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(54) Title: A COMPOSITION SUITABLE FOR USE IN BUILDING CONSTRUCTION

(57) Abstract: The present invention provides a composition suitable for use in a building construction wherein said composition comprises water, a thickener, a pH stabilizer, a preservative, a coalescing agent, an anionic pre-polymerized binder, bottom ash, silica particle mixture, stone grit, a filler and an extender. The invention also provides a process for manufacturing of the composition. The invention provides the composition which is environmental friendly, Portland cement free, wet mix in ready to use form with extended pot life and shelf life. The composition prepared in accordance with the present invention is used as a mortar, a plaster/render, repair mortar, grouting mortar and as crack filler.



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A COMPOSITION SUITABLE FOR USE IN BUILDING CONSTRUCTION

FIELD OF THE INVENTION

The present invention relates to a composition suitable for use in the building construction industry.

DEFINITION

In the context of the present invention the term "Mortar composition" includes binding mortar, adhesive mortar, plastering mortar, grouting mortar and crack filler.

BACKGROUND OF THE INVENTION

For thousands of years the architecture and construction of buildings were closely associated with the use of mortars. These mortars were mainly based on mineral binders like lime, cement and gypsum. The mortars have mainly been used as adhesives for clay bricks, fly ash bricks, aerated concrete blocks, and cement blocks, as a plaster/render, as crack filler and for coating walls.

The Lime mortar composed of lime, an aggregate such as sand, and water is one of the oldest known types of mortars, used even in the Indus valley civilization. With the introduction of Portland cement, the use of lime mortar in newer constructions gradually declined. However the soft, porous properties of lime mortar provide certain advantages when working with building materials such as natural stone and terracotta.

Cement is the vital binding agent in concretes, mortars and renders, and is used for the production of walling blocks and roofing tiles. Since its invention in the first half of the 19th century, Portland cement, a type of cement, has become the most widely available cementitious material due to its ease of use, quick setting properties and compressive strength. In conventional mortars, typically Portland cement, sand/silica and water and optionally other additives act as the main ingredients along with some additives like waterproofing agents, fibers, re-dispersible polymers and extenders are mixed using on-site mixing technology and applied on to the blocks/bricks. After application of the mortar curing, essentially with water

for at least seven days to complete the hydration process within the mortar and to attain the optimum strength of the mortar bond, is required. Inadequate curing adversely affects the hydration process and leads to cracking and shrinkage upon drying. Also, curing with hard water affects the bonding properties due to presence of contaminants. Furthermore, Portland cement based mortar suffers from some disadvantages such as delayed hardening, low tensile strength, large drying shrinkage and low chemical resistance. Also, manufacturing of Portland cement causes environmental impacts at all stages of the process due to substantial emission of carbon dioxide which results in global warming.

Generally, the most common practice of mortaring in masonry work involves on site mixing of cement, sand and water in a predefined ratio and the wet mortar is applied to building blocks. The quality of such a mortar depends on the raw materials used, their correct mixing ratio, the homogeneity of the mixture, the quality and the quantity of water used and the consistency of the final mortar. However, the consistency of such on site mixed mortars may vary due to errors that can occur during mixing of the raw materials, affecting the homogeneity of the final product which results in an inconsistent mortar mixture. The current practices of construction involve separate inventory management and material handling on site. This involves a lot of time, manpower as well as energy.

EXISTING KNOWLEDGE

Following patent applications/granted patents disclose various binding compositions employed as building materials.

US Patent 4229329 discloses a fire retardant coating composition which is used as a paint or as a mastic comprising fly ash and polymer emulsion binder. The composition disclosed in the abovementioned cited patent document comprises ultra-fine pulverized ash in an amount of 7-31% weight of the composition; a binder comprising a low viscosity vinyl acrylic type emulsion polymer in an amount of 1-40% by weight of the composition; fillers comprising gypsum or fiberglass in an amount of 20%-30% by wt. of the total composition; water constituting from 8-48% by weight of the composition; and additives like drying agent, defoamer, plasticizer and the like. However, the composition disclosed in the cited patent document is specifically employed as a fire retardant coating composition for vertical surfaces and not as a mortar or cementitious material in the construction industry. Also, fillers and

additives like defoaming agents and drying agents are added in the abovementioned composition in such proportions so as to essentially obtain a fire retardant coating composition.

