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GYBSUM PLASTER BASE BOARD AND PREPARATION THEREOF

The present invention relates to a plasterboard, notably having greatly improved fire resistance and to a process
5 for manufacturing this plasterboard.

It is well known to use plasterboards for producing partitions, coverings for vertical or inclined elements or for producing ceilings, whether suspended or not.

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These boards generally consist of an essentially plaster core covered on each of its sides with a sheet which serves both as reinforcement and as facing and which may be made of paperboard or a mat of mineral fibres.

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European Patent Application No. 0 470 914 of the Applicant disclosed in 1992 a plasterboard intended for fire protection, the faces of which are covered with a reinforcing material based on mineral and/or refractory
20 yarns and/or fibres.

The subject-matter of United States Patent No. 4 647 496 is an exterior insulation system for a building, comprising a plaster support surface provided with a
25 glass mat and an adhesive having an internal surface which adheres to an insulating material essentially devoid of channels passing through it, and an external surface on which an exterior finishing material is placed. The plaster support surface may be a plasterboard
30 having a plaster core coated on both its sides with a porous glass mat.

European Patent Application No. EP-A-755 903 relates to a construction board having a high fire resistance, both
35 sides of which are covered with a glass-fibre web, which board consists of a hydraulic setting mix of an α -semihydrate containing from 0.2 to 0.5% by weight of a retarder and an alum, in a weight ratio of from 75/25 to



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40/60. The glass-fibre webs may be coated on their external faces with a thin precoating consisting of a mix essentially composed of β -calcium sulphate semihydrate or anhydrite and small amounts of an organic binder. This
5 precoating allows the process to be carried out easily and satisfactorily in the usual plants for producing paperboard-faced plasterboards. Furthermore, it seals off the glass-fibre webs so that no material containing alum can go from the core of the board to the external face of
10 the glass-fibre web.

The Applicant has continued its research in the field of plasterboards for the purpose, in particular, of reducing the liberation of glass fibres during the use of boards
15 with a glass-fibre mat facing and to improve the appearance of the surface of the boards, their paintability, their fire reaction performance and their fire resistance performance.

20 It has now achieved its objectives by developing a plasterboard with improved fire resistance, having a plaster-based core and being characterized in that the said board is provided on at least one of its sides with a facing consisting of a glass-fibre mat, this mat being
25 coated on its external face with a coating composition comprising:

- a mineral filler, with the exception of hydratable calcium sulphates; and
- an organic or mineral binder.

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The second subject of the invention is a glass-fibre mat coated with a coating composition comprising:

- a mineral filler, with the exception of hydratable calcium sulphates;
- 35 - an organic or mineral binder; and
- a water-repellent agent.

Finally, the third subject of the invention is a process for manufacturing a plasterboard comprising at least one coated glass-fibre mat as just described.

- 5 The plasterboards according to the invention thus have a better surface finish than that of the plasterboards of the prior art.

Thus, the colouring uniformity of the facing of the board
10 and the absence of veining on the visible side of the board may be immediately noted.

In addition, the gross calorific value of the boards according to the invention is generally markedly less
15 than that of the boards of the prior art.

Furthermore, the temperature at which the board's facing melts or is destroyed is pushed up from 700°C (according to the prior art) to 1 000°C (according to the
20 invention).

Moreover, the glass fibres of the mats do not become detached as they are well bonded.

- 25 Finally, the painting behaviour is satisfactory; practically no change in colour between the board and the joint is detectable and painting requires no special preparation of the support.

- 30 Further characteristics and advantages of the invention will now be described in detail in the description which follows.

Plasterboard

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The term "plaster" should be understood to mean, in the present description, the product resulting from the hydraulic setting and the hardening of a hydratable

calcium sulphate, that is to say an anhydrous calcium sulphate (anhydrite II or III) or a semihydrated calcium sulphate ($\text{CaSO}_4 \cdot \frac{1}{2}\text{H}_2\text{O}$) in its α or β crystalline form. These compounds are well known to those skilled in the art and are generally obtained by baking a gypsum.

The plaster core generally comprises mineral and/or refractory fibres which are preferably glass fibres. They may be short (3 to 6 mm on average) or quite long (10 to 24 mm on average) or of intermediate lengths.

In particular, fibres made from an E-type glass are used, these possibly being in two forms, one form being called a "roving" and comprising glass strands supplied on reels and cut before they are introduced into the usual circuit for mixing the hydratable calcium sulphate with water, or else in the form of precut strands which are metered before mixing the hydratable calcium sulphate with water.

Fibres having a length of 13 mm and a diameter of 13 microns are preferably used.

The essential function of the glass fibres is to impart high-temperature mechanical strength, thereby allowing the calcined plaster to maintain its cohesion.

