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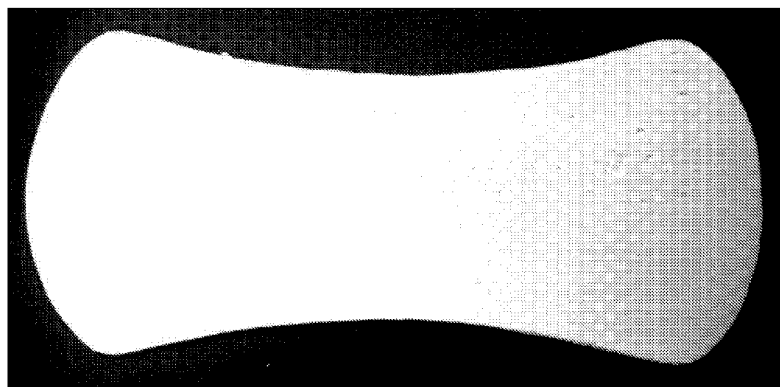


FIG. 1

(57) Abstract: Absorbent article comprising a hydrophilic polymer foam with a substantially open cell structure for absorbing liquids, characterized by comprising one or more inorganic substances belonging to the following group: silica, silicates, aluminosilicates. Adequately, the polymer foam may be associated with an absorbent core, preferably of the type comprising superabsorbent polymers.



"ABSORBENT ARTICLE COMPRISING ABSORBENT POLYMER FOAM"DESCRIPTIONTechnical Field

The present invention relates to the field of absorbent sanitary articles. An object of the invention is an absorbent article including hydrophilic absorbent, flexible polymer foams with a substantially open cell structure, characterized by the ability of absorbing bio-fluids, what makes these foams particularly suitable to be used like absorbent materials in products like diapers, tampons, sanitary napkins, panty liners, incontinence pads, mattress pads, plasters and bandages. A further object of the invention is an absorbent article such as an absorbent core with superabsorbent polymers, to which there are added elements with innovative features.

A further object of the invention is an absorbent polymer foam for these absorbent sanitary articles.

A further object of the invention is a method for producing this foam.

State of the Art

The industry is interested in the development of absorbent materials and structures suitable to be used in diapers, sanitary napkins, and incontinence pads.

Originally, these products had been produced using, as absorbent materials, cotton fiber-based materials. Later, more effective absorbent materials have been developed, such as air-laid cellulose structures. Recently, the so-called superabsorbent polymers, or SAPs, have been used, e.g. polyacrylate polymers that, combined with cellulose fibers, have increased the absorption capacity of the absorbent articles. Moreover, thanks to the superabsorbent polymers, it is possible to produce absorbent articles with relatively low thickness and, thus, reduced bulk.

The use of absorbent foams is also well known. The patent document US 5,260,345 discloses absorbent foams based upon hydrophilic polymer foams with open cell structure, characterized by high values of absorption and retention of body fluids, like urine and menses. In particular, these absorbent foams are prepared through a polymerization and foaming process, called

HIPE: High Internal Phase Emulsion. The document US 5,763,067 discloses absorbent foams that can incorporate layers of superabsorbent polymers so as further to increase their absorption capacity. The patent application WO 03/053298 A2 discloses absorbent polymer vulcanized foams, that are
5 comprised of styrene-butadiene polymers, and are produced by means of polymerization and subsequent foaming and vulcanization; in this way a hydrophobic foam material is produced, that is then make hydrophilic, i.e. suitable to absorb body fluids, by means of a substantially surfactant-based subsequent treatment. These foams are characterized by high imbibition
10 speeds and very good mechanical and elastic features. Unfortunately, the production process of these polymer foams is complex and includes several steps. In particular, after the foam has been prepared, a specific treatment is necessary to make it hydrophilic. Due to this further step, the industrial production of these foams is complex and expensive. Therefore, it would be
15 desirable to find a production method for these polymer foams that is more direct, has with less steps and is suitable to make the industrial production thereof more economical and simpler.

Though there are examples of absorbent foams featuring great absorption capability and examples of absorbent foams suitable to incorporate SAPs, there
20 is the need to produce absorbent foams using existing equipment, machines and processes, and assuring at the same time that these foams have good mechanical properties so that they can be assembled to produce absorbent articles. There is also the need to provide absorbent foams having such mechanical, elastic and visco-elastic properties to allow to produce absorbent
25 articles, like diapers and sanitary napkins, guaranteeing the users greater comfort, fit, and softness than the known absorbent articles. There is also the need to provide absorbent articles suitable to better fit the user's body than the known absorbent articles. Moreover, there is the need to provide production and synthesis processes of the polymer foams that are more economical, for
30 instance by finding simpler methods for preparing them.

