. When used herein the term "cross-section" refers to the shape of the face of either the shaped or first articles (as referred to) which is parallel to the cutting plane. First article describes any body of material from which a further thin, shaped particle may be cut.

[0022] The method according to the invention for forming the thin, shaped particles of the present invention may be a batch or a continuous process, continuous processes are preferred as a higher production rate can be achieved.

[0023] The first article of the present invention may typically be formed by extrusion. Typically, extrusion is understood to mean any process by which a body of material is forced through a die or orifice so as to form a length of extruded material. In the case of the present invention the extrusion will normally be performed using a commercially available extruder, such as a screw extruder. Commercially available screw extruders typically comprise one or more feeders or hoppers, for storing the material prior to extrusion; a barrel which houses one or more screws; and a die through which the material is extruded. The screws are rotated and the material is typically heated and/or kneaded and/or compacted as it is drawn through the barrel. Typically, the material is forced through the one or more dies, which are usually situated at the end of the barrel furthest from the one or more feeders. It is preferable to use more than one die as this increases the number of first articles, and thus thin, shaped particles, which can be produced at any one time. In a preferred embodiment of the present invention the extruder die comprises greater than or equal to 50 orifices, preferably greater than or equal to 100 orifices and even more preferably greater than or equal to 200 orifices. The shape of the one or more dies' orifices' will determine the cross-section and/or shape of articles extruded therefrom. The screw configuration is typically chosen depending on how deformable the material is and at what temperature the material is mobile enough to be properly compacted and extruded. In certain embodiments of the present invention the temperature of the extrudate may typically be from 70°C to 130°C, or from 80°C to 120°C or even from 90°C to 110°C. Screw configurations can be chosen with varying amounts of back-flow, sheer, compaction, heat and combinations thereof. Commercially available screw extruders suitable for use in the present invention include but are not limited to the TX-85 Twin Screw Extruder manufactured by Wenger.

[0024] When extrusion is used to form the first article, it is preferable for the thin, shaped particle to be cut from the first article as it is extruded. This is understood to mean that as the material leaves the die it is cut immediately to form the thin, shaped particle, as opposed to lengths of material being formed which are then stored and cut at a later time. Typically, the first article (the extrudate) will be cut when the length of extrudate equal to the desired length of the thin, shaped particle has been extruded.

[0025] Typically the thin, shaped particle will be cut from the first article by running the blade flush to the die. Preferably the blade will be tension mounted against the die's surface so as to ensure it runs as closely over the face of the die as possible. It is of course understood that in other embodiments of the invention, the material may be formed into extended lengths of material and cut at a later time.

[0026] The thin, shaped particle may have any preferred cross-section. Particularly preferred thin, shaped particle cross-sections are annular, other preferred cross-sections include any letter of the alphabet, stars, triangles, squares, pentagons, hexagons, heptagons, octagons, non-geometric shapes including for example shapes of animals, birds or other living things; cartoons, flowers, moons, discs, crosses and any other desired shape. In certain embodiments the thin, shaped particle may of course be non-annular. In a preferred embodiment of the present invention the thin, shaped particle will have an extruded length (i.e. the length of the thin, shaped particle) of from 0.05 mm to 1 mm, preferably from 0.1 mm to 0.75 mm and most preferably from 0.2 mm to 0.5 mm. In certain embodiments, the length of the thin, shaped particle will generally be equal to the length of material extruded prior to the cutting step taking place.

[0027] In the preferred embodiments of the present invention where the first article is formed by extrusion it is preferable for the orifice of the die to be shaped such that is compensates for the deformation during the cutting step so as to achieve a thin, shaped particle with a desired cross-section.

[0028] As discussed above, in a preferred embodiment of the present invention the first article's cross-section is

greater, with respect to the desired cross-section of the thin, shaped particle, in the cutting direction. In the embodiments of the present invention where the first article is formed by extrusion it is preferable that the orifice through which the composition is extruded is orientated such that the orifice's greatest cross-section is substantially parallel to the cutting direction.

[0029] In a further embodiment of the present invention the ratio between the smallest length of the thin, shaped particle to its main length is from about 1:3 to about 1:100, or even from about 1:5 to about 1:50, or even from about 1:10 to about 1:20. When the particles are extruded, the main length is usually the greatest cross-section and the smallest length is usually the extruded length.

