

FIRE RESISTANT BUILDING MATERIAL

FIELD

5 This invention relates to a fire resistant building material.

BACKGROUND

10 Fire resistant doors or walls are generally designed to provide a specified period of time at withstanding a particular temperature of fire on one side. The materials used in such doors or walls can include chemically treated board, processed products such as oriented strand board (OSB) or medium-density fibreboard (MDF), or composite products such as fibreglass.

15 To increase the fire rating for a given material, the typical solution is to simply increase the material thickness. However this leads to doors that are thicker than standard door or wall fittings are designed for and may significantly increase the weight and/or cost of manufacturing. As a result
20 there may be significant benefits to be made if the thickness of the fire resistance material can be decreased for a given fire rating.

 Accordingly, the present invention may provide an improved fire resistant building material or provide the public with a useful choice.

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SUMMARY

 In general terms in a first aspect the invention provides a fire resistant building material comprising:

30 a core of material incorporating a predetermined proportion of expandable graphite flake; and

one or more covering layers on the core.

Preferably the predetermined proportion of expandable graphite flakes is less than 10% by weight.

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Preferably the core further includes furnish.

Preferably the furnish is selected from one or more of the group comprising fibre, sawdust, shavings, flakes, particles.

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Preferably the covering layers are substantially free of expandable graphite flakes.

Preferably the core and/or the covering layers are a wood based material.

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Preferably the wood based material is selected from the group consisting of fibreboard, medium density fibreboard, particle board, chip board, strand board and oriented strand board.

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Preferably the covering layers include a substantially smooth outer finish configured for painting, laminating and/or encapsulating.

Preferably the core material further includes resin.

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In general terms in a further aspect the invention provides a fire resistant combustible door comprising a fire resistant building material previously described.

In general terms in a further aspect the invention provides a fire resistant wall comprising a fire resistant building material previously described.

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In general terms in a further aspect the invention provides a method of manufacturing a fire resistant building material core comprising the steps of:

- 5 mixing expandable graphite flakes, furnish and resin; and
- forming a board from the mix.

Preferably the graphite flakes and resin are mixed first before mixing with the furnish.

- 10 In general terms in a further aspect the invention provides a method of manufacturing a fire resistant building material comprising the steps of:
 - forming a fire resistant building material core using the method described above; and
 - applying one or more covering layers to the fire resistant building
- 15 material core.

- It is acknowledged that the terms “comprise”, “comprises” and “comprising” may, under varying jurisdictions, be attributed with either an exclusive or an inclusive meaning. For the purpose of this specification,
- 20 and unless otherwise noted, these terms are intended to have an inclusive meaning – i.e. they will be taken to mean an inclusion of the listed components which the use directly references, and possibly also of other non-specified components or elements.

- 25 Reference to any documents in this specification does not constitute an admission that those documents are prior art or form part of the common general knowledge.

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings which are incorporated in and constitute part of the specification, illustrate embodiments of the invention and, together with the general description of the invention given above, and the detailed description of embodiments given below, serve to explain the principles of the invention, in which:

Figure 1 is a cross section of a building material according to an example embodiment; and

Figure 2 is a flow diagram of manufacturing a fire resistant building material core according to an example embodiment.

DETAILED DESCRIPTION

An example embodiment is shown generally in Figure 1. The inventors have discovered that a fire resistant building material 100 can be most effectively provided by using a composite of a highly fire resistant core material 102 laminated with facing layers 104,106 on either side.

The fire resistant core 102 may be strand board with a fire resistant additive. The additive may be chosen according to the application. For example in a hinged or sliding fire door, expandable graphite flakes may be mixed with the resin and/or the core material before forming the strand board. The inventors have found it to be practical to introduce the expandable graphite flake with the resin.

The facing layers 104,106 may be relatively thin, and may be integral to the core or laminated to the core subsequent to its manufacture. If integral the facing layers 104,106 may be medium density fibre or other furnish

with smaller particle size than the core. Furnish refers to fibre, sawdust, shavings, flakes and particles. The facing layers 104,106 will generally provide a “paint quality” smooth finish suitable for directly painting or providing a base for further decorative or durable laminate.