Object and summary of the invention

An object of the invention is to provide an absorbent sanitary article with

great absorption capability.

A further important object of the invention is to provide an absorbent sanitary article capable to absorb liquids quickly.

5 A further important object of the invention is to provide an absorbent sanitary article that is resistant.

A further important object of the invention is to provide an absorbent sanitary article that is simple to be produced.

10 A further object of the invention is to provide a method for producing an absorbent sanitary article that has features connected to the objects mentioned above.

This and other objects, that will be more apparent below, are achieved by means of an absorbent hygienic article comprising a hydrophilic polymer foam with a substantially open cell structure, to absorb liquids; this foam comprising one or more inorganic substances belonging to the following group: silica,
15 silicates, aluminosilicates.

Preferably, the absorbent hygienic article has one first side, that shall be directed, in use, towards the user's body, and one second opposite side, said article including an absorbent mat (below, also referred to as "absorbent core") and at least one layer of said polymer foam, said absorbent mat being
20 associated with said foam layer so as to face said first side or said second side.

The absorbent mat, or absorbent core, comprises superabsorbent polymer; the absorbent mat or core comprises preferably from 5 to 100% of superabsorbent polymer with respect to the weight of the whole mat; the absorbent mat has preferably a grammage from 10 to 1500 gsm and more
25 preferably from 50 to 1000 gsm and more preferably from 100 to 800 gsm.

These inorganic substances preferably comprise feldspars and more preferably calcium feldspars.

According to preferred embodiments, these inorganic substances are zeolites and more preferably calcium zeolites.

30 These inorganic substances preferably comprise calcium silicate.

According to preferred embodiments, with reference only to the foam, the inorganic substances are used at weight concentrations from 2 to 50%,

preferably from 5 to 45% and more preferably from 10 to 35% in proportion to the foam polymer dry weight.

With reference only to the foam, it preferably has a density comprised between 70 and 500 g/L and more preferably between 80 and 200 g/L.

5 Adequately, with reference only to the foam, it has imbibition times lower than, or equal to, 20 seconds and more preferably lower than, or equal to, 5 seconds.

With reference only to the foam, it advantageously has a tensile strength equal to, or greater than, 4 Newton/50 mm.

10 Again with reference only to the foam, it has a percentage elongation greater than, or equal to, 100%.

According to preferred embodiments, the foam comprises one or more polymers from the following group: a) polybutadiene based polymers or styrene/butadiene copolymers and/or vulcanized derivatives, b) acrylic polymers or copolymers and/or cross-linked derivatives with polyfunctional comonomers, said cross-linking comonomers preferably including divinylbenzene, c) hydrophilic polyurethane polymers and/or cross-linked derivatives, d) polymers based on ethylene vinyl acetate (EVA) and/or derivatives thereof, e) polychlorovinyl polymers and/or derivatives thereof.

20 According to preferred embodiments, the foam features viscoelastic properties at nearly room temperature, i.e. it has the so-called "shape-memory effect" This effect is due to the molecular structure of the polymer chains, that are partially "frozen in" (i.e. they are in a low mobility status, due to the fact that the glass transition temperature of the material is similar to the room temperature), causing both impact resistance and long recovery times. The foam is preferably formed starting from polymer latexes or from monomer mixtures or from copolymers able to originate in the foam after cross-linking, with recovery times comprised between 0.5 and 50 seconds, and more precisely between 1 and 10 seconds.

30 According to some embodiments, the foam furthermore comprises one or more of the following substances: china clay, calcium carbonate; each of these substances is preferably used at weight concentrations from 1 to 40% and more

precisely from 2 to 20% in proportion to the polymer dry weight.

Preferably, the foam furthermore comprises titanium dioxide; titanium dioxide is preferably used at weight concentrations from 1 to 20 % and more precisely from 1 to 10 % in proportion to the polymer dry weight.

5 According to a further aspect, the invention relates to a method for producing a hydrophilic polymer foam according to one or more of the previous configurations; this method, according to the typical production process used for he polymer foams, comprises the steps of:

providing an emulsion of the polymer forming the foam,

10 acting on the emulsified polymer to form a non-solid foamed mixture,

and a subsequent step of solidifying the foam,

wherein, characteristically, an amount of one or more of said inorganic substances is added to said polymer before emulsifying it, or after having emulsified it, or during the step of forming the foam; wherein said amount of one
15 or more of said inorganic substances is preferably added to said polymer when it has been already emulsified and before the non-solid foam is produced.

