

Description**Background of the Invention**5 **1. Field of the Invention**

The subject invention is directed to coating compositions which are applicable in the field of construction materials. The invention is particularly applicable to the field of high-rise construction based on steel infrastructure where it is desired to provide fireproofing and/or acoustical insulation.

10

2. Description of the Related Art

Thick coatings of inorganic materials have been commonly applied in the course of the erection of steel structures designed to serve as multi-story building infrastructure primarily to serve in a fireproofing capacity, as well as to function as acoustic insulation agents. In the event of a major fire in a section or on one or more floors of a building, it has been found that such coatings substantially inhibit thermal weakening of the steel infrastructure and, thus, prevent a catastrophic collapse of the building.

In order to be suitable for such use, coating mixes, both in the wet and dry state, must possess a number of crucial properties. They must be able to hold the large quantity of water that renders them capable of being pumped easily and to great heights. Although high water content is desired, the aqueous dispersion must retain a consistency sufficient to prevent segregation or settling of ingredients and permit adequate "yield" or uniform coverage on the steel surface at a given thickness. Furthermore, the coating mixtures must obviously be capable of adhering to steel surfaces, both in the slurried state and upon drying. Finally, the mixtures must set without any undue expansion or shrinkage which could result in the formation of cracks that would seriously detract from the insulating value of the dry coating. This complex balance of properties has substantially been achieved heretofore by gypsum-vermiculite systems containing cellulosic fiber. Examples of compositions of this general type are described by Bragg in U.S. Patents 3,719,573 and 3,839,059. However, vermiculite as a naturally occurring mineral is subject to variations in quality, uniformity and consistency.

In order to overcome the deficiencies encountered with vermiculite-based mixtures, compositions containing synthetic and natural organic particulate material have been suggested (See U.S. Patent 4,751,024). Due to the hydrophobic nature of the organic material, the composition's properties are very sensitive to the water content used in forming the sprayable mix. Thus, when a low water content is used, it is difficult to form a uniform fluid mixture which is capable of being readily pumped to the desired point of application. When the water content is increased to achieve a mixture of lower viscosity (and thus readily mixable and pumpable), the resultant mixture exhibits a high flow at the point of application and, thus, does not readily maintain its shape and adhere to the infrastructural surface. Such formulations may fall off at the surface and, thereby, lose the advantages achievable by the coating.

Various agents are known to thicken formulations e.g. polyethylene oxide, xanthan gum, carboxymethyl cellulose guar gum, hydroxypropyl guar gum. Although such agents may provide a less fluid composition at the point of application and thereby aid in initial adhesion, they are not desirable for the instant application as they impair the ability of providing a uniform initial mix and require more energy (larger pumps) to force the fluid through the conduit to the point of application. Further, such thickeners, in many instances, do not impart good adhesion properties to compositions containing them.

Other agents are known to impart thixotropic properties to fluids. These agents include attapulgite and sepiolite clays which are conventionally provided as ultrafine colloidal material. For example, U.S. Patents 3,986,969 and 4,801,395 describe the use of attapulgite as a thixotropic agent while JP 63-297256 teaches the use of sepiolite as a thixotropy-imparting agent for an inorganic adhesive spray composition. The use of thixotropic agents would detract from the instant formulation. They would provide high viscosity under the low shear mixing conditions. The formulator would not be able to provide a uniform composition or would be required to add excess water at the mixing stage which would cause a high flow coating to be applied.

It is highly desired to provide a fireproofing and acoustical dampening composition which, when initially mixed with water at the job site, exhibits low viscosity to allow the components to readily mix and form a uniform composition while being capable of exhibiting high viscosity and minimal flow at the point of application to thus maintain its shape and adherence to the applied structure.

Summary of the Invention

The present invention is directed to enhanced fireproofing spray compositions which, when initially mixed with water, exhibit low viscosity while, after subjection to high shear, exhibit higher viscosity. The mixture is thus readily formed into an aqueous dispersion which, upon application, exhibits minimal flow and good adhesion to the structural substrate.

Accordingly this invention provides a dry composition comprising a hydratable cement, porous aggregate particulate, a fibrous material, an air-entraining agent and a magnesium silicate-based clay selected from granular attapulgite, sepiolite and mixtures thereof which have a particle size distribution such that at least 60 weight percent is greater than 44 μm and the average particle size is at least 72 μm ; said clay being present in an amount to impart, on addition of water, rheopectic properties to an aqueous dispersion of said composition.

Preferably the composition has from about 50 to 90 wt. percent cement, substantially from 3 to 40 vol. percent aggregate, substantially from 4 to 10 wt. percent organic fibrous material, from 0 to 2 wt. percent of an inorganic fibrous material, substantially from 0.05 to 0.5 wt. percent air-entraining agent, and substantially from 3 to 20 wt. percent of said clay having a water content of less than substantially 16 wt. percent. Suitably the porous aggregate is a polystyrene selected from shredded expanded polystyrene beads, shredded polystyrene beadboard, shredded extruded polystyrene and mixtures thereof. More suitably the shredded polystyrene has a density of substantially 3.2 to 12.8 Kg/m^3 (0.2 to 0.8 lb/ft^3) and is present in substantially from 1 to 5 weight percent of said composition; and the hydratable cement is gypsum and is present in at least substantially 75 weight percent of said composition.

Advantageously the porous aggregate is an exfoliated vermiculite, more advantageously one which has a density of substantially from 80 to 112 Kg/m^3 (5 to 7 lb/ft^3) and is present in substantially from 20 to 40 weight percent; and wherein the hydratable cement is a gypsum and is present in substantially from 50 to 70 weight percent.

Desirably the porous aggregate is an expanded perlite having a density of substantially from 32 to 192 Kg/m^3 (2 to 12 lb/ft^3), more desirably one which has a density of substantially from 32 to 80 Kg/m^3 (2 to 5 lb/ft^3) and is present in substantially from 5 to 30 weight percent; and wherein the hydratable cement is gypsum and is present in substantially from 50 to 70 weight percent.

The magnesium silicate-based clay may be dried, granulated attapulgite clay, wherein at least substantially 80 weight percent of said granulate has a particle size of at least 44 μm , has a water content of less than substantially 16 weight percent, and is present in substantially from 3 to 10 weight percent in said composition.

Conveniently the magnesium silicate-based clay is dried, granulated sepiolite clay wherein at least substantially 60 weight percent of said granulate has a particle size of at least 44 microns, has a water content of less than substantially 16 weight percent and is present in substantially from 3 to 10 weight percent of said composition.