[0030] The shape of the die's orifice will depend upon the shape of the desired thin, shaped particle, and the compensation for deformation or cutting. In one embodiment of the present invention the ratio of the diameter of the first article's cross-section in the cutting direction to the diameter of thin, shaped particle's cross-section in the cutting direction is greater than 1. Preferably the ratio will be from 5:1 to 101:100 or even from 3:1 to 11:10 or even from 1.5:1 to 1.05:1.

[0031] In a particularly preferred embodiment the desired thin, shaped particle comprises a circular ring and an elliptical ring orifice is used to form an elliptical tube-shaped first article from which substantially circular ring-thin, shaped particles are cut. In a particularly preferred embodiment of the present invention a die having at least one elliptical orifice is used. Preferably said elliptical orifice will have a greatest diameter of from 2 mm to 8 mm, preferably from 3 mm to 7 mm, and a smallest diameter of from 1 mm and 5 mm, preferably from 2 mm and 4 mm. In a particularly preferred embodiment the elliptical orifice will have an elliptical central pin inserted within the orifice so as to form an elliptical annular orifice. Preferably, said elliptical central pin will have a greatest diameter of from 0.5 mm to 7.5 mm, preferably from 2.5 mm to 5 mm, and a smallest diameter of from 0.25 mm to 3.5 mm, preferably from 0.5 to 2 mm. The particular shape of the die orifice required to achieve the desired thin, shaped particle will depend on a number of factors including the extrudate composition, the extrudate viscosity, the cutting speed and the length of the thin, shaped particles.

[0032] When used herein the term blade will be understood to have its normal meaning in the art and will include any means which may be used to cut, cleave or generally remove a thin, shaped particle from a first article; typically, including a knife. Particularly preferred blades for use herein are those mounted on rotary cutters. Rotary cutters comprise a number of individual blades fixed to a device having an axel. The device is rotated about the axel, with the blades aligned such that they are at a generally normal angle to the direction of rotation. Thus, a number of blades can be made to pass over a single location in a short period of time; allowing a great number of thin, shaped particles to be cut from first articles in quick succession. Typically, when rotary cutters are used in the present invention they may comprise more than one blade, preferably more than or equal to five blades, more preferably more than or equal to ten blades and most preferably more than or equal to fifteen blades. Typically the rotary cutters will be rotated at greater than or equal to 1000 revolutions per minute (rpm), preferably greater than or equal to 2000 rpm and even more preferably greater than or equal to 3000 rpm. In a particularly preferred embodiment of the present invention the rotary cutter may be located directly adjacent to the die of the extruder, where it will cut the thin, shaped particles from the first articles as they are extruded. Preferably the rotary cutter is located such that the blades are flush to the extruder die and even more preferably they are tension mounted against the die. Particularly preferred rotary cutters and blades are commercially available such as those from Wenger or de Souza.

[0033] In a preferred embodiment of the present invention the angle of the blade with respect to the cutting plane will be less than or equal to 45°, or even less than or equal to 25°, or even more less than or equal to 15°. By using lower blade angles it has been found that the thin, shaped particle it deformed less during the cutting step.

[0034] In a preferred embodiment of the present invention the one or more blades may be held by blade holders. Particularly preferred blade holders are tapered blade holders. A tapered blade holder is understood to mean any blade holder which is designed such that it will not deform the thin, shaped particle once the thin, shaped particle has been cut from the first article. Preferred tapered blade holders for use herein will cover a portion of the blade and will not form an abrupt edge with the uncovered portion of the blade. Particularly, preferred tapered blade holders will have an upper surface which intercepts the upper surface of the blade at an angle of less than 90°, preferably less than 45°, even more preferably less than 30° and most preferably less than 20°. The tapered blade holder may have a concave curved upper surface, such that the angle of the blade holder surface to the blade increases exponentially as the distance from the blade tip increases.

[0035] Typically, the thin, shaped particle and the first article will comprise substantially the same composition.

[0036] The bag may comprise from 0.01 % 10% of thin, shaped particles, for example from 0.01 % to 5%, or even from 0.1 to 2%, for example from 0.2 to 1%, by weight of thin, shaped particles.

The base granules

[0037] The base granules may be a detergent composition and may comprise a surfactant. The base granules may further comprise any adjunct ingredient as stated below.