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When one side of the material is subjected to a fire, the facing layer will - burn away, exposing the core 102. The expandable graphite flakes in the core will substantially expand on heating. As a result any fissures or burning of the strand board will tend to self-heal. The exposed surface will

10 tend to form an insulating char layer which resists or delays further penetration of and erosion by the flame and slows an increase in core temperature. This is as opposed to the typical use of expandable graphite particles which is to suppress flame spreading.

15 The core material 102, or the entire panel if facing layers 104, 106 are integral, will referring to Figure 2 be generally manufactured with expandable graphite flakes added to the core furnish 201 either directly 202 or mixed with the resin 203 prior to the furnish mat being laid 203. If the facing layers 104, 106 are applied post-production to a core containing

20 graphite flakes they will be applied using standard panel laminating and pressing processes.

The expandable graphite flakes will typically have a mean particle size of 250 microns to 350 microns and an expansion volume of 200 cubic

25 centimetres per gram at 600 degrees Celsius. A larger particle size is preferred to compensate for any mechanical reduction of particle size during board processing.

Due to the effect of the graphite flakes, the resin loading may be increased

30 to compensate to maintain the internal bond.

The fire resistant core 102 may be bound with any single one of, or a combination of resins: urea formaldehyde (UF); melamine formaldehyde (MF); melamine-urea formaldehyde (MUF); methyl diisocyanates esp. polymeric diphenyl methane diisocyanate (pMDI). The facing layers 104, 106 may be bound with any of the same resins as the core, but the resins used need not be the same as the core. The present invention has been successfully proven in UF resin bound strand board core faced with UF resin bound MDF, and in a pMDI resin bound strand board core, faced with UF resin bound MDF.

One or more embodiments may be expected to result in a board 10% thinner and/or a 15% lower density for the same fire resistance rating.

While the present invention has been illustrated by the description of the embodiments thereof, and while the embodiments have been described in detail, it is not the intention of the Applicant to restrict or in any way limit the scope of the appended claims to such detail. Additional advantages and modifications will readily appear to those skilled in the art. Therefore, the invention in its broader aspects is not limited to the specific details, representative apparatus and method, and illustrative examples shown and described. Accordingly, departures may be made from such details without departure from the spirit or scope of the Applicant's general inventive concept.

CLAIMS:

1. A fire resistant building material comprising:
 - a core of material incorporating a predetermined proportion of expandable graphite flakes; and
 - 5 one or more covering layers on the core.
2. The fire resistant building material in claim 1 wherein the predetermined proportion of expandable graphite flakes is less than 10% by weight.
3. The fire resistant building material in claim 1 or claim 2 wherein the
 10 core further includes furnish.
4. The fire resistant building material in claim 3 wherein the furnish is selected from one or more of the group comprising fibre, sawdust, shavings, flakes, particles.
5. The fire resistant building material in any preceding claim wherein the
 15 covering layers are substantially free of expandable graphite flakes.
6. The fire resistant building material in any preceding claim wherein the core and/or the covering layers are a wood based material.
7. The fire resistant building material in claim 6 wherein the wood based material is selected from the group consisting of fibreboard, medium
 20 density fibreboard, particle board, chip board, strand board and oriented strand board.
8. The fire resistant building material in any preceding claim wherein the covering layers include a substantially smooth outer finish configured for painting, laminating and/or encapsulating.
9. The fire resistant building material in any preceding claim wherein the
 25 core material further includes resin.

10. A fire resistant combustible door comprising a fire resistant building material according to any preceding claim.
11. A fire resistant wall comprising a fire resistant building material according to any one of claims 1 to 9.
- 5 12. A method of manufacturing a fire resistant building material core comprising the steps of:
 - mixing expandable graphite flakes, furnish and resin; and
 - forming a board from the mix.
- 10 13. The method of manufacturing a fire resistant building material as claimed in claim 12 wherein the graphite flakes and resin are mixed first before mixing with the furnish.
14. A method of manufacturing a fire resistant building material comprising the steps of:
 - forming a fire resistant building material core using the method of
 - 15 claim 12 or claim 13; and
 - applying one or more covering layers to the fire resistant building material core.