More preferably the composition has substantially from 1 to 5 wt. percent of a shredded polystyrene; at least substantially 75 weight percent of a hydratable cement composed of hydratable gypsum plaster; fibrous material composed of from substantially 4 to 10 wt. percent of high wet bulking organic fibres, and from 0 to substantially 2 wt. percent glass fibres; substantially from 0.1 to 0.5 wt. percent of the air-entraining agent; and substantially from 3 to 10 wt. percent of the dried, granular magnesium silicate clay. The composition may have substantially 20 to 40 wt. percent of an exfoliated vermiculite; at least substantially 50 weight percent of the hydratable cement composed of a hydratable gypsum plaster; fibrous material composed of substantially from 4 to 10 wt. percent of high wet bulking organic fibres, and 0 to 2 wt. percent of glass fibres; substantially from 0.1 to 0.5 wt. percent of an air-entraining agent and substantially from 3 to 10 wt. percent of a dried, granular magnesium silicate clay.

The composition may have:- substantially from 5 to 30 wt. percent of an expanded perlite having a density of (substantially 2-5 lb/ft^3); at least substantially 50 weight percent of hydratable cement composed of a hydratable gypsum plaster; fibrous material composed of substantially from 4 to 15 wt. percent high wet bulking organic fibres, and 0 to substantially 2 wt. percent glass fibres; substantially from 0.1 to 0.5 wt. percent of an air-entraining agent; and substantially from 3 to 20 wt. percent of a dried, granular magnesium silicate clay.

The composition may form an aqueous dispersion upon the addition of water to the composition, in a ratio of water to cementitious binder of substantially from 1.2 to 2.5 and said dispersion exhibits an increase in viscosity after application of high shear forces to said dispersion.

The invention also provides a process of providing a fireproofing and/or acoustic insulation to construction metal infrastructure comprising forming an aqueous dispersion from water and dry components

comprising substantially from 50 to 90 wt. percent of a hydratable cement; substantially 3 to 40 vol. percent of a porous aggregate selected from vermiculite, perlite or shredded polystyrene; substantially 4 to 10 wt. percent of an organic fibrous material and 0 to substantially 2 wt. percent of an inorganic fibrous material; substantially 0.05 to 0.5 wt. percent of an air-entraining agent; and substantially 3 to 20 wt. percent of a magnesium silicate clay selected from attapulgite, sepiolite or mixtures thereof having a particle size distribution such that at least 60 wt. percent is greater than 44 microns and the average particle size is greater than 72 microns; subjecting the formed dispersion to high shear forces to cause the viscosity of said dispersion to increase; and applying the resultant dispersion to a construction infrastructure. Preferably the water to cement ratio is substantially 1.2 to 2.5:1 to provide an initial dispersion having a density of from substantially 560 to 881 Kg/m³ (35 to 55 lb/ft³). The high shear force may be generated by a piston-pump, alone or in combination with the spray applicator. The hydratable cement may be gypsum; the aggregate may be shredded polystyrene; the organic fibrous material may be cellulosic material; and said clay may have a water content (as the initial dry component) of less than 16 wt. percent.

15 Detailed Description

For purposes of clarity, the following terms used in the present specification and appended claims are defined below;

The term "rheoplectic" shall mean compositions which, when presented in a fluid state, are capable of exhibiting an increase in viscosity after application of shear forces to the fluid.

The term "thixotropic" shall refer to compositions which, when presented in a fluid state, are capable of exhibiting a decrease in viscosity upon application of shear forces to the fluid.

Rheoplectic and thixotropic fluids are both classified as viscosity time-dependent-under-shear fluids but exhibit viscosity properties which are substantially opposite to each other.

The concentration of the components of the present composition are given herein in terms of parts by weight unless otherwise indicated.

The present invention is directed to a novel composition suitable for spray application on to steel infrastructures and other substructures of buildings to provide fireproofing and acoustic dampening. The subject compositions are capable of exhibiting a low initial viscosity (high fluidity) and, after subsection to high shear force, exhibiting a high viscosity. The compositions have unexpectedly been found to be capable of being readily mixed using conventional mixing apparatus without concern for criticality of water to solid content (within conventional ranges) and to be capable of providing a product which exhibits a high yield coating which has the ability to adhere and maintain itself as a coating on the substructure surface.

The subject composition comprises a hydratable cementitious binder, a porous aggregate, an air-entraining agent, a fibrous material and a magnesium silicate-based clay selected from attapulgite, sepiolite or mixtures thereof composed of large particle size (diameter) material. In particular, the present invention is directed to fireproofing coatings, such as disclosed in U.S. Patents 3719513, 3839059 (exfoliated vermiculite-based compositions) and 4751024 (polystyrene-based compositions), which have been enhanced and improved by the addition of the presently described magnesium silicate clay to impart rheoplectic properties to the resultant composition.

JP-A-2026881 discloses shaped lightweight mortar products formed from a mortar which contains polystyrene beads having an expansion ratio of from 10 to 60, and spherical inorganic aggregates. The polystyrene provides a means of achieving a lightweight mortar product by first extruding the mix under pressure into the shaped configuration, then allowing it to harden at low temperature, and then finally heating the shaped product at elevated temperatures and humidity to cause expansion and formation of the lightweight product. The mortar mix may contain sepiolite.

The present invention is a cementitious composition. It requires the use of from about 50 to 90 weight percent of a hydratable cementitious binder. Known Portland cements can be used as the binder. However, it is generally preferred to employ a hydratable gypsum binder (also known as gypsum plaster or plaster of paris) due to its advantageous fireproofing characteristics. The binder can be used in relatively low amounts, e.g. as little as 50 percent by weight. It is generally preferred to employ from about 50 to 70, preferably 50 to 60, weight percent binder when the aggregate is an aggregate of relatively high density e.g. 32-192 Kg/m³ (2-12 lbs/ft³) aggregate (i.e. vermiculite or perlite or mixtures thereof). However, it is generally preferred to employ at least about 75 percent by weight based on the total weight of the composition, and more preferably at least about 85% by weight when the aggregate is of a relatively low density e.g. 4.8-16 Kg/m³ (0.3 - 1 lb/ft³) (i.e. polystyrene).

The porous aggregate of the present composition can be selected from vermiculite, perlite or shredded polystyrene (preferred). The aggregate is normally contained in the subject composition in a volume percent

concentration of from about 3 to 40 with amounts of from about 3 to 20 volume percent being preferred. Low density aggregate is preferred as it provides a higher volume coating per unit weight of total composition. Preferably, the particle size at its maximum dimension is less than 6.35 mm (1/4 inch).

The vermiculite aggregate normally used is exfoliated (expanded) vermiculite of standard grade having a density of substantially 80 to 112 Kg/m³ (5 to 7 lb/ft³). Prior fireproofing compositions formed with vermiculite as the porous particulate have exhibited characteristics which tend to vary from batch to batch due to the variations in this natural product. The incorporation of the presently described rheopectic agent overcomes such variations and thus, provides an improved composition.