Our PCT application WO09007994, hereafter please refer to as PCT application, discloses a composition for the production of fly ash pre-polymerized resin emulsion composite useful as a mortar, as a crack filler and as a plaster/render. The composition disclosed in the abovementioned patent application comprises ultra fine pulverized fly ash and bottom ash, low-viscosity vinyl acetate as a polymer binder, water, fillers and one or more additives. The composition disclosed in the abovementioned application is a ready to use material and hence the consistency and homogeneity of the material is assured. However, the required bond strength of the mortar has not been achieved when low-viscosity vinyl acetate and fly ash were employed in the composition.

GB2438072 discloses a dry composition for preparing a flowable mixture for acoustic sound insulation. A dry composition includes at least 50% by volume of rubber crumb, aggregate material including at least 10% by total dry composition volume pulverized fuel ash, and a hydraulic binding agent including both cement based compound of between 5 and 20% by total dry composition and preferably between 10 and 15% and a hydraulic polymeric binder which is a copolymer of Ethylene-vinyl acetate.

US Patent 5244304 discloses a paving composition which is used in patching a depression in asphalt pavement. The composition comprises cement binder, water dispersible latex polymer binder based on ethylene-vinyl acetate copolymer, filler composition, water and additives. The invention also provides a method for using the composition in paving, repairing or filling depressions in asphalt pavement.

The compositions disclosed in the cited patent documents are designed as a job-site mixing compositions in which the applicator mixes the raw materials with the water available on site before applying it on the surface and hence the quality of the final product is not maintained because of the abrupt mixing of the raw materials.

Thus, there is felt a need to develop a composition suitable for use in building construction which is completely Portland cement free and in ready to use form. Also, to develop a product which does not require any pre-wetting or post-curing with water which saves time, manual labour and precious water and at the same time has the desired bond strength.

OBJECTS OF THE INVENTION

It is an object of the present invention to provide a construction composition which is Portland cement free.

Another object of the present invention is to provide a construction composition which can be used as a mortar, plaster/render, crack filler and as a plaster repair.

Another object of the present invention is to provide a construction composition which on application does not need any pre-wetting and/or post curing with water.

Another object of the present invention is to provide a construction composition with extended pot life and shelf life.

Yet another object of the present invention is to provide a construction composition which is non hazardous for the applicator and the end user.

Yet another object of the present invention is to provide a construction composition which saves time in application, manual labour.

Still another object of the present invention is to provide a construction composition which uses the major pollutants and hence offers an environmental friendly composition.

Still another object of the present invention is to provide a construction composition which is hassle free.

Still another object of the present invention is to provide a construction composition which can be directly applied on brick walls, concrete blocks, fly ash bricks, concrete materials, stone, ply boards and asbestos sheets.

Still further object of the present invention is to provide a construction composition which is cost-effective.

Still further object of the present invention is to provide a construction composition which is based on air drying/curing.

One more object of the present invention is to provide a construction composition which has adequate bond strength and offers good weather resistance.

SUMMARY OF THE INVENTION

In accordance with the present invention, there is provided a composition suitable for use in building construction comprising

- a. water in an amount of about 4% to about 49% of the mass of the total composition;
- b. a thickener in an amount of about 0.15% to about 4% of the mass of the total composition;
- c. a pH stabilizer in an amount of about 0.45% to about 1.5% of the mass of the total composition;
- d. a preservative in an amount of about 0.05% to about 1.25% of the mass of the total composition;
- e. a coalescing agent in an amount of about 0.22% to about 2.25% of the mass of the total composition;
- f. an anionic pre-polymerized binder having intrinsic viscosity in the range of 250 cps to 4000 cps in an amount of about 2% to about 45% of the mass of the total composition;
- g. bottom ash of particle size of above 45 microns in an amount of about 4.5% to about 76% of the mass of the total composition;

- h. silica particle mixture of particle size in the range of about 100 microns to about 4000 microns in an amount of about 0% to about 73.5% of the mass of the total composition;
- i. stone grit of hardness of greater than 2 on the Mohs scale in an amount of about 0 % to about 50 % of the mass of the total composition;
- j. a filler in an amount of about 0 % to about 55 % of the mass of the total composition;
- k. an extender in an amount of about 0 % to about 75 % of the mass of the total composition; and
- l. optionally at least one additive selected from a group of additives consisting of a water proofing/repellant agent, dispersing agent and a wax emulsion.