The core of the plasterboard may also include a mix of mineral additives for the purpose of improving the dimensional stability and the thermal performance of the plasterboard.

The core of the plasterboard may also include a mix of additives aimed at improving the water resistance; hydrophobic and/or water-repellent additives are appropriate. Mention may be made of those indicated in Patent US-P-5 220 762, namely organohydrogenopolysiloxanes.

Glass-fibre mats

These are generally manufactured by firing a mixture of amorphous silica, lime, feldspar, sodium silicate, boron silicate and/or other ingredients. This makes it possible to obtain wafers which are then re-melted and drawn by a winder system until yarns are obtained having a diameter of 10 μm which are chopped so as to have a length of 12 mm.

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The continuous manufacture of the glass-fibre mat relies on a so-called "wet" process, quite similar to the papermaking techniques well known to those skilled in the art. A mix comprising about 5% glass fibres, water and various additives is deposited on a filtering forming table by means of a "water box". After this preforming, the binder (a vinyl or acrylic resin or melamine) is deposited on the glass nonwoven. The web is then dried at about 140°C in order to remove the residual water and to crosslink the binder. The manufacturing line terminates in devices for winding and cutting to various widths.

Various publications, especially patent applications in the name of Schuller, teach this technique.

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The function of this mat is *inter alia* to limit the penetration of the plasterboard composition during manufacture of the boards. It is generally made hydrophobic and therefore fulfils a role similar to the peelable silicone sheet according to document DE-A-2 008 714.

This mat may furthermore receive an additional hydrophobic and/or water-repellent coating, using a technique described for example in US-P-5 397 631 and US-P-5 552 187. Thus, the mat according to the invention may receive a coating of the following types: (i) wax/asphalt emulsion; (ii) polysiloxane; (iii) dried

latex containing a resin, especially poly(vinylidene-co-polymer); (iv) 15-35 wt% of solid resin, 20-65 wt% of a filler and up to 5 wt% of an additive chosen from pigments, thickeners, defoaming agents, dispersants, preservatives or a mixture thereof. The resulting coating may be such that no fibre of the mat projects therefrom (the surface of the coating being smooth) and/or such that the surface absorption measured using the modified Cobb test (described in Patent US-P-5 397 631 in column 9, lines 15 to 48) is less than 2.4 g and preferably less than 0.5 g and/or is capable of forming a bond with Portland-based cement. This coating can be obtained in particular by the application of a latex and by drying.

15 Coating composition
Mineral filler

This may be chosen from the group consisting of mineral fillers which release water (structural water or water of crystallization), such as hydrated alumina, calcium carbonate, white kaolin, clays and mixtures thereof.

Advantageously, clays are used whose surface finish has been modified by waterproofing, for example by means of stearates or titanates.

It is preferred to use fine white fillers, that is to say those having a particle size of less than 40 μm , particularly less than 20 μm .

30 The preferred filler used is either a mixture of hydrated alumina and clay having a hydrated alumina/clay mass ratio of between 30/70 and 70/30, or a mixture of hydrated alumina and kaolin having a hydrated alumina/kaolin mass ratio of between 30/70 and 70/30 or pure alumina.

Binder

The binder may be organic or mineral.

- 5 As organic binder, it is possible to use a binder of the vinyl type such as an ethylene/vinyl acetate resin.

As binder, mention may also be made in general of ethylene/vinyl acetate copolymers (plasticized or
10 unplasticized EVAs), ethylene/vinyl versatate and vinyl acetate/vinyl versatate copolymers, polyacrylics, vinyl acetate/acrylic copolymers, styrene/acrylic copolymers, vinyl acetate/vinyl versatate/acrylic terpolymers and blends thereof.

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As mineral binder, it is possible to use a binder of the alkali metal silicate type, such as a sodium silicate or a potassium silicate.

- 20 It is preferred to use a vinyl-type binder insensitive to re-wetting (which would in general result in wrinkles in the glass mat).

Water-repellent agent

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The water-repellent agent may be chosen from the group consisting of fluorocarbons and silicone oils.

According to a preferred embodiment of the invention, the
30 coating composition comprises:

- from 85 to 95% of a mineral filler which is either a mixture of hydrated alumina and clay having a hydrated alumina/clay mass ratio of between 30/70 and 70/30, or a mixture of hydrated alumina and kaolin having a
35 hydrated alumina/kaolin mass ratio of between 30/70 and 70/30 or pure hydrated alumina;
- from 1 to 10% of a vinyl binder, for example an ethylene/vinyl acetate copolymer (EVA);

- from 0.1 to 1% of a fluorocarbon or a silicone oil; and
- water or another solvent.