Another useful aggregate material is perlite. This material is essentially an amorphous mineral composed of fused sodium potassium aluminum silicate. The mineral is conventionally ground and then expanded by heating to form particulate material having densities ranging from substantially 32 to 192 Kg/m³ (2 to 12 lb/ft³). Preferred perlite aggregates are commercial grades of expanded perlite having a density of 32 to 80 Kg/m³ (2 to 5 lb/ft³).

The use of the subject rheopectic agents, as fully described herein below, is particularly useful in combination with perlite containing compositions as such compositions tend to be too fluid at the point of application to provide good adhesion. The subject rheopectic agents provide a counteracting property which enhances conventional perlite compositions to achieve the desired properties both during mixing and at the point of application.

The preferred porous aggregate used in the present coating compositions is shredded polystyrene particles which can be produced by shredding loose expanded polystyrene beads or molded polystyrene beadboard. Extruded polystyrene can also be shredded to provide the aggregate material of this invention. A method and apparatus for shredding foamed polystyrene beads are disclosed in U.S. Pat. Nos. 3,627,211 and 3,686,068. As disclosed in these patents, the shredded particles have irregularly shaped exterior surfaces, tears, and ragged edges. The shredding process opens a substantial number of the cells on the surface of the foamed beads, thereby allowing penetration of the cementitious binder into the cellular structure and integrating the binder and the particles. The density of the shredded polystyrene is preferably in the range of substantially 4.8 to 12.8 Kg/m³ (0.3 to 0.8 lb/ft³), more preferably substantially 6.4 to 9.6 Kg/m³ (0.4 to 0.6 lb/ft³).

The aggregate is contained in the subject composition to aid in providing a high yield coating. The amount of aggregate used (in terms of weight percent) will be, generally, directly proportional to the density of the aggregate. Thus, when the aggregate is exfoliated vermiculite (density of substantially 80 to 112 Kg/m³ or 5-7 lbs/ft³), the vermiculite is used as from about 20 to 40, preferably 30 to 40 weight percent of the composition. When shredded polystyrene is used (density of substantially 3.2 to 12.8 Kg/m³ or 0.2 to 0.8 lbs/ft³) this aggregate is used in from about 1 to 5, preferably about 1 to 3 weight percent of the composition. When perlite is the aggregate of the composition (density ranges from 32 to 192 kg/m³ or 2 to 12 lbs/ft³), the perlite should be present as from about 5 to 40 weight percent. Low density perlite (32 to 80 Kg/m³ or 2-5 lbs/ft³) is normally present as from substantially 5 to 30 weight percent while high density perlite (112 to 192 Kg/m³ 7-12 lbs/ft³), when used, is present as from substantially 20 to 40 weight percent. In generally, the volume of aggregate contained in 45.4 Kg (100 pounds) of composition is substantially from 0.057 to 0.28 m³ (2 to 10 ft³), preferably substantially 0.11 to 0.27 m³ (4 to 8 ft³).

The fibrous component of the present composition is normally provided by either organic fibrous material alone or in combination with inorganic fibrous material. Preferably, the organic fibrous material is a high wet bulking organic fibre, such as cellulose fibres described in U.S. Patent Nos. 3719513 and 3839059. The inorganic fibres should be capable of providing reinforcement of the composition, and are preferably glass fibres. The total amount of fibrous component is from substantially 4 to 12 weight percent of the composition with the organic fibres being from substantially 4 to 10 weight percent and the inorganic fibres, when present, being present in from 0 to substantially 2 weight percent.

The foaming agents or air entraining agents that are used in the compositions of this invention are well-known in the cement art. Such well-known materials as sulfonated monoglycerides, sodium alkyl arylsulfonate, and sodium lauryl sulfate, can be used in appropriate quantities to provide a slurry of desired density and pumpability. Dry foaming agents can be incorporated into the dry composition before addition of water, while both dry and liquid agents can be added to the slurried composition. The air-entraining agent may be present in from 0.05 to substantially 0.5% by weight with from 0.1% to 0.5% by weight, preferred.

In addition to the above-described components, the subject compositions must contain certain specific material, as fully described below, to impart rheopectic properties to the aqueous dispersion of the composition. These materials are attapulgite, sepiolite and mixtures thereof which are of relatively large particle size.

Attapulgite or Attapulgus clay is an off-white or cream-colored needle-like crystal normally mined in Attapulgus, Georgia, and parts of Florida. Sepiolite (meerschaum) occurs in California, U.S.A. as well as in parts of Turkey, Spain, Greece and Morocco. In both instances, the mined material is dried to remove the free water. The dried product is initially broken into a tough, granulated "first cut" material which is then subjected to ball milling or the like to form very fine particulate powder. The resultant very fine powder (90% or greater amount has particle size of less than 44 microns) product is conventionally used as a thixotropic agent in paints, inks, adhesives and the like.

The attapulgite and sepiolite material found useful herein are the granular particles which have a particle size distribution such that at least 60 percent by weight (preferably at least 80 percent by weight) is of a particle size of at least 44 μm or greater (is retained on a No. 325 mesh screen of U.S. Standard Sieve Series). The average particle size should be at least 74 μm or greater, (retained on a No. 200 mesh sieve). When attapulgite is used, it is preferred that at least about 80 percent by weight of the attapulgite particles are at least 44 μm or larger. When sepiolite granular material is used, the particles can have a particle size distribution such that at least about 60% of the sepiolite particles are of 44 microns or larger. The subject attapulgite and sepiolite are obtainable as first cut material. Preferably, the particle size distribution has a major amount of material which is +100 mesh and most preferably + 50 mesh (297 microns or greater). Particles greater than +10 mesh (2000 microns) are not desired.

It is preferable that the subject attapulgite and sepiolite have low moisture content. The lower the moisture content, the greater the ability the clay has to impart rheopectic properties to aqueous dispersions of the instant composition. The moisture content should be less than substantially 16%, with from substantially 4 to 16 percent being preferred and from substantially 4 to 10 percent being most preferred. The preferred clays are dried at low temperatures of 10 to 121 °C (50 ° to 250 °F) to reduce the moisture content.

The presently required attapulgite and sepiolite granular material has unexpectedly been found to cause the desired rheopectic property to be imparted to aqueous dispersions of the subject composition. In contrast, other clays such as bentonite, kaolin as well as fine particulate (normally less than 44 μm) attapulgite and sepiolite powders do not provide the desired property.

The subject composition should contain a sufficient amount of the above-described coarse particulate clay to impart rheopectic properties to the resultant aqueous dispersion. Minimal experimentation will determine the exact amount needed for a particular formulation. It is normally desirable to use from 3 to 20 weight percent, preferably from 3 to 10 weight percent of the granular attapulgite, sepiolite or mixture thereof to provide the enhanced formulation.