Preferably, according to this method, the emulsified polymer is an emulsified polymer latex, and the processing of the emulsified polymer to produce a non-solid foamed mixture is a foaming by means of air, and the
20 solidification step provides a cross-linking or vulcanization step.

According to further embodiments, this emulsified polymer may be formed by a mixture of different polymers or copolymers that can be further polymerized during the foam forming step.

According to further embodiments, the method provides a HIPE (high
25 internal phase emulsion) process, wherein a mixture of monomers or comonomers, comprising cross-linking agents, is polymerized and cross-linked and take a substantially open cell structure during one single process.

Practically, the present invention discloses, in association with absorbent
30 articles, absorbent foams with a substantially open cell structure, provided with a good capability of absorbing bio-fluids, having in particular very fast imbibition times and superior mechanical properties, especially tensile strength and elongation.

In particular, the foams associated with the article of the invention has tensile strength equal to, or greater than, 4 Newton/50 mm and percentage elongation greater than, or equal to, 100%. Moreover, these foam materials can have indentation times lower than 20 seconds, and more preferably lower than 5 seconds. The density of these absorbent foams can vary from 70 to 500 g/L, and more preferably from 80 to 200 g/L.

Their thickness can vary from 0.3 mm to 5 mm, and more preferably from 1 mm to 3 mm.

Furthermore, these polymer foams are prepared by means of simple processes that do not require further treatments to make them hydrophilic. The foams of the present invention are characterized by being hydrophilic and by having indentation times preferably lower than 20 seconds, and more preferably lower than 5 seconds.

As regards the foams associated with these absorbent articles, in the present invention particularly useful are butadiene based polymers and styrene/butadiene copolymers and styrene copolymerized with acrylic comonomers and/or derivatives thereof. Also useful in the present invention are polymers formed by acrylic monomers or comonomers (acrylates), cross-linked with comonomers like divinyl benzene. A further class of polymers particularly useful in this invention is the class of polyurethanes, especially hydrophilic polyurethanes, and more especially polyurethanes having a particular visco-elastic behavior at nearly human body temperature (37°C), usually called shape-memory polymers. A method for producing polyurethane-based hydrophilic foams according to the invention is that of mixing a polyether, containing isocyanate end-groups, with more than two functionalities, with surfactant and water, then this mixture is poured in a surface. More in particular, the synthesis of these polyurethane foams is described in the patent documents GB1429711 and GB1507232. Other polymers useful for the present invention are ethylene-vinyl-acetate (EVA) based polymers and/ or derivatives thereof, and polychlorovinyl polymers and/or derivatives thereof.

The specific morphology of the foams with open cell structure can be achieved in several ways. For instance, it is possible to emulsified with air a

polymer latex in water, using specific equipment, called foaming units, known to those skilled in the art. Then, the foam shall be solidified and can be cross-linked so as to make it stable and to improve its chemical and physical properties. If styrene/butadiene copolymers or polybutadiene are used, the most
5 common cross-linking process is the so-called vulcanization, well known in the prior art. In general, processes to prepare polymer foams based upon vulcanized rubbers are described in "Latex Foam Rubber" by E. W. Madge, McLaren & Sons Ltd, 1962.

A further way to produce foams according to the invention is a particular
10 polymerization called HIPE (High Internal Phase Emulsion). This process consists of the preparation of a special type of emulsion of water in oil, characterized by a relatively reduced oil phase and a relatively great water phase. The preparation of absorbent foams by means of this type of polymerization is described in the patent document US 5,260,345.

15 The absorbent foams associated with the articles of the invention are prepared after the foaming process; in this way, they are hydrophilic and, thus, ready to be used in hygienic products without the need for subsequent treatments.

As shown in the examples, if particular inorganic substances are
20 incorporated in the foam formulation, hydrophilic absorbent foams are produced, characterized by very low imbibition times, lower than 20 seconds and preferably lower than 5 seconds. These inorganic substances may be feldspars, in particular calcium feldspars, in a quantity comprised between 2 and 50%, more preferably between 5 and 45 %, and more preferably between
25 10 and 35%, in proportion to the polymer dry weight. Other inorganic compounds can be used instead of feldspars, e.g. natural and synthetic zeolites, in particular calcium-based zeolites. Other inorganic compounds that can be used in the invention are silicates, calcium silicate, and silica. This allows to produce high-performance hygienic products, such as diapers,
30 tampons, sanitary napkins, panty liners, incontinence pads, mattress pads, plasters and bandages, to absorb and retain body-fluids like urine, menses, blood and the like.