Typically, the water is demineralized water.

Typically, the demineralized water is obtained by reverse osmosis.

Alternatively, the water is distilled water or deionized water, soft water and water is free from bacteria.

Typically, the thickener is at least one selected from cellulosic or non-cellulosic compounds which include acrylic polymer, acrylic emulsion copolymer, Hydroxyethylcellulose, acrylic copolymer and crystalline hydrated magnesium aluminium silicate.

Preferably, the thickener is an acrylic polymer.

Typically, the pH stabilizer is selected from a group consisting of liquid ammonia, triethylamine, ammonium chloride and ammonium hydroxide.

Typically, the pH stabilizer is liquid ammonia having concentration in the range of 15% to 30%.

Typically, the pH stabilizer is triethylamine.

Typically, the preservative is selected from a group consisting of chloromethyl-methylisothiazolone formaldehyde, carbendazim-octylisothiazolone and isothiazolinones.

Typically, the coalescing agent is selected from a group consisting of monoethylene glycol, diethylene glycol, propylene glycol, taxanol, mixed xylene, gentamicin sulphate and hexane.

Preferably, the coalescing agent is either mixed xylene or diethylene glycol or gentamicin sulphate.

Preferably, the anionic pre-polymerized binder is water dispersible.

In accordance with one embodiment of the present invention, the anionic pre-polymerized binder is a homopolymer.

Typically, the anionic pre-polymerized binder is selected from a group consisting of acrylic polymer, styrene polymer, CNSL (Cashew nut shell liquid) emulsion, shellac emulsion, low viscosity vinyl acrylic polymer, elastomeric acrylic emulsion and silicon emulsion.

Preferably, the anionic pre-polymerized binder is an acrylic polymer or styrene polymer.

In accordance with another embodiment of the present invention the anionic pre-polymerized binder is a copolymer of acrylic and styrene.

Typically, the anionic pre-polymerized acrylic and styrene copolymer are in the ratio of 70 to about 30 by mass.

Preferably, the anionic pre-polymerized acrylic and styrene copolymer are in the ratio of 50 to about 50 by mass.

Typically, the glass transition temperature of the anionic pre-polymerized binder is in range of about 10⁰C to 50⁰C.

Preferably, the glass transition temperature of the anionic pre-polymerized binder is in range of about 10⁰C to 30⁰C.

Typically, the anionic pre-polymerized binder contains particulate monomeric units in the form of suspended monomeric particles having particle size below 8 microns preferably in the range of about 4 to 5 microns.

Typically, the pH of the anionic prepolymerized binder is in the range of 3 to 10.

Typically, the bottom ash is ash obtained from a wet or dry bottom coal combustion boiler and has moisture content less than about 0.5%.

In accordance with the present invention, said composition includes fly ash in an amount of 0% to 76% of the mass of the total composition.

Alternatively, the silica used is at least one silica derived from a group consisting of crystalline silica derived from rice husk, fumed silica, foundry silica, quarry silica, river bed silica or seashore silica which is used after desalinization.

Typically, the composition comprises silica particle mixture having particle sizes of 1.7 mm, 1.4 mm, 0.4 mm and 0.2mm respectively in proportions of about 10%, 30%, 14% and 55% of the total mass of silica.

In accordance with other embodiment of the present invention said composition comprises silica particle mixture having particle size of 0.4mm and 0.2 mm respectively in the proportions of 93.33% and 6.67% of the total mass of silica.

In accordance with another embodiment of the present invention said composition comprises silica particle mixture having particle size of 0.2 mm and 0.6 mm respectively in the proportions of about 10% and about 90%.

In accordance with other embodiment of the present invention the stone grit has irregular shapes and has a particle size in the range of 1mm to 4mm.

Typically, the stone grit is selected from the group of stones selected from consisting of Shahabad, kotta, basalt, granite, sandstone, limestone, marble, soapstone and slate.