This unexpected ability to impart a shear-thickening behavior is highly desired and of extreme technological utility in the process of mixing and subsequent spray application of the subject formulations onto the infrastructure of buildings. It is most desirable that an aqueous composition exhibit relatively low viscosity at the low shear mixing stage but significantly higher viscosity subsequent to being subjected to high shear forces of the pump and spray apparatus. The subject compositions are capable of providing an aqueous dispersion which is not sensitive to normal deviations in water content, are readily mixed and pumped to the application site without segregation and which provide coatings of high yield, i.e. placement over a relatively large area, per weight of the dry composition, at a given thickness of application. Yield is generally calculated by methods known in the art as board feet per dry weight of composition. The particularly preferred compositions are capable of providing a high yield of at least substantially 20 board feet per 20.4 Kg. (45 pounds) by weight of the dry composition. Generally, a yield in the range of substantially 7.6 to 10.7 board metres (25 to 35 board feet per 20.4 Kg (45 pounds) dry weight is obtained. The subject compositions also exhibit a low flow and are, therefore, capable of being applied to vertical surfaces without sagging, run-off, or fall-off. Instead, the subject compositions adhere to the applied substructure prior to set and after set.

In certain instances it is also desirable to incorporate into the mix a conventional (to the cement technology) water-retaining agent which allows more water to be incorporated into the slurry, thereby increasing yield, while retaining about the same level of adhesion to steel. A preferred water-retaining agent is hydroxypropylmethylcellulose.

The dry compositions of this invention are converted to pumpable slurries by addition of water. Generally, the water is added to the dry mix at the job site shortly before being pumped to the point of application. A water to cementitious binder ratio of about 1.2:1 to 2.5:1 is generally employed to provide a pumpable mixture of desired consistency and adhesiveness. Generally, a useful range of slurry density, which affords easy pumping, is substantially 560 to 881 Kg/m³ (35 to 55 lb/ft³).

The compositions of the instant invention exhibit low viscosity when mixed with water under the low shear forces normally produced by conventional mixers (e.g. mortar mixers having paddle or spiral blade

design or the like) to produce the coating composition at the construction or job site. When the resultant aqueous dispersion is subjected to high shear forces, such as is generated by piston pumps used to move and supply the aqueous composition to the site of application, the dispersion exhibits its rheopectic abilities and provides a high viscosity material. The high shear is provided by standard application pumps, such as a piston pump capable of pumping the subject composition at a rate of substantially from 0.028 to 0.071 m³/min (1 to 2.5 ft³/min). Each piston normally has a piston stroke of substantially 10 to 12.7 cm (4 to 5 inches) in a 7.6 cm (3 inch) bore with from 50 to 125 strokes per minute (SPM) per cylinder. The typical application setting is about 100 SPM which provides for a calculated volumetric output of substantially 0.042 to 0.057 m³/min/cyl. (1.5-2 cu.ft./min/cyl). The actual volumetric output may be only 25 to 50 percent of this due to the compressible nature of the fluid composition being moved and the amount of pumping pressure being generated.

The following examples are given for illustrative purposes only. All parts and percentages are by weight unless otherwise indicated.

Example I

A gypsum-based composition was prepared by dry mixing the following ingredients:

Ingredient	wt. %
Gypsum Plaster	82.5
Shredded Expanded Polystyrene of density 6 Kg/m ³ (0.375 lb/ft ³)	2.9
Cellulose fiber	6.2
Air-entraining agent (alpha-olefinsulfonate) (WITCONATE AOK)	0.2
Attapulgit granules (90+ % greater than 325 mesh US. Std.; Average Particle Size of 140 mesh)	8.2

The granules had a distribution of 17% of +50 mesh; 39% of +100 mesh; 31% of +200 mesh; and 13% of +325 mesh.

The formed dry composition was mixed with water at a water/solids ratio of 1.4 using a ribbon blade mortar mixer to provide a substantially uniform dispersion. The dispersion was transported to a spray applicator using a Thompson A375 sprayer-pump of a cylinder-pump design which imparts high shear forces to the dispersion. The dispersion is carried through 61 m (200 foot) hose at a pump pressure of 1172 kPa (170 lb/in²). The pumped slurry was applied to a 25.4 cm 10-inch steel I-beam to provide an even coating of 19 mm (0.75 inch) thickness. Viscosity measurements were made of the dispersion after mixing, after subjection to the high shear forces of the spray pump and also of the sprayed material. The formed coating was observed 20 minutes after application to determine if the dispersion commenced to set and if any cracking, sagging or adhesion fault (material falls off) occurred. The results are shown below:

Viscosity ¹			Observations			
Mixer	Pump	Sprayer	Set ²	Cracking	Sagging	Adhesion
27	21	16	Yes	No	No	Yes

¹Done according to ASTM C-472 using Vicat Viscometer adapted for sanded plaster.
Low numbers indicate high viscosity.

²Observation taken at 6 hours.

The components formed a dispersion of low viscosity in the mixer and thus was readily mixed to a uniform consistency. After subjection to the high shear forces of the pump the compositions' viscosity began to increase and became stiff after subjection to the spray-applicator. Thus, the dispersion exhibited a high degree of body which adhered well to the steel structure and did not crack or sag while setting to a dry uniform coating.

Example II

A gypsum-based composition was prepared by dry mixing the following:

Ingredients	wt. %
Gypsum Plaster	69.2
Perlite of density 62 Kg/m ³ (3.9 lb/ft ³)	13.9
Shredded Expanded Polystyrene of density 6 Kg/m ³ (0.375 lb/ft ³)	1.8
Cellulose fiber	5.0
Air-Entraining Agent (alpha olefin sulfonate)	0.2
Sepiolite granules (65% larger than 325 mesh US. Std. with average particle size of about 140 mesh)	9.0

The dry composition was mixed, pumped, sprayed and applied in the same manner as described in Example I above except that the water/solids ratio was 1.45 and the pump pressure was 1276 kPa (185 lb/in²). Viscosity measurements and observations were done as described in Example I above.

The results were:

Vicat Viscosity			Observations			
Mixer	Pump	Sprayer	Set	Cracking	Sagging	Adhesion
26	22	20	Yes	No	No	Yes

Again this composition formed a low-viscosity dispersion in the mixer. After subjection to the high-shear pump the viscosity increased and further increased upon application from the sprayer. The resultant high-viscosity dispersion adhered well to the steel beam and set without cracking or sagging.

A second composition was formed in the same manner as described above except that the sepiolite was not present. The initial composition had good viscosity in the mixer but, upon application, was too thin to remain on the steel beam, e.g. it exhibited sagging and poor adhesion.