The foams described above are preferably incorporated in the above mentioned hygienic articles according to the invention in laminar structures with thickness comprised between 0.3 and 5 mm. Usually, a hygienic article is comprised of a liquid-permeable upper layer (top sheet), a liquid impermeable lower layer (back sheet) and one or more absorbent intermediate layers. These absorbent layers are fastened between the top sheet and the back sheet. The hygienic article may also feature other elements, such as elastic band or adhesive labels. A hygienic article of this type is described, for instance, in the patent application US-A-3,860,003. The absorbent foams of the invention can be used alone, or they can be the main absorbent material. In this case, the foams are useful both to absorb and to retain fluids.

As mentioned above, the foams of the present invention can be used for fluid absorption in combination with an absorbent material containing superabsorbent polymers in a quantity comprised between 5 to 100% by weight.

The absorbent material (absorbent core or absorbent mat) may be wholly composed of SAPs or of a structure suitable to incorporate them. This absorbent core or mat is well known in the state of the art. Examples of absorbent core are: a cellulose fiber matrix (air-laid web, spun bonded web), a mixture of synthetic fibers (melt-blown web, spun bonded web), a mixture of cellulose fibers and synthetic fibers. Alternatively, the absorbent core may be formed by melting or coupling fiber layers containing, in the middle thereof, SAP powder. The fiber layers may be based on cellulose or synthetic fibers. The absorbent core can contain a weight percentage of SAPs comprised between 5 and 100%, and more preferably between 20 and 100%. The grammage of the absorbent core may vary between 50 gsm and 1,500 gsm, and more preferably between 100 and 1,000 gsm.

The absorbent core may comprise both natural and synthetic fibers. Examples of natural fibers are cellulose fibers widely used for hygienic products, e.g. the so-called fluff or cotton. Examples of synthetic fibers are; polyvinyl acetate fibers, polyvinyl alcohol, polyolefin fibers such as polyethylene-, polypropylene-, polyethylenterephthalat- based fibers and the so-called

bicomponent fibers.

According to the present invention, the absorbent article can be an absorbent medical-sanitary finished product containing the foam, or an intermediate product to be associated with further functional layers. For example, a combination of absorbent core, as described above, and foam, as described above, represent an article according to the invention, though it does not constitute a finished product that a user can directly uses; in the same way, also a finished product comprising an absorbent core and the foam as described above can be an object of the invention.

Therefore, a medical-sanitary article may be provided, substantially flat and formed by one layer (or more layers) of absorbent foam as described above.

Moreover, an absorbent medical-sanitary article (such as a finished or intermediate product) may be provided, substantially flat and formed by one layer (or more layers) of absorbent core or mat, as described above, and by one layer (or more layer) of absorbent foam, as described above, fastened, in a known manner, to a face thereof.

The individual layers forming the hygienic article can be coupled together by means of known methods, for instance by melting the layers together by means of heat treatments, using hot melt adhesive, latexes, ultrasounds, etcetera. In the joined material, the foam may face the user's body and the absorbent core may face the opposite side. In this way, it is possible effectively to use the foam capability to quickly absorb bio-fluids and quickly transfer them to the absorbent core below. In particular, on the foam upper surface only a very reduced spot is visible, and the most part of the fluid is transferred to the absorbent core, where it is effectively retained. As a further advantage, the reduced size of the spot on the foam surface has an effective masking effect. In other cases, it would be advantageous to arrange the absorbent core facing the user's body and the absorbent core facing the opposite side.

According to a further aspect, the invention also relates to a hydrophilic polymer foam for absorbing liquids, to be used in medical-sanitary articles as mentioned above, as well as a layer or mat of said foam.

Description of the figure

Figure 1 shows pictures of an absorbent article to be used in hygienic products like diapers, sanitary napkins and incontinence pads, produced by coupling a polymer foam according to the invention (sample S2) and an absorbent core containing superabsorbent polymers or SAPs. In the hygienic products, this coupled product can be arranged so that the polymer foam faces the user's body and the absorbent core faces the lower side. The absorbent core has been prepared according to what described in the patent application US 2001/0044378 A1; the overall grammage thereof is 130 gsm, with a SAP content of 27 gsm.

In particular, figure 1 shows an hygienic article (for instance a sanitary napkin) formed by foam-core coupled together: the upper side (facing the user's body) is constituted by an absorbent polymer foam.

Figure 2 shows the article of figure 1 from the opposite side.