Typically, filler is at least one filler selected from a group of fillers consisting of coir dust, coconut powder, polystyrene balls, plastic wastes, rubber crumbs, glass beads, coir mesh, cork chips, natural fibers, synthetic fibers, glass fibers, ceramic spheres, powdered titanium oxide, calcium carbonate, iron oxide, mica, vermiculite and perlite.

Typically, the extender is at least one extender selected from a group of extenders consisting of china clay, super chalk, talc, barites, quartz powder and dolomite.

In accordance with one embodiment of the present invention, the composition contains wax emulsion in an amount of about 0.1% to about 5% of the mass of the total composition.

Typically, the water proofing/repellant agent is calcium stearate.

In one embodiment, the present invention provides a composition suitable as a mortar in the building construction comprising the following ingredients:

- demineralized water in an amount of about 32% to about 37% of mass of the total composition;
- acrylic polymer in an amount of about 1.25% to about 1.5 % of mass of the total composition;
- liquid ammonia in an amount of about 0.38% to about 0.45% of the mass of the total composition;

- chloromethyl-methylisothiazolone formaldehyde in an amount of about 0.6 % to about 1.2% of the mass of the total composition;
- gentamicin sulphate in an amount of about 0.3% to about 0.5% of the mass of the total composition;
- water dispersible anionic pre-polymerized Acrylic-styrene binder in an amount of about 6% to about 6.6% of the mass of the total composition;
- bottom ash of particle size above 45 microns in an amount of about 28% to about 34% of the mass of the total composition;
- silica particle mixture with particle size in the range of 400 micron to 1000 micron in an amount of about 22% to about 28% of the mass of the total composition;
- stone grit having particle size of 4 mm in an amount of about 20% to about 24% of mass of the total composition; and
- stone grit having particle size of 1 mm in an amount of about 6% to about 8% of mass of the total composition.

In another embodiment, the present invention provides a composition suitable as a plaster/render in the building construction, comprising the following ingredients:

- demineralized water in an amount of about 32% to about 34% of mass of the total composition;
- acrylic polymer in an amount of about 0.9% to about 1.9 % of mass of the total composition;
- liquid ammonia in an amount of about 0.25% to about 0.39% of the mass of the total composition;
- chloromethyl-methylisothiazolone formaldehyde in an amount of about 0.05 % to about 1% of the mass of the total composition;
- gentamicin sulphate in an amount of about 0.3% to about 0.5% of the mass of the total composition;
- water dispersible anionic pre-polymerized Acrylic-styrene binder in an amount of about 6% to about 6.5% of the mass of the total composition;

- bottom ash of particle size above 45 microns in an amount of about 25% to about 35% of the mass of the total composition; and
- silica particle mixture with particle size in the range of 400 micron to 1000 micron in an amount of about 22% to about 27% of the mass of the total composition.

In another embodiment, the present invention provides a composition suitable as a grouting mortar in the building construction, comprising the following ingredients:

- demineralized water in an amount of about 26.3% to about 27% of mass of the total composition;
- acrylic polymer in an amount of about 1.2% to about 2 % of mass of the total composition;
- liquid ammonia in an amount of about 0.3 % to about 0.7 % of the mass of the total composition;
- carbendazim-octylisothiazolone in an amount of about 0.5 % to about 1% of the mass of the total composition;
- gentamicin sulphate in an amount of about 0.3% to about 0.6% of the mass of the total composition;
- water dispersible anionic pre-polymerized Acrylic-styrene binder in an amount of about 6% to about 6.6% of the mass of the total composition;
- bottom ash of particle size above 45 microns in an amount of about 28% to about 32% of the mass of the total composition;
- silica particle mixture with particle size in the range of 400 micron to 1000 micron in an amount of about 22% to about 27% of the mass of the total composition;
- stone grit having particle size of 4 mm in an amount of about 25% to about 27% of mass of the total composition; and
- stone grit having particle size of 1 mm in an amount of about 7% to about 8.5% of mass of the total composition.