Example III

A dry gypsum-based composition was formed by dry mixing the following:

Ingredients	wt. %
Gypsum Plaster	58.0
Perlite of density 62 Kg/m ³ (3.9 lb/ft ³)	23.2
Cellulose fiber	10.3
Air-entraining Agent (WITCONATE AOK)	0.2
Attapulgate granules (90% greater than 325 mesh U.S. Standard; Average Particle Size about 140 mesh)	8.3

The dry mixture was mixed with water (water/solid ratio of 1.7), pumped and spray-applied to a steel I-beam as described in Example I above. Vicat Viscosity measurements and observation of the formed coating were made as described in Example I above. The results are given below:

Vicat Viscosity			Observations			
Mixer	Pump	Sprayer	Set	Cracking	Sagging	Adhesion
20	20	18	Yes	No	No	Yes

The higher density aggregate used here required higher loading of aggregate and, therefore, a predictably more viscous initial dispersion. However, the material was readily mixable to a uniform dispersion which did exhibit the desired rheopectic properties after the pump and sprayer and thereby provided a coating having excellent properties.

Example IV

The following example is given for comparative purposes only.

A dry gypsum-based composition was formed by dry mixing the following:

Ingredients	wt. %
Gypsum plaster	68.8
Perlite of density 62 Kg/m ³ (3.9 lb/ft ³)	26.1
Cellulose fibers	4.9
Air-entraining Agent (WITCONATE AOK)	0.2

The dry mix was mixed with water (water/solid ratio of 1.4), pumped and spray-applied to a steel I-beam as described in Example 1 above. The following measurements and observations were made as described in Example 1.

Vicat Viscosity			Observations			
Mixer	Pump	Sprayer	Set	Cracking	Sagging	Adhesion
20	32	27	Yes	No	Yes	No

The above example shows that when the subject clay rheopectic agent was not present, the composition was thicker (lower number is more viscous) in mixer (harder to mix) and still too thin at the point of application. The resultant coating showed excessive sagging and poor adhesion.

Claims

1. A dry composition comprising a hydratable cement, porous aggregate particulate, a fibrous material, an air-entraining agent and a magnesium silicate-based clay in the form of granular attapulgite, sepiolite or mixtures thereof which have a particle size distribution such that at least 60 weight percent is greater than 44 μm and the average particle size is at least 72 μm ; said clay being present in an amount to impart, on addition of water, rheopectic properties to an aqueous dispersion of said composition.
2. The composition of claim 1 having from about 50 to 90 wt. percent cement, substantially from 3 to 40 vol. percent aggregate, substantially from 4 to 10 wt. percent organic fibrous material, from 0 to 2 wt. percent of an inorganic fibrous material, substantially from 0.05 to 0.5 wt. percent air-entraining agent, and substantially from 3 to 20 wt. percent of said clay having a water content of less than substantially 16 wt. percent.
3. The composition of claim 1 or 2, wherein the porous aggregate is a polystyrene in the form of shredded expanded polystyrene beads, shredded polystyrene beadboard, shredded extruded polystyrene or mixtures thereof.
4. The composition of claim 3 wherein the shredded polystyrene has a density of substantially 3.2 to 12.8 Kg/m³ (0.2 to 0.8 lb/ft³) and is present as substantially from 1 to 5 weight percent of said composition; and wherein the hydratable cement is gypsum and is present as at least substantially 75 weight percent of said composition.
5. The composition of claim 1 or 2, wherein the porous aggregate is an exfoliated vermiculite.
6. The composition of claim 5 wherein the exfoliated vermiculite has a density of substantially from 80 to 112 Kg/m³ (5 to 7 lb/ft³) and is present as substantially from 20 to 40 weight percent; and wherein the



The higher density aggregate used here required higher loading of aggregate and, therefore, a predictably more viscous initial dispersion. However, the material was readily mixable to a uniform dispersion which did exhibit the desired rheopectic properties after the pump and sprayer and thereby provided a coating having excellent properties.

Example IV

The following example is given for comparative purposes only.
A dry gypsum-based composition was formed by dry mixing the following:

Ingredients	wt. %
Gypsum plaster	68.8
Perlite of density 62 Kg/m ³ (3.9 lb/ft ³)	26.1
Cellulose fibers	4.9
Air-entraining Agent (WITCONATE AOK)	0.2

The dry mix was mixed with water (water/solid ratio of 1.4), pumped and spray-applied to a steel I-beam as described in Example 1 above. The following measurements and observations were made as described in Example 1.

Vicat Viscosity			Observations			
Mixer	Pump	Sprayer	Set	Cracking	Sagging	Adhesion
20	32	27	Yes	No	Yes	No

The above example shows that when the subject clay rheopectic agent was not present, the composition was thicker (lower number is more viscous) in mixer (harder to mix) and still too thin at the point of application. The resultant coating showed excessive sagging and poor adhesion.

Claims

1. A dry composition comprising a hydratable cement, porous aggregate particulate, a fibrous material, an air-entraining agent and a magnesium silicate-based clay in the form of granular attapulgite, sepiolite or mixtures thereof which have a particle size distribution such that at least 60 weight percent is greater than 44 μm and the average particle size is at least 72 μm ; said clay being present in an amount to impart, on addition of water, rheopectic properties to an aqueous dispersion of said composition.
2. The composition of claim 1 having from about 50 to 90 wt. percent cement, substantially from 3 to 40 vol. percent aggregate, substantially from 4 to 10 wt. percent organic fibrous material, from 0 to 2 wt. percent of an inorganic fibrous material, substantially from 0.05 to 0.5 wt. percent air-entraining agent, and substantially from 3 to 20 wt. percent of said clay having a water content of less than substantially 16 wt. percent.
3. The composition of claim 1 or 2, wherein the porous aggregate is a polystyrene in the form of shredded expanded polystyrene beads, shredded polystyrene beadboard, shredded extruded polystyrene or mixtures thereof.
4. The composition of claim 3 wherein the shredded polystyrene has a density of substantially 3.2 to 12.8 Kg/m³ (0.2 to 0.8 lb/ft³) and is present as substantially from 1 to 5 weight percent of said composition; and wherein the hydratable cement is gypsum and is present as at least substantially 75 weight percent of said composition.
5. The composition of claim 1 or 2, wherein the porous aggregate is an exfoliated vermiculite.
6. The composition of claim 5 wherein the exfoliated vermiculite has a density of substantially from 80 to 112 Kg/m³ (5 to 7 lb/ft³) and is present as substantially from 20 to 40 weight percent; and wherein the



hydratable cement is a gypsum and is present as substantially from 50 to 70 weight percent.