15 Test method

Test method 1 - Measurement of the tensile strength of the absorbent foams

The test is carried out according to the test method EDANA 20.2-89 "Tensile strength". In particular, both the tensile strength at peak (Newton/50 mm), and the elongation at peak (%) are measured. The specimens have a size of 2.5 x 7.0 cm and a thickness comprised between less than 1 mm and 5 mm. The measurement is carried out at 22 +/-2 °C.

Test method 2 – Measurement of the foam imbibition times

Specimens constituted by foam sheets having a size of 5 x 5 cm and variable (but measured and recorded) thickness are arranged on the surface of a 1 l cylindrical container, containing about 500 ml of sodium chloride 0.9% w solution, so that the part of the foam specimen having larger surface touches the fluid. By means of a stopwatch the time has been measured necessary for the specimen to be completely covered by the fluid.

Test method 3 - Measurement of the foam density

A useful method for this test is that described in ASTM D3574-86, Test A. According to this method, the foam samples are pre-conditioned according to the test. The foam density is determined by measuring the dry mass and the

volume of the foam sample at 22 +/-2°C. The foam density may be expressed as mass per unit volume, for instance g/l (gram per liter).

Test method 4 - Measurement of the absorbent foam thickness

5 The thickness of the foam according to the invention has been measured according to the method EDANA ERT 30.5-99. In particular, the thickness gauge has a sensitivity of 0.01 mm, and the pressure exerted on the sample is 0.1 KPa.

Test method 5 – Measurement of the foam imbibition times

10 The recovery values have been measured by means of a device specifically produced. Two wood plates have been fastened above each other at a distance of 4.5. cm. A third plate moves vertically, up and down, between the first two plates, moving from a minimal position corresponding to a distance of 1.5 cm from the lower plate, up to a maximum position, where it touches the upper plate.

15 A foam sample of cubic shape, 5 cm side, is inserted below the central plate and is compressed up to achieve a thickness of 1.5 cm (70% compression). The central plate is fastened in the lower position by winding a thread around the central and the lower plate. The thread is then cut and the foam sample expands again, lifting the central plate up to the upper plate. The
20 recovery time is measured by means of a digital stopwatch, starting from the instant when the thread is cut until the instant when the central plate touches the upper plate (10% compression). The test is performed at 22 +/- 2°C.

The recovery time in the usual foams (without visco-elastic characteristics) is ≤ 0.1 s.

25 Foam integrity and softness

Even if it is not necessary for the production of absorbent structures, the foams of this invention are preferably able to remain integer during use, once they have been incorporated in this absorbent products; they remain soft and do not irritate the skin both when dry and when wet, after having imbibing bio
30 fluids. For instance, the foams of the invention, if used to produce a napkin, are subjected to both dynamic and static forces, due to the fact that the child using the napkin walks, jumps and, in general, moves, with the body weight stressing

parts of the napkin. These forces tend not only to compress the absorbent foams, but also to draw or tear them. It is obvious that mechanical strength and elasticity of the foams are a great advantage for the production of absorbent articles. The absorbent foams of this invention may be also used for absorbent articles where the foams touch or are near the skin. In this case it is particularly advantageous that the foam of the invention do not irritate the skin and are soft.

Examples of the present invention

Example 1

Below there is illustrated a formulation according to the present invention:

	Concentrations /dispersion in water	Parts by weight	
10	Lipolan F 2530F	66 %	100.0
	Potassium oleate	10 %	1.0
	Sulphur	50 %	2.0
15	ZDC (zinc diethyl dithiocarbamate)	50 %	1.0
	ZMBT (zinc mercaptobenzo thiazole)	50 %	1.0
	Phenolic antioxidant	33 %	1.0
20	Sodium pyrophosphate	10 %	0.05
	Zinc oxide	50 %	5.0
	Carboxymethyl cellulose	2 %	0.2
	Diphenyl guanidine	25%	0.5

25 The components of the formulation are added while stirring, starting from Lipolan F 2530F. This resin, produced by Synthomer, is particularly useful for the invention as the manufacturer states that with this resin, after vulcanization, the so-called "visco-elastic effect" is achieved, typical of the sop-called "memory foams".

30 Continuing stirring, 30 pbw (with respect to Lipolan F 2530F, taken as 100) of calcium feldspar in 50% aqueous dispersion is added to the described formulation.

The mixture is foamed for 5 minutes in a mechanical foaming unit, until to achieve the desired density, i.e. 250 g/l. At this point, the foaming process is stopped and a 20% sodium fluorosilicate solution is inserted. This compound is used as gelling agent for producing latex foams. It is generally used in a percentage of 10-20 parts with respect to latex (in this case Lipolan F 2530F).
5 The mixture is then homogenized for 1 minute, and then transferred in a Teflon container, where it solidifies in 10 minutes. After gelling, the foam is vulcanized by heating it at 135°C for 40 minutes.