- 5 Particularly preferred are coating compositions prepared by diluting a mixture composed of:
- 90 to 98% of aluminium hydroxide;
 - 1 to 9% of a vinyl resin, for example EVA; and
 - 0.1 to 1% of a fluorocarbon or a silicone oil.

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Coating method according to the invention

According to the invention, a coating composition as defined above is applied to the glass-fibre mat.

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The glass-fibre mat is coated on a suitable line by carrying out the operations of mixing a liquid slurry, depositing this slurry on the mat by a conventional coating method and drying at various temperatures according to the type of coating. This coating generally creates a dissymmetry in the mat, the treatment being carried out on part of the thickness, generally up to 30 to 70%, and in general about 50%, of the thickness of the mat.

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The coating grammage is preferably between 200 and 300 g/m².

Again, various publications, especially patent applications in the name of Schuller, teach this technique.

It has been found that a coating (for example in an amount of 250 g/m²) with a filler (for example a white or very slightly coloured filler), whatever its nature, in combination with an organic binder (for example in an amount of 5%), makes it possible to significantly reduce the porosity and the permeability of the glass mat. This

has the consequence of preventing any local penetration of plaster, while at the same time ensuring, because of the dissymmetry of the coated glass mat, that there is a homogeneous bond between the glass mat and the core of the plasterboard.

Process for manufacturing plasterboards according to the invention

Finally, the third subject of the invention is a continuous process for manufacturing plasterboards, essentially comprising the following steps:

- preparation of a plaster slurry by mixing the various constituents of the composition with water in a mixer;
- deposition of the slurry thus prepared on at least one coated glass mat, on the uncoated side of this mat, followed by the shaping and the covering of the upper face of the slurry using a second reinforcing material, preferably a second coated glass mat;
- where appropriate, shaping of the edges of the board obtained previously by moulding the fresh plaster on profiled bands, this shaping consisting especially in feathering the edges of the board;
- hydraulic setting of the hydratable calcium sulphate on a manufacturing line while the ribbon of hydratable calcium sulphate board runs along a conveyor belt;
- cutting of the ribbon at the end of the line into predetermined lengths; and
- drying of the boards obtained.

The invention applies particularly well to plasterboards whose core composition and the manufacture of which are described in the aforementioned European Patent Application No. EP-A-0 470 914.

Preferred plaster composition

The invention applies particularly well to plasterboards whose core composition is the following:

- from 55 to 92% of hydrated calcium sulphate;
- from 0.1 to 5% of mineral and/or refractory fibres;
- 5 - from 3 to 25% of a mineral additive;
- from 1 to 5% of unexpanded vermiculite; and
- from 3 to 15% of hydrated alumina.

According to a preferred embodiment of the invention, the
10 nature and the amount of the mineral additive are chosen so that the plasterboard composition contains at most 2% crystalline silica and/or at most 1% cellular crystalline silica, that is to say having crystals of less than 5 microns in size. Such a composition then has the
15 advantage of having a crystalline silica, especially cellular crystalline silica, content in accordance with the recommendations of the International Agency for Research on Cancer, in which it is recommended to reduce the use of cellular crystalline silica as much as
20 possible as this compound is presumed to have a maximum toxicity.

The mineral and/or refractory fibres are preferably glass fibres. They may be short (3 to 6 mm on average) or else
25 long (10 to 24 mm on average) or of intermediate lengths. Preferably, glass fibres having a single length of 13 mm $\pm$ 5 mm are used.

In particular, fibres coming from an E-type glass are
30 used, these possibly being in two forms, one being in a form called "roving" comprising glass strands supplied on reels and cut before they are introduced into the usual circuit for mixing the hydratable calcium sulphate with water, or else in the form of precut strands which are
35 metered before mixing the hydratable calcium sulphate with water.

Preferably, fibres having a length of about 13 mm (± 5 mm) and a diameter of about 13 microns ($\pm 5 \mu\text{m}$) are used.

- 5 The essential function of the glass fibres is to impart high-temperature mechanical strength, allowing the cohesion of the calcined plaster to be maintained.

As mineral additive, numerous clays may be used. The
10 advantages afforded by clays are, on the one hand, the fact that they release the water that they contain (water of constitution) when they are heated to a temperature between 100 and 600°C and, on the other hand, the fact that they compensate for the shrinkage of the plaster in
15 a fire because of their ability to exfoliate.

Preferably, the nature and the amount of mineral additive are chosen so that the plaster composition contains at most 2% crystalline silica and/or at most 1% cellular
20 crystalline silica.

It is therefore advantageous to use a mineral additive comprising at most 7.5% of cellular crystalline silica.