7. The composition of claim 1 or 2, wherein the porous aggregate is an expanded perlite having a density of substantially from 32 to 192 Kg/m³ (2 to 12 lb/ft³).
8. The composition of claim 7 wherein the expanded perlite has a density of substantially from 32 to 80 Kg/m³ (2 to 5 lb/ft³) and is present as substantially from 5 to 30 weight percent; and wherein the hydratable cement is gypsum and is present as substantially from 50 to 70 weight percent.
9. The composition of claim 1, 2, 3, 4, 5, 6, 7 or 8 wherein the magnesium silicate-based clay is dried, granulated attapulgite clay wherein at least substantially 80 weight percent of said granulate has a particle size of at least 44 μm, has a water content of less than substantially 16 weight percent, and is present as substantially from 3 to 10 weight percent in said composition.
10. The composition of claim 1, 2, 3, 4, 5, 6, 7 or 8 wherein the magnesium silicate-based clay is dried, granulated sepiolite clay wherein at least substantially 60 weight percent of said granulate has a particle size of at least 44 μm, has a water content of less than substantially 16 weight percent and is present as substantially from 3 to 10 weight percent of said composition.
11. The composition of claim 1 having substantially from 1 to 5 wt. percent of a shredded polystyrene; at least substantially 75 weight percent of a hydratable cement composed of hydratable gypsum plaster; fibrous material composed of from substantially 4 to 10 wt. percent of high wet bulking organic fibres, and from 0 to substantially 2 wt. percent glass fibres; substantially from 0.1 to 0.5 wt. percent of the air-entraining agent; and substantially from 3 to 10 wt. percent of the dried, granular magnesium silicate clay.
12. The composition of claim 1 having substantially 20 to 40 wt. percent of an exfoliated vermiculite; at least substantially 50 weight percent of the hydratable cement composed of a hydratable gypsum plaster; fibrous material composed of substantially from 4 to 10 wt. percent of high wet bulking organic fibres, and 0 to 2 wt. percent of glass fibres; substantially from 0.1 to 0.5 wt. percent of an air-entraining agent and substantially from 3 to 10 wt. percent of a dried, granular magnesium silicate clay.
13. The composition of claim 1 having substantially from 5 to 30 wt. percent of an expanded perlite having a density of substantially 32-80 Kg/m³ (2-5 lb/ft³); at least substantially 50 weight percent of hydratable cement composed of a hydratable gypsum plaster; fibrous material composed of substantially from 4 to 15 wt. percent high wet bulking organic fibres, and 0 to substantially 2 wt. percent glass fibres; substantially from 0.1 to 0.5 wt. percent of an air-entraining agent; and substantially from 3 to 20 wt. percent of a dried, granular magnesium silicate clay.
14. An aqueous dispersion formed upon the addition of water to the composition of claim 1, 2, 4, 6, 8, 11, 12 or 13 wherein the ratio of water to cementitious binder is substantially from 1.2 to 2.5 and said dispersion exhibits an increase in viscosity after application of high shear forces to said dispersion.
15. A process of providing a fireproofing and/or acoustic insulation to construction metal infrastructure comprising forming an aqueous dispersion from water and dry components comprising substantially from 50 to 90 wt. percent of a hydratable cement; substantially 3 to 40 vol. percent of a porous aggregate selected from vermiculite, perlite or shredded polystyrene; substantially 4 to 10 wt. percent of an organic fibrous material and 0 to substantially 2 wt. percent of an inorganic fibrous material; substantially 0.05 to 0.5 wt. percent of an air-entraining agent; and substantially 3 to 20 wt. percent of a magnesium silicate clay selected from attapulgite, sepiolite or mixtures thereof having a particle size distribution such that at least 60 wt. percent is greater than 44 μm and the average particle size is greater than 72 μm; subjecting the formed dispersion to high shear forces to cause the viscosity of said dispersion to increase; and applying the resultant dispersion to a construction infrastructure.
16. The process of claim 15 wherein the water to cement ratio is substantially 1.2 to 2.5:1 to provide an initial dispersion having a density of from substantially 560 to 881 Kg/m³ (35 to 55 lb/ft³).



17. The process of claim 15 wherein the high shear force is generated by a piston-pump, alone or in combination with the spray applicator.
18. The process of claim 15, 16, or 17 wherein the hydratable cement is gypsum; the aggregate is shredded polystyrene; the organic fibrous material is cellulosic material; and said clay has a water content (as the initial dry component) of less than 16 wt. percent.

Patentansprüche

1. Trockene Zusammensetzung, die einen hydratisierbaren Zement, poröse teilchenförmige Zuschlagstoffe, ein Fasermaterial, einen Luftporenbildner und einen Ton auf Magnesiumsilikat-Basis in Form von Attapulgitgranulat, Sepiolitgranulat oder Mischungen davon mit einer Teilchengrößeverteilung umfaßt, so daß mindestens 60 Gew.-% größer als 44 µm sind und die mittlere Teilchengröße mindestens 72 µm beträgt, wobei der Ton in einer Menge vorhanden ist, daß er bei Zugabe von Wasser einer wäßrigen Dispersion der Zusammensetzung rheopaktische Eigenschaften verleiht werden.
2. Zusammensetzung nach Anspruch 1, die etwa 50 bis 90 Gew.-% Zement, etwa 3 bis 40 Vol.-% Zuschlagstoff, etwa 4 bis 10 Gew.-% organisches Fasermaterial, 0 bis 2 Gew.-% eines anorganischen Fasermaterials, etwa 0,05 bis 0,5 Gew.-% Luftporenbildner und etwa 3 bis 20 Gew.-% des Tons mit einem Wassergehalt von weniger als etwa 16 Gew.-% enthält.
3. Zusammensetzung nach Anspruch 1 oder 2, in der der poröse Zuschlagstoff ein Polystyrol in Form von zerkleinerten, expandierten Polystyrolkugeln, zerkleinerten Platten aus Polystyrolkugeln, zerkleinertem extrudiertem Polystyrol oder Mischungen davon ist.
4. Zusammensetzung nach Anspruch 3, in der das zerkleinerte Polystyrol eine Dichte von etwa 3,2 bis 12,8 kg/m³ (0,2 bis 0,8 lb/ft³) aufweist und zu etwa 1 bis 5 Gew.-% in der Zusammensetzung vorhanden ist und der hydratisierbare Zement Gips ist und zu mindestens 75 Gew.-% in der Zusammensetzung vorhanden ist.
5. Zusammensetzung nach Anspruch 1 oder 2, in der der poröse Zuschlagstoff ein aufgeblätterter Vermiculit ist.
6. Zusammensetzung nach Anspruch 5, in der der aufgeblätterte Vermiculit eine Dichte von etwa 80 bis 112 kg/m³ (5 bis 7 lb/ft³) aufweist und zu etwa 20 bis 40 Gew.-% vorhanden ist und der hydratisierbare Zement Gips ist und zu etwa 50 bis 70 Gew.-% vorhanden ist.
7. Zusammensetzung nach Anspruch 1 oder 2, in der der poröse Zuschlagstoff ein expandierter Perlit mit einer Dichte von 32 bis 192 kg/m³ (2 bis 12 lb/ft³) ist.
8. Zusammensetzung nach Anspruch 7, in der der expandierte Perlit eine Dichte von etwa 32 bis 80 kg/m³ (2 bis 5 lb/ft³) aufweist und in etwa 5 bis 30 Gew.-% vorhanden ist und der hydratisierbare Zement Gips ist und in einer Menge von etwa 50 bis 70 Gew.-% vorhanden ist.
9. Zusammensetzung nach einem der Ansprüche 1, 2, 3, 4, 5, 6, 7 oder 8, in der der Ton auf Magnesiumsilikat-Basis getrocknetes Attapulgit-Tongranulat ist, wobei mindestens etwa 80 Gew.-% des Granulats eine Teilchengröße von mindestens 44 µm und einen Wassergehalt von weniger als etwa 16 Gew.-% aufweist und zu etwa 3 bis 10 Gew.-% in der Zusammensetzung vorhanden ist.
10. Zusammensetzung nach einem der Ansprüche 1, 2, 3, 4, 5, 6, 7 oder 8, in der der Ton auf Magnesiumsilikat-Basis getrocknetes Sepiolit-Tongranulat ist, wobei mindestens etwa 60 Gew.-% des Granulats eine Teilchengröße von mindestens 44 µm und einen Wassergehalt von weniger als etwa 16 Gew.-% aufweist und zu etwa 3 bis 10 Gew.-% in der Zusammensetzung vorhanden ist.
11. Zusammensetzung nach Anspruch 1, die etwa 1 bis 5 Gew.-% eines zerkleinerten Polystyrols, mindestens etwa 75 Gew.-% eines hydratisierbaren Zements, der aus hydratisierbarem Baugips zusammengesetzt ist, Fasermaterial, das aus etwa 4 bis 10 Gew.-% naß stark quellfähigen organischen Fasern und 0 bis etwa 2 Gew.-% Glasfasern zusammengesetzt ist, etwa 0,1 bis 0,5 Gew.-% des