[0038] The base granules may be made by any particulation or granulation process. An example of such a process is spray drying (in a co-current or counter current

spray drying tower) which typically gives low bulk densities of 600g/l or lower. Particulate materials of higher bulk density can be prepared by a continuous granulation and densification process (e.g. using LodigeÂ® CB and/or LodigeÂ® KM mixers). Other suitable processes include fluid bed processes, compaction processes (e.g. roll compaction), extrusion and spheronization, as well as any particulate material made by any chemical process like flocculation, crystallisation sentering. The base granules may be composed by from 20 to 100% for example from 50 to 90 %, or from 60 to 80% of spray-dryed powder and from 0 to 80%, for example from 10 to 50% or even from 20 to 40% of added powder.

[0039] Granulation processes are well known in the detergent art. Some non-limiting examples include the process as described in U.S Patent Nos. 5,489,392. 5,516,448 to Capeci et al.

[0040] The granules may be substantially convex. A substantially convex granule is a geometric solid in which at least 75%, in particular 85%, or even substantially all pairs of points lying on or within the surface of the solid can be connected by a straight line which is substantially contained within the solid or surface thereof. Familiar examples of convex granules are extruded cylinders, balls and tablets. Of course, it is intended for convex granules which contain minor irregularities to still be considered convex particles.

[0041] The base granules of the invention may have an average circularity of at most 50, for example at most 30, or at most 23, or at most 18. Also base granules may have an average aspect ratios of at most 2, or at most 1.5, or at most 1.3, or at most 1.2. Shape can be measured in a number of different ways known to those of ordinary skill in the art. One such method is using optical microscopy with Optimus (V5.0) image analysis software. Important calculated parameters are "Circularity" which is defined as (measured perimeter length of the particle image)^2/(measured area of the particle image). The circularity of a perfectly smooth sphere (minimum circularity) is 12.57; and "Aspect Ratio" which is defined as the length/width of the particle image.

[0042] The base granules may be processed or dry added. The base granules may have an average geometric mean diameter of at most 1000 micrometers. Preferably, the geometric mean particle diameter of the particles is from 400 microns to 900 microns, for example from 500 microns to 800 microns, and in particular from 600 microns to 800 microns.

[0043] The base granules may be a composition as exemplified in EP 1 776 442 which is incorporated by reference.

[0044] The bag may comprise from 50% to 99.9% of base granules, for example from 75% to 99.5%, or even from 90 to 99% by weight of base granules

[0045] The thin, shaped particles to base granules weight ratio may be less than 0.1, for example from 0.001 to 0.05, in particular from 0.002 to 0.02, or even less than 0.01.

Adjunct ingredients

[0046] While not essential for the purposes of the present invention, the non-limiting list of adjuncts illustrated hereinafter are suitable for use in the instant thin, shaped particles and/or the base granules. They may be desirably incorporated in certain embodiments of the invention, for example to assist or enhance cleaning performance, for treatment of the substrate to be cleaned, or to modify the aesthetics of the cleaning composition as is the case with perfumes, colorants, dyes or the like. The adjuncts may be incorporated either as part of the thin, shaped particles or as part of a detergent composition comprising the base granules. The precise nature of these additional adjunct components, and levels of incorporation thereof, will depend on the physical form of the particles or granules and the nature of the cleaning operation for which it is to be used. Suitable adjunct materials include, but are not limited to, surfactants, builders, chelating agents, dye transfer inhibiting agents, dispersants, additional enzymes, and enzyme stabilizers, catalytic materials, bleach activators, hydrogen peroxide, sources of hydrogen peroxide, preformed peracids, polymeric dispersing agents, clay soil removal/anti-redeposition agents, brighteners, suds suppressors, dyes, perfumes, structure elasticizing agents, fabric softeners, carriers, hydrotropes, processing aids, solvents and/or pigments. In addition to the disclosure below, suitable examples of such other adjuncts and levels of use are found in U.S. Patent Nos. 5,576,282, 6,306,812 B1 and 6,326,348 B1 that are incorporated by reference.

The bag

[0047] The bag comprising a material having a 2% secant tensile modulus of at least 100 MPa and a thickness of at least 30 microns.