Foams poured in the Teflon container from different heights generate foam samples of different thickness. In particular, two foam sample are produced,
10 called S1 and S2, with thickness of 0.96 and 1.98 mm respectively.

Moreover, the density of these samples S1 and S2 has been measured according to the test method 3 "Measurement of the foam density"; it is 145.7 g/l and 155.9 g/l respectively.

15 It should be noted that the foams of the present invention can be produced also by means of different methods, for instance by heating them by means of electromagnetic waves, as described in the patent document US 3,737,488.

It should be noted that the formulation of this example allows to prepare a hydrophilic polymer foam in only one passage, thus significantly simplifying the
20 preparation of these foams with respect to the prior art.

Example 2

In this example, a foam of the invention is prepared according to the same process of example 1; the difference is that here the formulation is foamed at a
25 density of 200 g/l. This sample is called S3; after drying, its thickness was 2.55 mm. The density, measured according to the test method 3 "Measurement of the foam density" of the sample 3 is 129 g/l.

Comparative example 3

A foam usually used in commercial hygienic products has been extracted
30 from the sanitary napkins "Lines è". In particular, specimens have been provided, 2.5 x 7.0 cm, for physical evaluations. The visual and microscopic examinations showed that this foam is formed by coupling two different layers of

foam having different density. This foam is called R1; it has a thickness of 2.15 mm.

Table 1 – Comparison of the foams of the invention and the commercial foams – Measurement of the tensile strength and elongation at peak.

5 Table 1 shows the comparison of the results of the test method 1 - Tensile strength of the absorbent foams. The average values are shown, and the standard deviation, after the symbol +/- . It should be noted, in particular, that the values of tensile strength are very sensitive to the thickness value of the foam specimens.

10

Table 1

Sample	Thickness, mm	Strength at peak, Newton/50 mm	Elongation at peak %
S1	0.96	5.60 +/- 0.64	227.6 +/-49.8
S2	1.98	7.64 +/- 0.21	228.2 +/-21.2
S3	2.44	9.50 +/- 0.81	258.5 +/-18.3
R1	2.15	5.45 +/- 0.83	16.9 +/-2.6

It is clearly apparent that, given the same thickness, the foams of the present invention have a significantly greater tensile strength than the commercial foam, namely the foam S1 of the invention has the same tensile strength as the commercial foam R1 having a more than double thickness. Moreover, the elongation capability, without damage or tear, of the foams of the invention make them suitable to be incorporated in hygienic products like elastic diapers and sanitary napkins, suitable to adapt themselves to the body shape and to the position taken by the user. Moreover, the combination of higher cohesion and elasticity make the foams of the invention suitable to produce the above mentioned hygienic products by means of the common process and using the common machines known in the prior art, without the need for specific processes and machines suitable to process fragile and less resistant products such as the foam R1, that would necessarily lead to an increase in production

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costs and limit the commercial development of the foams of the invention.

Table 2 – Comparison of the foams of the invention and the commercial foams – Measurement of the foam imbibition time

Table 2 shows the result of the imbibition times measured according to the test method 2. The average values are shown, and the standard deviation, after the symbol +/- . The foams of the invention have a higher fluid imbibition speed than the known commercial foams.

Table 2

Sample	Imbibition time, sec.
S1	1.7 +/- 0.6
S2	2.0 +/- 0.5
S3	2.0 +/- 0.5
R1	22.3 +/- 2.5

Table 3 - Comparison of the foams of the invention - Measurement of the foam recovery time

Table 3 shows the results of the recovery times (in seconds) measured according to the test method 5 on cubical samples of the foams of the examples 1 and 2. The average values are shown, and the standard deviation, after the symbol +/- . The foams of the present invention have recovery times that are typical of the visco-elastic foams (so called "shape-memory effect" foams).

Table 3

Sample	Recovery time, sec.
Foam cubical sample (side 5 cm) of example 1	2.1 +/- 0.3
Foam cubical sample (side 5 cm) of example 2	2.7 +/- 0.2

It is understood that what illustrated above purely represents possible non-limiting embodiments of the invention, which may vary in forms and arrangements without departing from the scope of the concept on which the invention is based. Any reference numbers in the appended claims are provided
5 for the sole purpose of facilitating the reading thereof in the light of the description before and the accompanying drawings and do not in any way limit the scope of protection of the present invention.