Luftporenbildners und etwa 3 bis 10 Gew.-% des getrockneten Magnesiumsilikat-Tongronulats enthält.

12. Zusammensetzung nach Anspruch 1, die etwa 20 bis 40 Gew.-% eines aufgeblätterten Vermiculits, mindestens etwa 50 Gew.-% des hydratisierbaren Zements, der aus einem hydratisierbaren Baugips zusammengesetzt ist, Fasermaterial, das aus etwa 4 bis 10 Gew.-% naß stark quellfähigen organischen Fasern und 0 bis 2 Gew.-% Glasfasern zusammengesetzt ist, etwa 0,1 bis 0,5 Gew.-% eines Luftporenbildners und etwa 3 bis 10 Gew.-% eines getrockneten Magnesiumsilikat-Tongranulats enthält.
13. Zusammensetzung nach Anspruch 1, die etwa 5 bis 30 Gew.-% eines expandierten Perlits, das eine Dichte von etwa 32 bis 80 kg/m³ (2 bis 5 lb/ft³) aufweist, mindestens etwa 50 Gew.-% hydratisierbaren Zement, der aus einem hydratisierbaren Baugips zusammengesetzt ist, Fasermaterial, das aus etwa 4 bis 15 Gew.-% naß stark quellfähigen organischen Fasern und 0 bis etwa 2 Gew.-% Glasfasern zusammengesetzt ist, etwa 0,1 bis 0,5 Gew.-% eines Luftporenbildners und etwa 3 bis 20 Gew.-% eines getrockneten Magnesiumsilikat-Tongranulats enthält.
14. Wässrige Dispersion, die nach Zugabe von Wasser zu einer Zusammensetzung gemäß einem der Ansprüche 1, 2, 4, 6, 8, 11, 12 oder 13 gebildet wird, wobei das Verhältnis von Wasser zu Zementbindemittel etwa 1,2 bis 2,5 ist und die Dispersion ein Ansteigen der Viskosität nach Einwirkung von hohen Scherkräften zeigt.
15. Verfahren, um einer Metallkonstruktion eine Feuer- und/oder Schallisolierung zu verleihen, bei dem eine wässrige Dispersion aus Wasser und trockenen Komponenten gebildet wird, die etwa 50 bis 90 Gew.-% eines hydratisierbaren Zements, etwa 3 bis 40 Vol.-% eines porösen Zuschlagstoffs, ausgewählt aus Vermiculit, Perlit oder zerkleinertem Polystyrol, etwa 4 bis 10 Gew.-% eines organischen Fasermaterials und 0 bis etwa 2 Gew.-% eines anorganischen Fasermaterials, etwa 0,05 bis 0,5 Gew.-% eines Luftporenbildners und etwa 3 bis 20 Gew.-% eines Magnesiumsilikat-Tons umfaßt, der ausgewählt ist aus Attapulgit, Sepiolit oder Mischungen davon, mit einer Teilchengrößeverteilung, so daß mindestens 60 Gew.-% größer als 44 µm sind und die durchschnittliche Teilchengröße größer als 72 µm ist, die gebildete Dispersion hohen Scherkräften ausgesetzt wird, um die Viskosität der Dispersion ansteigen zu lassen, und die erhaltene Dispersion auf die Metallkonstruktion appliziert wird.
16. Verfahren nach Anspruch 15, bei dem das Verhältnis Wasser zu Zement etwa 1,2 bis 2,5 : 1 beträgt, um eine Anfangsdispersion mit einer Dichte von etwa 560 bis 881 kg/m³ (35 bis 55 lb/ft³) zu liefern.
17. Verfahren nach Anspruch 15, bei dem die hohe Scherkraft durch eine Kolbenpumpe allein oder in Verbindung mit dem Spritzapplikator erzeugt wird.
18. Verfahren nach einem der Ansprüche 15, 16 oder 17, bei dem der hydratisierbare Zement Gips ist, der Zuschlagstoff zerkleinertes Polystyrol ist, das organische Fasermaterial Cellulosematerial ist und der Ton einen Wassergehalt (als anfängliche Trockenkomponente) von weniger als 16 Gew.-% aufweist.

Revendications

1. Composition sèche comprenant un ciment hydratable, une matière particulaire d'agrégat poreuse, un matériau fibreux, un agent d'entraînement d'air et une argile à base de silicate de magnésium sous la forme de sépiolite, d'attapulгите granulaire ou de mélange de celles-ci qui ont une distribution de taille de particules telle qu'au moins 60% en poids est supérieure à 44 µm et que la taille moyenne de particules est d'au moins 72 µm ; ladite argile étant présente en une quantité pour impartir, lors de l'addition d'eau, des propriétés rhéopéctiques à une dispersion aqueuse de ladite composition.
2. Composition selon la revendication 1 ayant d'environ 50 à 90% en poids de ciment, de substantiellement 3 à 40% volume d'agréats, de substantiellement 4 à 10% en poids de matériau fibreux organique, de 0 à 2% en poids d'un matériau fibreux inorganique, de substantiellement 0,05 à 0,5% en poids d'agent d'entraînement d'air, et de substantiellement 3 à 20% en poids de ladite argile ayant une teneur en eau inférieure à substantiellement 16% en poids.
3. Composition selon la revendication 1 ou 2, où l'agrégat poreux est un polystyrène sous la forme de billes de polystyrène expansées déchiquetées, un panneau de billes de polystyrène déchiqueté, un



polystyrène extrudé déchiqueté ou des mélanges de ceux-ci.