In another embodiment, the present invention provides a composition suitable as a repair mortar in the building construction, comprising the following ingredients:

- demineralized water in an amount of about 21% to about 22.3% of mass of the total composition;
- acrylic polymer in an amount of about 2% to about 2.4 % of mass of the total composition;
- liquid ammonia in an amount of about 0.5 % to about 0.8 % of the mass of the total composition;
- isothiazolinones in an amount of about 0.5 % to about 1.2% of the mass of the total composition;
- gentamicin sulphate in an amount of about 0.3% to about 0.6% of the mass of the total composition;
- water dispersible anionic pre-polymerized Acrylic-styrene binder in an amount of about 6% to about 6.6% of the mass of the total composition;
- bottom ash of particle size in the range of 60 micron to 80 micron in an amount of about 28% to about 32% of the mass of the total composition;
- silica particle mixture with particle size in the range of 400 micron to 1000 micron in an amount of about 32% to about 36% of the mass of the total composition; and
- stone grit having particle size of 1 mm in an amount of about 5% to about 5.5% of mass of the total composition.

In another embodiment, the present invention provides a composition suitable as crack filler in the building construction, comprising the following ingredients:

- demineralized water in an amount of about 22% to about 22.5% of mass of the total composition;
- acrylic polymer in an amount of about 1% to about 1.27 % of mass of the total composition;
- liquid ammonia in an amount of about 0.3 % to about 0.4 % of the mass of the total composition;

- isothiazolinones in an amount of about 0.1 % to about 1 % of the mass of the total composition;
- gentamicin sulphate in an amount of about 1 % to about 1.2 % of the mass of the total composition;
- water dispersible anionic pre-polymerized Acrylic-styrene binder in an amount of about 12% to about 14% of the mass of the total composition;
- bottom ash of particle size above 45 microns in an amount of about 27% to about 29% of the mass of the total composition; and
- silica particle mixture with particle size in the range of 400 micron to 1000 micron in an amount of about 32% to about 33.5% of the mass of the total composition.

In accordance with another aspect of the present invention, there is provided a process for manufacturing a composition suitable for use in building construction comprising the following steps:

- a. mixing at temperature in the range of 30 to 40⁰C water, a thickener, a pH stabilizer, a preservative, a coalescing agent and an anionic pre-polymerized binder in predetermined quantities to a stainless steel high speed disperser at a speed of about 1200-1700 rpm for 2 to 3 hrs. to obtain a first concentrate;
- b. adding appropriate amount of water, bottom ash, silica and stone grit at a speed of about 700 to 800 rpm to the first concentrate; and
- c. mixing the complete mixture at a speed of about 400-800 rpm to obtain the composition suitable for use in building construction.

Preferably, the thickener and the pH stabilizer are added simultaneously.

Preferably, the process step (a) is carried out at a speed of about 1400-1500 rpm.

Typically, the process step (c) is carried out at a speed of about 600-700 rpm.

Typically, the process steps result in a homogenous composition.

Typically, optionally at least one additive selected from a group of additives consisting of a water proofing/repelling agent, a dispersing agent and a wax emulsion is incorporated in said composition.

DETAILED DESCRIPTION OF THE INVENTION

The present invention relates to a composition which is suitable for use in building construction as an adhesive for all sorts of masonry units such as clay bricks, fly ash bricks, aerated concrete bricks, cement blocks and building blocks for civil construction activities as a mortar, plaster/render, repair mortar, grouting mortar and crack filling material and also as a fire and heat resistant plaster. The product is designed to be used in building construction industry as a self-curing, crack resistant, eco-friendly, ready to use. The composition provided in accordance with the present invention is in ready to use form hence no on-site mixing of the raw materials with water is required and thus, this enables to control both the quality and quantity of the composition.

The composition in accordance with the present invention is free from conventional Portland cement hence no pre-wetting and post curing with water is required. This not only saves the water but also the construction time. Also, the composition provided in accordance with the present invention uses one of the major pollutants like fly ash and/or bottom ash of the environment thus helps in reducing environmental pollution. Moreover, the silica used in the composition is prepared in accordance with the present invention and need not be river bed side silica which also protects ecology.