- 25 As mineral additive, it is possible to use a mineral additive comprising essentially a clayey material, the amount of crystalline silica of which is at most equal to about 15% by weight of the mineral additive, and an inert mineral supplement compatible with the clayey material
30 and dispersible in the hardened plaster substrate.

For example, it is possible to use a mineral additive comprising, as clayey material, kaolin, illite or quartz and, as mineral supplement, dolomite. In particular, a
35 mineral additive is used which has the following composition (in percentages by weight with respect to the total weight of mineral additive):

- 25% of kaolin;

- 10% of illite;
- 15% of quartz; and
- 50% of dolomite.

5 The calcined chemical composition of this additive is the following (in %):

- SiO_2 : 43
- TiO_2 : 1.1
- Al_2O_3 : 15
- 10 - Fe_2O_3 : 1.6
- K_2O : 1.2
- CaO : 23
- MgO : 14.

15 Its particle size is expressed by a 63 μm sieve retention of less than 15%.

Its loss on ignition at 900°C is 26.5%.

20 The preferred plaster composition according to the invention comprises unexpanded vermiculite, which is an aluminium-iron-magnesium silicate in the form of flakes which expand at a temperature above 200°C, thereby making it possible to compensate for the shrinkage of the
25 plaster. Furthermore, the unexpanded vermiculite improves the thermal resistance of the plaster.

Preferably, a micronized unexpanded vermiculite is used, that is to say one in which all the particles are less
30 than 1 mm in size. This has the advantage of making it possible for the vermiculite to be better distributed within the plaster and of avoiding an abrupt expansion causing structural disorders.

35 Hydrated alumina (aluminium trihydroxide) is preferably used with a fine particle size (median diameter of about 10 microns). It has the effect of giving rise to an endothermic reaction complementary to that of gypsum,

especially by having a water of crystallization content of about 35%, the water being releasable between 200 and 400°C (gypsum containing about 20% of water releasable at about 140°C).

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The preferred plaster composition according to the invention may furthermore possibly include up to 4%, especially from 1 to 4%, of boric acid, as this product advantageously loses its water of constitution above
10 100°C, thereby contributing to the fire resistance of the plasterboard. Moreover, boric acid modifies the crystalline structure of the hydrated calcium sulphate in a manner favourable as regards shrinkage on ignition.

15 The composition according to the invention may be prepared by mixing, per 100 parts by weight of composition:

- from 55 to 92 parts by weight of hydratable calcium sulphate;
- 20 - from 0.1 to 5 parts by weight of mineral and/or refractory fibres;
- from 3 to 25 parts by weight of a mineral additive;
- from 1 to 5 parts by weight of unexpanded vermiculite; and
- 25 - from 3 to 15 parts by weight of hydrated alumina.

The preferred composition according to the invention has the following advantages:

- the composition can be easily formulated in the form
30 of a fluid slurry which is then converted, advantageously continuously, into a plasterboard in conventional plants used for this type of manufacture;
- it provides effective fire protection; thus boards according to the invention, having a thickness of
35 around 12.5 mm and a density of around 0.88 g/cm³, guarantee fire resistance for longer than 2 hours;
- by virtue of their good dimensional stability, the boards according to the invention after the fire

- resistance test maintain a good overall appearance without any deep cracking and exhibit mechanical integrity (this behaviour is important for applications requiring a very high level of fire protection, such as air ducts for ventilation and for smoke venting, in which there is a requirement for them to seal against hot gases under high pressure);
- the results of the reaction-to-fire tests on plasterboards according to the invention are very good: when these boards are exposed to the action of a radiating source and/or a specific burner under defined conditions (for 20 minutes), capable of igniting the gases released and of propagating the combustion, it has been found that there is no ignition and deterioration of these boards is merely superficial; after this test, the plasterboards according to the invention are therefore still capable of stopping the spread of a fire;
 - because of its lightness and its ability to be worked (cut, nailed, screwed, stapled, screwed/bonded, etc.), it is very easy to install; advantageously, it has feathered edges with which it is possible to produce reliable joints between the boards using plasterboard jointing compounds, for example of the type of those used for plasterboards faced with paperboard, and preferably fire-resistant jointing compounds; in addition, there are various possible ways of finishing off the construction elements produced with boards according to the invention, especially with paint, wallpaper, etc.;
 - it has the application characteristics required in the construction field: such as flexural stiffness, high impact strength, moisture resistance and no creep in the presence of moisture or under its own weight when it is mounted as a ceiling; and
 - finally, given that it can be manufactured using a simple process well known in the plasterboard field and that, in addition, the raw materials of which it

is composed are quite inexpensive, the plasterboard according to the invention has the advantage of having a moderate manufacturing cost.