[0048] The 2% secant tensile modulus is measured according to ASTM D882 at 22°C. The bag may comprise a material having a 2% secant tensile modulus of from 200 MPa to 2000 MPa, or even from 300 MPa to 1600 MPa, for example of at least 500 MPa.

[0049] The bags of the present invention may be formed from materials including but not limited to polymeric film, woven materials, non-woven materials, preferably polyethylene film, more preferably monolayers, coextrusions, two-layer laminations, three-layer laminations and metalized laminations, all materials with or without lacquer coatings.

[0050] Bags according to the present invention can be formed by any method known in the art. In particular, the bag may be provided via a process as disclosed in patent application EP1409366.

[0051] The bag may be formed from a continuous web of material. One method for forming flexible bags from a continuous web of material is well known in the art and described in U.S. Pat. No. 5,054,619, issued to Muckenfuhs.

[0052] The bag may have a thickness of from 30 microns to 200 microns, in particular of from 60 microns to 170 microns or even of at least 100 microns, or even 120 microns or 150 microns.

[0053] The bag may be such that from 0 to 10% of the inside space of the bag is distant from the panel(s) of the bag by a distance inferior to the average by number main length of the thin, shaped particles. In particular, the bag may be such that from 0.1 to 5%, or even less than 2%, for example less than 1 of the inside space of the bag is distant from the panel(s) of the bag by a distance inferior to the average by number main length of the thin, shaped particles.

[0054] The bag may have an opacity of more than 75%, for example of more than 80% or even from 90% to 100%. When the thin, shaped particles are coloured, an opaque bag may better prevent colour shift of the particles.

[0055] As used herein, the term "opacity" refers to the property of a substrate or printed substrate which measures the capacity of the substrate to hide or obscure from view an object placed behind the substrate relative to the point from which an observation is made. Opacity can be reported as the ratio, in percent, of the diffuse reflectance of a substrate backed by a black body having a reflectance of 0.5% to the diffuse reflectance of the same substrate backed with a white body having an absolute reflectance of 89%. Opacity can be measured as described in ASTM D 589-97, Standard Test Method for Opacity of Paper (15°/Diffuse Illuminant A, 89% Reflectance Backing and Paper Backing). A substrate high in opacity will not permit much, if any, light to pass through the substrate. A substrate having low opacity will permit much, if not nearly all, light to pass through the substrate. Opacity can range from 0 to 100%.

Claims

1. Bag comprising a material having a 2% secant tensile modulus of at least 100 MPa as measured according to ASTM D882 and a thickness of at least 30 microns and containing a composition comprising:

   - thin, shaped particles having a main length, a, of at least 1.5 mm,
   - base granules having an average geometric mean particle diameter, of at most 0.8*a mm, or even at most 0.6*a mm, or even 0.4*a mm.

2. Bag according to claim 1, wherein the base granules comprises spray-dryed or agglomerated granules.

3. Bag according to any one of the preceding claims wherein the base granules have an average geometric mean diameter of at most 800 micrometers.

4. Bag according to claim 1 or 2, wherein the thin, shaped particles are concave and in particular are discs or rings, preferably rings.

5. Bag according to any one of the preceding claims, wherein the thin, shaped particles comprise soap.

6. Bag according to any one of the preceding claims wherein the thin, shaped particles have a main length, a, of at least 2 mm or even at least 3 mm.

7. Bag according to any one of claims 2 to 7 wherein the thin, shaped particles to base granules weight ratio is less than 0.1 or even less than 0.01.

8. Bag according to any one of the preceding claims, wherein the bag is comprising a material has a 2% secant tensile modulus of at least 200 MPa, or even 300 MPa as measured according to ASTM D882.

9. Bag according to any one of the preceding claims, wherein the bag comprises a material having a thickness of at least 60 microns, in particular 100 microns.

10. Bag according to any one of the preceding claims wherein the shape of the bag is such that less than 10% of the inside space of the bag is distant from the panel(s) of the bag by a distance inferior to the average main length of the thin, shaped particles.

Patentansprüche

1. Beutel, umfassend ein Material, das einen 2%-Sekantenzugmodul von mindestens 100 MPa, wie gemäß ASTM D882 gemessen, und eine Dicke von mindestens 30 Mikrometern aufweist und eine Zusammensetzung enthält, die Folgendes umfasst:

   - dünne, geformte Teilchen mit einer Hauptlänge, a, von mindestens 1,5 mm,
   - Basisgranalien mit einem durchschnittlichen geometrischen mittleren Teilchendurchmesser von höchstens 0,8*a mm oder sogar höchstens 0,6*a mm oder sogar 0,4*a mm.