4. Composition selon la revendication 3 où le polystyrène déchiqueté a une densité de substantiellement 3,2 à 12,8 kg/m³ (0,2 à 0,8 livre/pied³) et est présent comme substantiellement de 1 à 5% en poids de ladite composition ; et où le ciment hydratable est du gypse et est présent comme au moins substantiellement 75% en poids de ladite composition.
5. Composition selon la revendication 1 ou 2, où l'agrégat poreux est une vermiculite exfoliée.
6. Composition selon la revendication 5 où la vermiculite exfoliée a une densité de substantiellement 80 à 112 kg/cm³ (5 à 7 livres/pied³) et est présente comme substantiellement de 20 à 40% en poids ; et où le ciment hydratable est un gypse et est présent comme substantiellement de 50 à 70% en poids.
7. Composition selon la revendication 1 ou 2, où l'agrégat poreux est une perlite expansée ayant une densité de substantiellement 32 à 192 kg/cm³ (2 à 12 livres/pied³).
8. Composition selon la revendication 7 où la perlite expansée a une densité de substantiellement 32 à 80 kg/m³ (2 à 5 livre/pied³) et est présente comme substantiellement de 5 à 30 en poids ; et où le ciment hydratable est le gypse et est présent comme substantiellement de 50 à 70% en poids.
9. Composition selon la revendication 1, 2, 3, 4, 5, 6, 7 ou 8 où l'argile à base de silicate de magnésium est séchée, l'argile d'attapulгите granulée où au moins substantiellement 80% en poids dudit granulat à une taille de particules d'au moins 44 μm, a une teneur en eau inférieure à substantiellement 16% en poids, et est présente comme substantiellement de 3 à 10% en poids de ladite composition.
10. Composition selon la revendication 1, 2, 3, 4, 5, 6, 7 ou 8 où l'argile à base de silicate de magnésium est séchée, l'argile sépiolite granulée où au moins substantiellement 60% en poids dudit granulat à une taille de particules d'au moins 44 μm, a une teneur en eau de moins de substantiellement 16% en poids et est présent comme substantiellement de 3 à 10% en poids de ladite composition.
11. Composition selon la revendication 1 ayant substantiellement de 1 à 5% en poids d'un polystyrène déchiqueté; au moins substantiellement 75% en poids d'un ciment hydratable composé d'un plâtre de gypse hydratable ; un matériau fibreux composé de substantiellement 4 à 10% en poids de fibres organiques volumineuses à humidité élevée, et de 0 à substantiellement 2% en poids de fibres de verre ; substantiellement de 0,1 à 0,5% en poids de l'agent d'entraînement d'air ; et substantiellement de 3 à 10% en poids de l'argile de silicate de magnésium séchée, granulaire.
12. Composition selon la revendication 1 ayant substantiellement 20 à 40% en poids d'une vermiculite exfoliée ; au moins substantiellement 50% en poids du ciment hydratable composé d'un plâtre de gypse hydratable ; un matériau fibreux composé de substantiellement 4 à 10% en poids de fibres organiques volumineuses à humidité élevée, et de 0 à 2% en poids de fibres de verre ; substantiellement de 0,1 à 0,5% en poids d'un agent d'entraînement d'air et substantiellement de 3 à 10% en poids d'une argile de silicate de magnésium séchée, granulaire.
13. Composition selon la revendication 1 ayant substantiellement de 5 à 30% en poids d'une perlite expansée ayant une densité de substantiellement 32 à 80 kg/m³ (2 à 5 livres/pied³) ; au moins substantiellement 50% en poids de ciment hydratable composé d'un plâtre de gypse hydratable ; un matériau fibreux composé de substantiellement 4 à 15% en poids de fibres organiques volumineuses à humidité élevée, et de 0 à substantiellement 2% en poids de fibres de verre ; de substantiellement 0,1 à 0,5% en poids d'un agent d'entraînement d'air ; et de substantiellement 3 à 20% en poids d'une argile de silicate de magnésium séchée, granulaire.
14. Dispersion aqueuse formée lors de l'addition d'eau à la composition selon la revendication 1, 2, 4, 6, 8, 11, 12 ou 13 où le rapport d'eau au liant cimenteux est substantiellement de 1,2 à 2,5 et ladite dispersion montre une augmentation de viscosité après application de forces de cisaillement élevées à ladite dispersion.



- 5 15. Procédé de fourniture d'une isolation au feu et/ou acoustique à une infrastructure métallique de construction comprenant la formation d'une dispersion aqueuse à partir d'eau et des composants secs comprenant substantiellement de 50 à 90% en poids d'un ciment hydratable ; substantiellement de 3 à 40% en volume d'un agrégat poreux choisi parmi la vermiculite, la perlite ou le polystyrène déchiqueté ; substantiellement de 4 à 10% en poids d'un matériau fibreux organique et de 0 à substantiellement 2% en poids d'un matériau fibreux inorganique; substantiellement de 0,05 à 0,5% en poids d'un agent d'entraînement d'air ; et substantiellement de 3 à 20% en poids d'une argile de silicate de magnésium choisie parmi l'attapulgit, la sépiolite ou les mélanges de celles-ci ayant une distribution de taille de particules telle qu'au moins 60% en poids est supérieure à 44 μm et la taille de particules moyenne est supérieure à 72 μm ; soumission de la dispersion formée à des forces de cisaillement élevées pour faire que la viscosité de ladite dispersion augmente ; et application de la dispersion résultante à une infrastructure de construction.
- 10
- 15 16. Procédé selon la revendication 15 où le rapport eau à ciment est substantiellement de 1,2 à 2,5:1 pour fournir une dispersion initiale ayant une densité de substantiellement 560 à 881 kg/m^3 (35 à 55 livres/pied³).
- 20 17. Procédé selon la revendication 15 où la force de cisaillement élevée est générée par une pompe à piston, seule ou en combinaison avec l'applicateur de vaporisation.
- 25 18. Procédé selon la revendication 15, 16 ou 17 où le ciment hydratable est le gypse ; l'agrégat est le polystyrène déchiqueté ; le matériau fibreux organique est un matériau cellulosique ; et ladite argile a une teneur en eau (sous la forme du composant sec initial) inférieure à 16% en poids.
- 30
- 35
- 40
- 45
- 50
- 55