5 Good performance is achieved with the following composition:

- 70 to 80% of a hydratable calcium sulphate semi-hydrate;
- 1% of glass fibres;
- 10 - 10 to 15% of the clay described above, consisting of 25% kaolin, 10% illite, 15% quartz and 50% dolomite;
- 2 to 4% of unexpanded micronized vermiculite;
- 6 to 10% of hydrated alumina; and
- 0 to 2% boric acid.

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Of course, provided that the proportions assigned to each of the essential constituents are respected, it is possible to introduce, into the composition according to the invention, by way of secondary ingredients, additives
20 normally used to facilitate the processing of the other constituents or for imparting additional particular properties on the composition. By way of examples of such additives, mention may be made of thinners, foaming agents, setting accelerators and water-repellent agents.

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Aeraulic duct

The invention makes it possible to obtain improved aeraulic ducts, namely smoke-venting ducts (for a fire
30 internal to the element) and ventilation ducts (for a fire external to the element). The mat forming the facing will be that side exposed to the fire. The fire-wall classification is in general one hour in both cases.

35 This system is based on a duct body made as four faces precut in the workshop and assembled, especially by stapling in a connecting sleeve which is itself also prepared in the workshop. By way of non-limiting example,

mention may be made of a single-faced (one mat face) smoke-venting or ventilation duct in a frame comprising a structure made of steel sections from which the duct is suspended. The internal cross section of the duct portions is 600 x 400 mm, its length being variable, for example 1000 mm. The body of the duct portion is produced from 25 mm thick boards according to the invention, joined together as a single thickness. The portions are connected by sleeves made of the board according to the invention, the boards being precut and joined together, having a length of 200 mm and an internal cross section of 650 x 450 mm, fitting around the portions of the duct. If necessary, a plaster may be used to make a perfect seal.

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Examples

The following examples are given purely by way of illustration and are in no way limiting in character.

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The hydrated alumina used in the examples is alumina trihydrate $\text{Al}(\text{OH})_3$, the characteristics of the dry hydrate of which are as follows:

- whiteness: 92%;
- 25 moisture content: 0.2%;
- bulk density: 0.8 g/cm³;
- particle size: $d_{50} = 10 \mu\text{m}$;
- 45 μm screen oversize: less than 1%;
- Al_2O_3 weight content: 65%;
- 30 H_2O weight content: 35%.

With regard to the fire performance of the plasterboards, a distinction is made between:

- 35 a) the reaction to fire, which involves the behaviour of the materials subjected to a localized fire. In the case of a plasterboard, the facing is the predominant element for the classification;

b) the fire resistance, which relates to the behaviour of the work exposed to a fully developed fire (post-flashover situation). The core and the facing of the plasterboards contribute to the performance of the work. The contribution by the facings to the fire resistance performance of the plasterboard is limited by the melting or destruction of the glass-fibre mat. This applies both to the external facing directly exposed to the fire and to the facing at the back of the board, which contributes to the hot mechanical strength.

Example 1

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According to the aforementioned European Patent Application No. EP-A-0 470 914, the following composition was prepared:

- 20 - 76% hydratable calcium sulphate (obtained from the industrial baking of desulphurized gypsum (FGD));
- 1% of glass fibres;
- 10% of hydrated alumina;
- 9% of quartz; and
25 - 4% of talc.

Using this composition, plasterboards were obtained with the following facings:

- board A (according to the prior art): 0.5 mm thick glass mat reinforced with a glass mesh having 3/1 mesh cells coated with an organic (vinyl or acrylic) composition, the total (mat + mesh + organic coating) grammage being 140 g/m²;
- board B (according to the prior art): 0.85 mm thick uncoated glass mat, with a total grammage of 110 g/m²;
- board C (according to the invention): 0.95 mm thick glass mat coated with a coating composition comprising hydrated alumina (about 94.5%), an acrylic resin

(about 5%) and a fluorocarbon (about 0.3%), the composition being applied in an amount of 250 g/m².

Example 2

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Certain properties of boards A to C were measured. The results obtained are given in the following table:

PROPERTIES	BOARDS		
	A	B	C (invention)
Porosity to air (l/m ² .s)	550	1 600	200
Permeability to the plaster slurry (g)	< 1 200	< 700	< 300
Tensile strength: SL (N/50 mm) SN (N/50 mm)	> 730 > 350	550 330	650 500
Loss on ignition at 650°C (%)	50	21	31
Gross calorific value (GCV): per unit mass (MJ/kg) per unit area (MJ/m ²)	12 1.7	4 0.5	2 0.65
Behaviour at very high temperature	Melts at 700°C	Melts at 800°C	Softens at 900°C, crumbles to a powder at 1 000°C

- 10 The current standards require, for a classification called "Euroclassification", that the GCV per kilogram or the GCV per square meter be less than or equal to 2 MJ.