Thus, in accordance with the present invention there is provided a composition suitable for use in building construction comprising water in an amount of about 4% to about 49% of the mass of the total composition; a thickener in an amount of about 0.25% to about 4% of the mass of the total composition; a pH stabilizer in an amount of about 0.1% to about 1.5% of the mass of the total composition; a preservative in an amount of about 0.05% to about 1.25% of the mass of the total composition; a coalescing agent in an amount of about 0.25% to about 1.25% of the mass of the total composition; an anionic pre-polymerized binder having intrinsic viscosity in the range of 250 cps to 4000 cps and an amount of about 2% to about 45% of the mass of the total composition; bottom ash of particle size of above 45 microns in

an amount of about 5% to about 75% of the mass of the total composition; silica particle mixture with particle size in the range of about 100 microns to about 4000 microns in an amount of about 0% to about 40% of the mass of the total composition; stone grit of hardness of above 2 on the Mohs scale. and having particle size of about 0.5 mm to 4 mm in an amount of about 0 % to about 30 % of the mass of the total composition; a filler in an amount of about 0% to 55%, an extender in an amount of 0% to 75% and optionally at least one additive selected from a group of additives consisting of a water proofing/repellant agent, dispersing agent and a wax emulsion.

The water in the composition is used as a medium and can be demineralized water which is obtained from distillation process, distilled water, deionized water or a soft water free from bacteria. The amount of water employed in said composition depends on the use to which the composition is to be applied.

In order to control the flow and viscosity of said composition, the thickener is employed in said composition and which can be at least one selected from cellulosic or non-cellulosic compounds which include acrylic polymer, acrylic emulsion copolymer, Hydroxyethylcellulose, acrylic copolymer and crystalline hydrated magnesium aluminium silicate. Preferably, in accordance with the present invention, the thickener employed in said composition is an acrylic polymer.

The pH stabilizer is incorporated in said composition to maintain the alkaline pH thereby making the composition resistant to the acidic conditions and can be at least one selected from a group consisting of liquid ammonia, triethylamine, ammonium chloride and ammonium hydroxide. In accordance with one preferred embodiment of the present invention, the pH stabilizer is liquid ammonia having concentration in the range of 15 to 30. Alternatively, the pH stabilizer is triethylamine.

In order to increase the shelf life of the composition it is desirable to include a preservative in said composition. The preservative can be at least one selected from a group consisting of chloromethyl-methylisothiazolone formaldehyde, carbendazim-octylisothiazolone and isothiazolinones.

The coalescing agent in said composition helps in film formation after application of said composition. The coalescing agent can be at least one selected from a group consisting of monoethylene glycol, diethylene glycol, propylene glycol, taxonol, mixed xylene, gentamicin sulphate and hexane. In accordance with one embodiment of the present invention, the coalescing agent used is mixed xylene. In accordance with the present invention, the coalescing agent is diethylene glycol. Alternatively, the coalescing agent employed in the present invention is gentamicin sulphate.

The anionic pre-polymerized binder which employed in said composition is either homopolymer or a copolymer. The binder enhances the applicability, flow properties and strength and weather sustenance of the final product sustenance. The proportions of the binders used in said composition varies as per the purpose of the product and its desired properties and performance. The anionic pre-polymerized binder can be at least one binder selected from a group consisting of acrylic polymer, styrene polymer, CNSL (cashew nut shell liquid) emulsion, shellac emulsion, low viscosity vinyl acrylic polymer, elastomeric acrylic emulsion and silicon emulsion.

Said composition made with anionic pre-polymerized acrylic polymer as a binder gives excellent outdoor durability and excellent adhesion under damp or dry conditions.

In accordance with other embodiment of the present invention, the anionic pre-polymerized binder is a copolymer of acrylic and styrene. The ratio of acrylic to styrene in said composition is of about 70 to about 30 by mass. Alternatively, the ratio of acrylic to styrene in said composition is of 50 to about 50 by mass. The glass transition temperature of the anionic pre-polymerized binder is in range of about 10⁰C to 50⁰C, preferably in the range of about 10⁰C to 30⁰C. The pH of the anionic prepolymerized binder is in the range of 3 to 10. In accordance with the present invention the anionic pre-polymerized binder contains particulate monomeric units with suspended monomeric particles having particle size below 8 microns, preferably in the range of 4 to 5 microns.

In accordance with the present invention, the bottom ash is ash obtained from a wet bottom coal combustion boiler or from the dry bottom coal combustion boiler. The bottom ash used

in the present invention has moisture content less than about 0.5 %. The bottom ash when used with other inert inorganic materials gives bulk to the product. Alternatively, said composition includes fly ash in an amount of 0% to 55 % of the mass of the total composition. The ratio of fly ash and bottom ash in said composition is in the range of about 10:90 to about 90:10.