CLAIMS

- 1) Absorbent hygienic article comprising a hydrophilic polymer foam for absorbing liquids, characterized in that said foam comprises one or more inorganic substances belonging to the following group: silica, silicates,
5 aluminosilicates.
- 2) Absorbent hygienic article according to claim 1, having one first side that shall be directed, in use, towards the user's body and one second opposite side, said article including an absorbent mat and at least one layer of said polymer foam, said absorbent mat being associated with said foam layer
10 so as to face said first side or said second side.
- 3) Absorbent hygienic article according to claim 2, wherein said absorbent mat comprises superabsorbent polymer; said absorbent mat comprising preferably from 5 to 100% of superabsorbent polymer with respect to the weight of the whole mat; said absorbent mat having preferably a
15 grammage from 10 to 1500 gsm and more preferably from 50 to 1000 gsm and more preferably from 100 to 800 gsm.
- 4) Absorbent hygienic article according to any one of the previous claims, wherein said inorganic substances are feldspars.
- 5) Absorbent hygienic article according to claim 4, wherein said
20 inorganic substances are calcium feldspars.
- 6) Absorbent hygienic article according to any one of claims 1 to 3, wherein said inorganic substances are zeolites.
- 7) Absorbent hygienic article according to claim 6, wherein said inorganic substances are calcium zeolites.
- 25 8) Absorbent hygienic article according to any one of claims 1 to 3, wherein said inorganic substances include calcium silicate.
- 9) Absorbent hygienic article according to any one of claims 4 to 7, wherein **said foam** said inorganic substances are used at weight concentrations from 2 to 50%, preferably from 5 to 45% and more preferably
30 from 10 to 35% in proportion to the foam polymer dry weight.
- 10) Absorbent hygienic article according to one or more of the previous claims, wherein said foam has a density comprised between 70 and

500 g/L and more preferably between 80 and 200 g/L.

11) Absorbent hygienic article according to one or more of the previous claims, wherein said foam has imbibition times lower than or equal to 20 seconds and more preferably lower than or equal to 5 seconds.

5 12) Absorbent hygienic article according to one or more of the previous claims, wherein said foam has a tensile strength equal to, or greater than, 4 Newton/50 mm.

13) Absorbent hygienic article according to one or more of the previous claims, wherein said foam has a percentage elongation greater than or
10 equal to 100%.

14) Absorbent hygienic article according to one or more of the previous claims, wherein said foam comprises one or more polymers from the following group: a) polybutadiene based polymers or styrene/butadiene copolymers and/or vulcanized derivatives, b) acrylic polymers or copolymers
15 and/or cross-linked derivatives with polyfunctional comonomers, said cross-linking comonomers preferably including divinylbenzene, c) hydrophilic polyurethane polymers and/or cross-linked derivatives, d) polymers based on ethylene vinyl acetate (EVA) and/or derivatives thereof, e) polychlorovinyl polymers and/or derivatives thereof.

20 15) Absorbent hygienic article according to one or more of the previous claims, wherein said foam furthermore comprises one or more of the following substances: china clay, calcium carbonate; each of said substances being preferably used at weight concentrations from 1 to 40% and more precisely from 2 to 20% in proportion to the polymer dry weight.

25 16) Absorbent hygienic article according to one or more of the previous claims, wherein said foam further comprises titanium dioxide; said titanium dioxide being preferably used at weight concentrations from 1 to 20 % and more precisely from 1 to 10 % in proportion to the polymer dry weight.

30 17) Absorbent hygienic article according to one or more of the previous claims, wherein said foam is characterized by the so-called "shape-memory effect", preferably with recovery times comprised between 0.5 and 50 seconds, and more precisely between 1 and 10 seconds; said foam being

preferably formed starting from polymer latexes or from monomer mixtures or from copolymers capable to generate foam after cross-linking.

5 18) Hydrophilic polymer foam for absorbing liquids, to be used in absorbent hygienic articles, having the features of the foam according to one or more of the previous claims.

19) A method for producing a hydrophilic polymer foam for an article according to one or more of claims 1 to 17, comprising the steps of

- providing an emulsion of the polymer forming the foam,
- acting on the emulsified polymer to form a non-solid foamed mixture,
- 10 - and a subsequent step of solidifying the foam,

wherein an amount of one or more of said inorganic substances is added to said polymer before emulsifying it, or after having emulsified it, or during the step of forming the foam; wherein said amount of one or more of said inorganic substances is preferably added to said polymer when it has been already emulsified and before the non-solid foam is produced.

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20) Method according to claim 19, wherein said emulsified polymer is an emulsified polymer latex, said processing of the emulsified polymer to produce a non-solid foamed mixture is a foaming by means of air, and said solidification step provides a cross-linking or vulcanizing step.