It may be seen that only board C has both a GCV per
15 kilogram and a GCV per square meter less than or equal to 2 MJ.

Example 3

- 20 Based on the composition prepared in Example 1, board D according to the prior art and boards E to K according to

the invention were prepared, the characteristics of these boards being given in the following table:

	BOARDS							
	D	E	F	G	H	I	J	K
Coating:	-							
- alumina (%)		95	95	95	94.9	94.8	94.7	94.8
- EVA resin (%)		5	5	5	5	5	5	5
- fluorocarbon (%)		-			0.1	0.2	0.3	0.2
- water * (%)		90	90	90	90	90	90	60 to 80
Total grammage (g/m ²)	103.9	256.9	311.5	311.0	366.0	370	363	338
Facing thickness (mm)	0.795	0.90	0.94	0.94	0.87	0.87	0.92	0.94

- 5 *: This is the % of water in the mixture of solid matter (alumina/resin/optional water-repellent agent) and water.

Example 4

- 10 Certain properties of boards D to K were measured. The results obtained are given in the following table:

BOARDS									
	D	E	F	G	H	I	J	K	
Water-drop absorption (in seconds): - mat - board	-	-	-	18 10	130 105	> 1 000 > 1 000	> 1 000	-	
85° gloss* (2 paint passes)	0.7	1.00	1.6	3.2	2.0	2.4	4.6	-	
GCV: - per unit mass (MJ/kg) - per unit area (MJ/m²)	4.05 0.421	2.95 0.756	2.90 0.903	2.0 0.622	-	-	-	2.0 0.676	
Loss on ignition (%): - at 650°C - at 1 000°C	21.3 22.1	30.2	30.7	31.5 32.9				31.5	
Loss on ignition at 650°C (organic estimate):	21.3	11.6	10.3	9.9					
Observations after loss on ignition: - at 700°C - at 800°C - at 900°C - at 1 000°C	NTR Melting starts Shrinking and melting Vitrification			NTR Crumpling Crumpling and softening Crumpling to a powder				NTR Crumpling and softening Crumpling to a powder	

*: Gloss using a light beam inclined at 85°

It may therefore be seen that the protection provided by the coating raises the temperature at which the glass-fibre mat melts and delays its destruction. Thus (cf. boards G and K, for example), a coating based on hydrated alumina allows the softening of the glass mat to be delayed until 900°C.

During these fire-resistance tests on a work, delamination of the glass mat coated with hydrated alumina was thus observed after 50 minutes, which corresponds to a standardized temperature of 920°C of the oven.

Moreover, incorporating the water-repellent agent has the effect of increasing the water-drop absorption times (see boards H, I and J).

Example 5

Based on the composition prepared in Example 1, boards L to Q were prepared, the characteristics of which are given in the following table:

	BOARDS					
	L	M	N	O	P	Q
Coating:						
- alumina (%)	95	94.5	94	47.5		47.5
- limestone (%)				47		
- clay (%)					94.5	47
- EVA (%)	5	5	5	5	5	5
- silicone (%)		0.5	1.0	0.5	0.5	0.5
- water* (%)	90	90	90	90	90	90
Total grammage (g/m ²)	350	350	350	350	350	350

*: This is the % of water in the mixture of solid matter (alumina/resin/optional water-repellent agent) and water.

Example 6

Certain properties of boards L to Q were measured. The results obtained are given in the following table:

BOARDS							
	L	M	N	O	P	Q	
Water-drop absorption (in seconds): - mat - board	20 1	50 33	70 44	100 45	360 20	240 20	
85° gloss* (2 paint passes)	2.7	2.00	1.2	2.0	4.8	4.0	
GCV: - per unit mass (MJ/kg) - per unit area (MJ/m ²)					1.65 0.495		
Loss on ignition (%): - at 650°C - at 1 000°C						31.5	
Observations after loss on ignition: - at 700°C - at 800°C - at 900°C - at 1 000°C		32.9		36.4	27.2		Not vitrified, good cohesion
		Not vitrified, very powdery		Not vitrified, very powdery	Not vitrified, good cohesion	Not vitrified, good cohesion	

*: Gloss using a light beam inclined at 85°

Again it may be seen that incorporating the water-repellent agent increases the water-drop absorption times (see boards M to Q compared with board L).