In accordance with the present invention, said composition contains crystalline silica which is derived from rice husk. Alternatively, the silica can be fumed silica. Other sources are river bed silica, quarry silica, foundry silica. In accordance with one embodiment of the present invention, said composition comprises a silica particle mixture having particle size less than 2 mm. In accordance with other embodiment of the present invention, said composition comprises a silica particle mixture having particle size of 1.7 mm, 1.4 mm, 0.4 mm and 0.2mm respectively in the proportions of about 10%, 30%, 14% and 55% of the total mass of silica. In accordance with another embodiment of the present invention, said composition comprises silica particle mixture having particle size of 0.4mm and 0.2 mm respectively in the proportions of 93.33% and 6.67% of the total mass of silica. In accordance with yet another embodiment of the present invention, said composition comprises silica particle mixture having particle size of 0.2 mm and 0.6 mm respectively in the proportions of 10% and 90%.

In accordance with the present invention, said composition uses stone grit having particle size in the range of 1mm to 4mm with irregular shapes. The stone can be at least one selected from a group of stones consisting of Shahabad, kotta, basalt, granite, sandstone, limestone, marble, soapstone and slate.

In accordance with the present invention, said composition optionally uses a filler which can be at least one selected from a group of fillers consisting of coir dust, coconut powder, polystyrene balls, plastic wastes, rubber crumbs, glass beads, coir mesh, cork chips, natural fibers, synthetic fibers, glass fibers, ceramic spheres, powdered titanium dioxide, calcium carbonate iron oxide, mica, vermiculite and perlite. In accordance with the present invention, the filler is in an amount of about 0% to about 55% of the mass of the total composition.

It has been found that, mixing of bottom ash with lightweight inert inorganic material like fillers, silica and stone grit having different particle sizes is beneficial as it supports the faster drying of the product, improves the water resistance due to close packing of particles and mechanical strength and shear strength of the product.

In accordance with the present invention, the composition optionally contains an extender and can be at least one extender selected from a group of extenders consisting of china clay, super chalk, talc, barites, quartz powder and dolomite. In accordance with the present invention the extender is in an amount of about 0% to about 75% of the mass of the total composition.

In accordance with the present invention, said composition optionally contains wax emulsion in an amount of about 0% to about 5% of the mass of the total composition.

In accordance with the present invention, said composition optionally contains water proofing/repelling agent.

The composition suitable for use in building construction disclosed in accordance with the present invention is in the form of a wet mixture which is 'ready to use.'

The composition suitable for use in building construction disclosed in accordance with the present invention is free from Portland cement.

In one embodiment, the present invention provides a composition suitable as a mortar in building construction which comprises demineralized water in an amount of about 32% to about 37% of mass of the total composition; acrylic polymer in an amount of about 1.25% to about 1.5 % of mass of the total composition; liquid ammonia in an amount of about 0.38% to about 0.45% of the mass of the total composition; chloromethyl-methylisothiazolone formaldehyde in an amount of about 0.6 % to about 1.2% of the mass of the total composition; gentamicin sulphate in an amount of about 0.3% to about 0.5% of the mass of the total composition; water dispersible anionic pre-polymerized Acrylic-styrene binder in an amount of about 6% to about 6.6% of the mass of the total composition; bottom ash of

particle size above 45 microns in an amount of about 28% to about 34% of the mass of the total composition; silica particle mixture with particle size in the range of 400 micron to 1000 micron in an amount of about 22% to about 28% of the mass of the total composition; stone grit having particle size of 4 mm in an amount of about 20% to about 24% of mass of the total composition; and stone grit having particle size of 1 mm in an amount of about 6% to about 8% of mass of the total composition.

In another embodiment, the present invention provides a composition suitable as a plaster/render in building construction which comprises demineralized water in an amount of about 32% to about 34% of mass of the total composition; acrylic polymer in an amount of about 0.9% to about 1.9 % of mass of the total composition; liquid ammonia in an amount of about 0.25% to about 0.39% of the mass of the total composition; chloromethyl-methylisothiazolone formaldehyde in an amount of about 0.05 % to about 1% of the mass of the total composition; gentamicin sulphate in an amount of about 0.3% to about 0.5% of the mass of the total composition; water dispersible anionic pre-polymerized Acrylic-styrene binder in an amount of about 6% to about 6.5% of the mass of the total composition; bottom ash of particle size above 45 microns in an amount of about 25% to about 35% of the mass of the total composition; and silica particle mixture with particle size in the range of 400 micron to 1000 micron in an amount of about 22% to about 27% of the mass of the total composition.