20 21) Method according to claim 19, wherein said emulsified polymer may be formed by a mixture of different polymers or copolymers that can be further polymerized during the foam forming step.

22) Method for producing a hydrophilic polymer foam according to one or more of claims 1 to 17, characterized by being a high internal phase emulsion (HIPE) process, wherein a mixture of monomers or comonomers comprising cross-linking agents are polymerized and cross-linked and take a substantially open cell structure during one single process.

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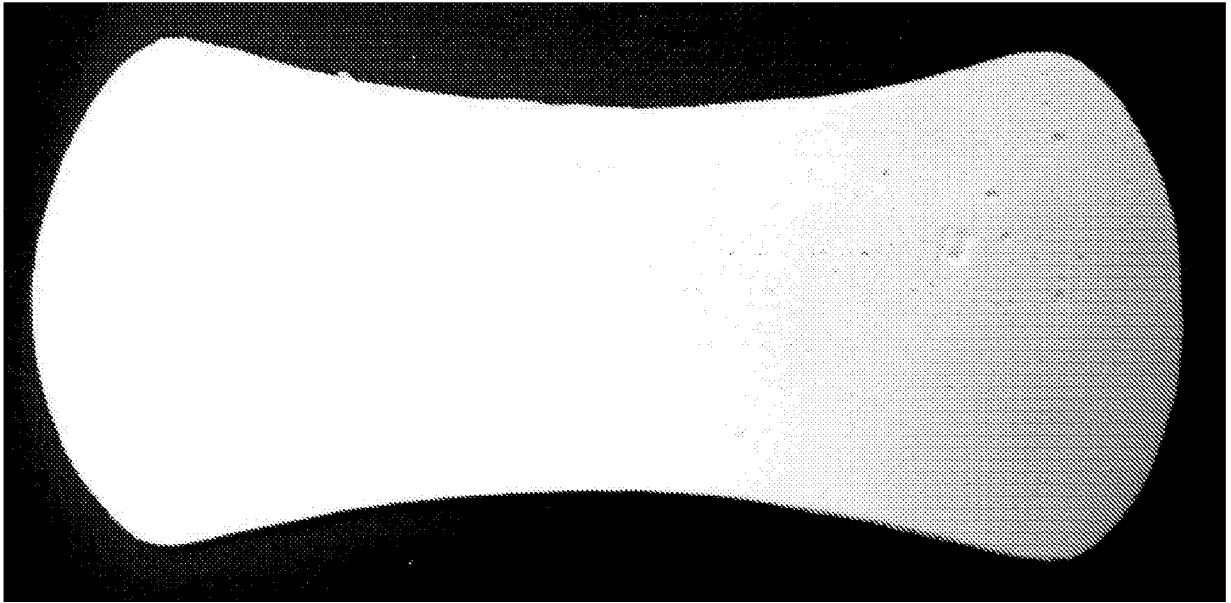


FIG. 1



FIG. 2

INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2015/052280

A. CLASSIFICATION OF SUBJECT MATTER
INV. A61F13/53 A61L15/42 A61L15/60
ADD.
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED
Minimum documentation searched (classification system followed by classification symbols)
A61F A61L

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
EPO-Internal, WPI Data

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 1 358 894 A1 (SCA HYGIENE PROD AB [SE]) 5 November 2003 (2003-11-05) paragraph [0062] - paragraph [0067]; examples 7, 8 paragraph [0037]	1-8, 10-19,21
X	US 2012/089068 A1 (MCCLURE JR ROBERT L [US]) 12 April 2012 (2012-04-12) figures 2, 4 paragraphs [0022], [0025], [0027]	1,2,4-8, 10-21
X	US 2004/087926 A1 (KO YOUNG C [US] ET AL) 6 May 2004 (2004-05-06) paragraphs [0001], [0006], [0007], [0013], [0019], [0025], [0036], [0038], [0039], [0041]	1-22
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Further documents are listed in the continuation of Box C.

See patent family annex.

* Special categories of cited documents :

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Date of the actual completion of the international search 1 June 2015	Date of mailing of the international search report 17/06/2015
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Name and mailing address of the ISA/ European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Fax: (+31-70) 340-3016	Authorized officer Beckert, Audrey
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INTERNATIONAL SEARCH REPORT

International application No
PCT/IB2015/052280

C(Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	FR 2 187 836 A1 (GRACE W R & CO [US]) 18 January 1974 (1974-01-18) page 26 - page 27; example 17 -----	18-21

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No

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