5 Example 7

Based on the composition prepared in Example 1, boards R to W were prepared, the characteristics of which are given in the following table:

10

	BOARDS					
	R	S	T	U	V	W
Coating:						
- alumina (%)	47.5	47.5				
- limestone (%)						94.5
- kaolin	47	47	94	94	94	
- clay (%)						
- EVA (%)	5	5	5	5	5	5
- silicone (%)	0.5	0.5	1.0	1.0	0.5	0.5
Total grammage (g/m ²)	350	350	350	500	350	350

Example 8

Certain properties of boards R to W were measured. the
15 results obtained are given in the following table:

BOARDS						
	R	S	T	U	V	W
Water-drop absorption (in seconds): - mat - board	60 20	75 40	95 35	155 55	150 25	540 340
85° gloss* (2 paint passes)	2.3	2.5	3.2	11.5	2.7	2.1
GCV: - per unit mass (MJ/kg) - per unit area (MJ/m ²)	1.65 0.79		1.65 0.74			
Loss on ignition (%): - at 650°C - at 1 000°C						
Observations after loss on ignition: - at 700°C - at 800°C - at 900°C - at 1 000°C	25.6	23.8	17.5	17.2	16.9	36.9
	Not vitrified, good cohesion	Not vitrified, good cohesion	Not vitrified, good cohesion	Not vitrified, good cohesion	Not vitrified, good cohesion	Crumbling to a powder

*: Gloss using a light beam inclined at 85°

Example 9

Based on the composition prepared in Example 1, boards X, Y, Z, AA, BB, CC, DD and EE were prepared, the characteristics of which are given in the following table:

	BOARDS							
	X	Y	Z	AA	BB	CC	DD	EE
Coating:								
- alumina (%)							47.5	
- limestone (%)								47.5
- clay ⁽¹⁾ (%)	95	94.5						
- clay ⁽²⁾ (%)			94	97	90	89.5	47	47
- EVA (%)	5	5	5	2.5				
- sodium silicate (%)					10	10	5	5
- silicone (%)		0.5	1.0	0.5		0.5	0.5	0.5
Theoretical total grammage (g/m ²)	350	350	350	500	350	350	350	350

(1): Clay rendered hydrophobic by a stearate

(2): Clay rendered hydrophobic by a titanate

Example 10

Certain properties of boards X to EE were measured. The results obtained are given in the following table:

BOARDS								
	X	Y	Z	AA	BB	CC	DD	EE
Water-drop absorption (in seconds):								
- mat	360	420	20	13	5	480	390	180
- board	120	420	95	75	10	120	35	180
85° gloss* (2 paint passes)	10.8	18.8	2.8	6.2	4.5	2.1	11.2	7.6
GCV:								
- per unit mass (MJ/kg)		3.15	2.10	2.95	1.45	2.70	2.50	3.15
- per unit area (MJ/m ²)		1.10	0.67	0.80	0.73	1.13	0.90	0.98
Loss on ignition (%):								
- at 700°C			12.8	13.3	8.8	10.0	20.6	19.0
- at 1 000°C	12.7	13.9	13.9	14.1	9.1	11.4	21.7	26.3

*: Gloss using a light beam inclined at 85°

BOARDS								
	X	Y	Z	AA	BB	CC	DD	EE
Observations after loss on ignition:	- at 700°C		NTR	NTR	Greenish (uncoated side) slightly pinkish	Greenish (uncoated side) slightly pinkish	NTR	NTR
	- at 800°C		NTR	Slight softening Pinkish	slightly pinkish	slightly pinkish	Lift-up	Lift-up
	- at 900°C		Pinkish , slight softening	' slight lift-up	slightly pinkish	slightly pinkish	Lift-up	Slight crusting (uncoated side) Very powdery
	- at 1 000°C	Not vitrified, good cohesion	Not vitrified, quite good cohesion		Lift-up, good cohesion	Lift-up, good cohesion	Lift-up, pinkish, good cohesion	

* NTR: Nothing to report

Example 11

The painting behaviour of 4 groups of two identical boards joined together by a jointing compound, sold
5 under the name PREGYLYS 45 by the Applicant, was measured.

The boards of group 1 were plasterboards having the composition given in Example 1, having a glass mat
10 coated with a PREGYLYS 45 coating composition.

The boards of group 2 were plasterboards having the composition given in Example 1, having a glass mat coated with alumina.
15

The boards of group 3 were plasterboards having the composition given in Example 1, having an uncoated glass mat.

20 The boards of group 4 were plasterboards of the prior art, having a glass mat reinforced with a glass mesh and without a mineral coating.

The colour of the boards and of the joints before
25 applying paint and after applying two coats of a white satin acrylic paint was observed.