2. Beutel nach Anspruch 1, wobei die Basisgranalien sprühgetrocknete oder agglomerierte Granalien umfassen.

3. Beutel nach einem der vorstehenden Ansprüche, wobei die Basisgranalien einen durchschnittlichen geometrischen mittleren Durchmesser von höchstens 800 Mikrometern aufweisen.

4. Beutel nach Anspruch 1 oder 2, wobei die dünnen, geformten Teilchen konkav und insbesondere Scheiben oder Ringe, vorzugsweise Ringe sind.

5. Beutel nach einem der vorstehenden Ansprüche, wobei die dünnen, geformten Teilchen Seife umfassen.

6. Beutel nach einem der vorstehenden Ansprüche, wobei die dünnen, geformten Teilchen eine Hauptlänge, a, von mindestens 2 mm oder sogar mindestens 3 mm aufweisen.

7. Beutel nach einem der Ansprüche 2 bis 7, wobei das Gewichtsverhältnis der dünnen, geformten Teilchen zu den Basisgranalien weniger als 0,1 oder sogar weniger als 0,01 beträgt.

8. Beutel nach einem der vorstehenden Ansprüche, wobei der Beutel ein Material umfasst, das einen 2%-Sekantenzugmodul von mindestens 200 MPa, oder sogar 300 MPa, wie gemäß ASTM D882 gemessen, aufweist.

9. Beutel nach einem der vorstehenden Ansprüche, wobei der Beutel ein Material mit einer Dicke von mindestens 60 Mikrometern, insbesondere 100 Mikrometern umfasst.

10. Beutel nach einem der vorstehenden Ansprüche, wobei die Form des Beutels derart ist, dass weniger als 10 % des Innenraums des Beutels über eine Entfernung, die kleiner ist als die durchschnittliche Hauptlänge der dünnen, geformten Teilchen, von dem Feld bzw. den Feldern des Beutels entfernt sind.

Revendications

1. Sac comprenant un matériau ayant un module de traction sécant à 2 % d'au moins 100 MPa tel que mesuré selon ASTM D882 et une épaisseur d'au moins 30 microns et contenant une composition comprenant :

   - des particules profilées minces ayant une longueur principale, a, d'au moins 1,5 mm,
   - des granules de base ayant un diamètre moyen géométrique de particules, d'au plus 0,8*a mm, ou même au plus 0,6*a mm, ou même 0,4*a mm.

2. Sac selon la revendication 1, dans lequel les granules de base comprennent des granules séchés par atomisation ou agglomérés.

3. Sac selon l'une quelconque des revendications précédentes, dans lequel les granules de base ont un diamètre moyen géométrique d'au plus 800 micromètres.

4. Sac selon la revendication 1 ou 2, dans lequel les particules profilées minces sont concaves et, en particulier, sont des disques ou des anneaux, de préférence des anneaux.

5. Sac selon l'une quelconque des revendications précédentes, dans lequel les particules profilées minces comprennent du savon.

6. Sac selon l'une quelconque des revendications précédentes, dans lequel les particules profilées minces ont une longueur principale, a, d'au moins 2 mm ou même au moins 3 mm.

7. Sac selon l'une quelconque des revendications 2 à 7, dans lequel le rapport pondéral des particules profilées minces sur les granules de base est inférieur à 0,1 ou même inférieur à 0,01.

8. Sac selon l'une quelconque des revendications précédentes, où le sac est constitué d'un matériau qui a un module de traction sécant à 2 % d'au moins 200 MPa, ou même 300 MPa tel que mesuré selon ASTM D882.

9. Sac selon l'une quelconque des revendications précédentes, où le sac comprend un matériau ayant une épaisseur d'au moins 60 microns, en particulier 100 microns.

10. Sac selon l'une quelconque des revendications précédentes, dans lequel la forme du sac est telle que moins de 10 % de l'espace intérieur du sac est distant du ou des panneau(x) du sac d'une distance inférieure à la longueur principale moyenne des particules profilées minces.

REFERENCES CITED IN THE DESCRIPTION

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