The results are given in the following table:

	Board group			
	1	2	3	4
Before applying paint	White colour with slight hues in places	Uniform white colour	White colour with a few stains on the mat	White colour with a few stains on the mat
After applying paint	The joint is not visible in perpendicular light The joint is visible in oblique light No roughness difference Joint gloss: 12.9 Board gloss: 7.7	The joint is not visible in perpendicular light The joint is visible in oblique light No roughness difference Joint gloss: 12.7 Board gloss: 6.5	The joint is visible in perpendicular light Difference in roughness Joint gloss: 14.4 Board gloss: 2.6	The joint is slightly visible in perpendicular light Difference in roughness Joint gloss: 12.4 Board gloss: 4.3

It may be seen that the gloss goes from 2.6 in the case of the control boards without a coating (boards of group 3) to 6.5 (boards of group 2).

CLAIMS

1. Plasterboard, having a plaster-based core,
characterized in that the said board is provided on
5 at least one of its sides with a facing consisting
of a glass-fibre mat, this mat being coated on its
external face with a coating composition
comprising:
 - a mineral filler, with the exception of
 - 10 hydratable calcium sulphates; and
 - an organic or mineral binder.
2. Plasterboard according to the preceding claim,
characterized in that the mineral filler is chosen
15 from the group consisting of hydrated alumina,
calcium carbonate, white kaolin, clays and mixtures
thereof.
3. Plasterboard according to the preceding claim,
20 characterized in that the clay is rendered
hydrophobic.
4. Plasterboard according to Claim 2, characterized in
that the mineral filler is hydrated alumina.
- 25 5. Plasterboard according to Claim 2 or 3,
characterized in that the mineral filler is a
mixture of hydrated alumina and clay having a
hydrated alumina/clay mass ratio of between 30/70
30 and 70/30.
6. Plasterboard according to Claim 2, characterized in
that the mineral filler is a mixture of hydrated
alumina and kaolin having a hydrated alumina/kaolin
35 mass ratio of between 30/70 and 70/30.

7. Plasterboard according to one of the preceding claims, characterized in that the organic binder is of the vinyl type.
- 5 8. Plasterboard according to the preceding claim, characterized in that the organic binder is an ethylene/vinyl acetate resin (EVA).
9. Plasterboard according to one of Claims 1 to 6,
10 characterized in that the mineral binder is of the sodium silicate type.
10. Plasterboard according to one of the preceding claims, characterized in that the coating
15 composition furthermore includes a water-repellent agent.
11. Plasterboard according to the preceding claim,
20 characterized in that the water-repellent agent is chosen from the group consisting of fluorocarbons and silicone oils.
12. Plasterboard according to Claim 1, characterized in
25 that its mat has been coated with a coating composition prepared by diluting a mixture composed of:
 - 90 to 98% of hydrated alumina;
 - 1 to 9% of a vinyl resin, preferably EVA; and
 - 0.1 to 1% of a fluorocarbon or a silicone oil.
- 30 13. Plasterboard according to one of the preceding claims, characterized in that the coating composition penetrates up to 30 to 70% of the thickness of the glass mat.
- 35 14. Plasterboard according to one of the preceding claims, characterized in that its coating has a grammage of between 200 and 300 g/m².

15. Plasterboard according to one of the preceding claims, having an improved fire resistance.
- 5 16. Plasterboard according to one of the preceding claims, furthermore having a hydrophobic and/or water-repellent coating on at least one side of the mat.
- 10 17. Plasterboard according to Claim 16, characterized in that the coating is such that no fibre of the mat projects therefrom, the surface of the coating being smooth and/or is such that the surface absorption measured using the modified Cobb test is
15 less than 2.4 g, preferably less than 0.5 g, and/or is capable of forming a bond with Portland-based cement.
18. Glass-fibre mat coated with a coating composition
20 comprising:
- a mineral filler, with the exception of hydratable calcium sulphates;
- an organic or mineral binder; and
- a water-repellent agent.
- 25 19. Glass-fibre mat according to Claim 15, having the characteristics of Claims 2 to 9 and 11 to 14.
20. Process for manufacturing a plasterboard according
30 to one of Claims 1 to 17, essentially comprising the following steps:
- preparation of a plaster slurry by mixing the various constituents of the composition with water in a mixer;
35 - deposition of the slurry thus prepared on at least one coated glass-fibre mat, on the uncoated side of this mat, followed by the shaping and the covering of the upper face of

the slurry using a second reinforcing material, preferably a second coated glass mat;

- where appropriate, shaping of the edges of the board obtained previously by moulding the fresh plaster on profiled bands, this shaping consisting especially in feathering the edges of the board;

- hydraulic setting of the hydratable calcium sulphate on a manufacturing line while the ribbon of hydratable calcium sulphate board runs along a conveyor belt;

- cutting of the ribbon at the end of the line into predetermined lengths; and

- drying of the boards obtained.

21. Aeraulic duct comprising a plasterboard according to any one of Claims 1 to 17.

22. Duct according to Claim 20, which is a smoke-venting duct or a ventilation duct.