In another embodiment, the present invention provides a composition suitable as a grouting mortar in building construction which comprises demineralized water in an amount of about 26.3% to about 27% of mass of the total composition; acrylic polymer in an amount of about 1.2% to about 2 % of mass of the total composition; liquid ammonia in an amount of about 0.3 % to about 0.7 % of the mass of the total composition; carbendazim-octylisothiazolone in an amount of about 0.5 % to about 1% of the mass of the total composition; gentamicin sulphate in an amount of about 0.3% to about 0.6% of the mass of the total composition; water dispersible anionic pre-polymerized Acrylic-styrene binder in an amount of about 6% to about 6.6% of the mass of the total composition; bottom ash of particle size above 45 microns in an amount of about 28% to about 32% of the mass of the total composition; silica particle mixture with particle size in the range of 400 micron to 1000 micron in an amount of about

22% to about 27% of the mass of the total composition; stone grit having particle size of 4 mm in an amount of about 25% to about 27% of mass of the total composition; and stone grit having particle size of 1 mm in an amount of about 7% to about 8.5% of mass of the total composition.

In another embodiment, the present invention provides a composition suitable as a repair mortar in building construction which comprises demineralized water in an amount of about 21% to about 22.3% of mass of the total composition; acrylic polymer in an amount of about 2% to about 2.4 % of mass of the total composition; liquid ammonia in an amount of about 0.5 % to about 0.8 % of the mass of the total composition; isothiazolinones in an amount of about 0.5 % to about 1.2% of the mass of the total composition; gentamicin sulphate in an amount of about 0.3% to about 0.6% of the mass of the total composition; water dispersible anionic pre-polymerized Acrylic-styrene binder in an amount of about 6% to about 6.6% of the mass of the total composition; bottom ash of particle size above 45 microns in an amount of about 28% to about 32% of the mass of the total composition; silica particle mixture with particle size in the range of 400 micron to 1000 micron in an amount of about 32% to about 36% of the mass of the total composition; and stone grit having particle size of 1 mm in an amount of about 5% to about 5.5% of mass of the total composition.

In another embodiment, the present invention provides a composition suitable as a crack filler in building construction which comprises demineralized water in an amount of about 22% to about 22.5% of mass of the total composition; acrylic polymer in an amount of about 1% to about 1.27 % of mass of the total composition; liquid ammonia in an amount of about 0.3 % to about 0.4 % of the mass of the total composition; isothiazolinones in an amount of about 0.1 % to about 1 % of the mass of the total composition; garsol in an amount of about 1 % to about 1.2 % of the mass of the total composition; water dispersible anionic pre-polymerized Acrylic-styrene binder in an amount of about 12% to about 14% of the mass of the total composition; bottom ash of particle size above 45 microns in an amount of about 27% to about 29% of the mass of the total composition; and silica particle mixture with particle size in the range of 400 micron to 1000 micron in an amount of about 32% to about 33.5% of the mass of the total composition.

In accordance with another aspect of the present invention, there is provided a process for manufacturing of said composition suitable for use in building construction, the process comprises the following steps: soft water which is free from bacteria, a thickener, a pH stabilizer, a preservative, a coalescing agent and an anionic pre-polymerized binder are mixed in a stainless steel mixer at a speed of about 1200-1700 rpm and a temperature of about 10-50°C for about 2-3 hrs. to obtain a first concentrate. Then appropriate amount of water, bottom ash, silica and stone grit are added to the first concentrate and the whole mixture is then mixed at a speed of about 400-800 rpm to obtain a homogeneous composition suitable for use in building construction. Optionally at least one additive selected from a group of additives consisting a dispersing agent and a wax emulsion can also be incorporated in said composition. The composition prepared in accordance with the present invention is in ready to use form hence no on site mixing of water and additives is required. It can be applied in conventional method using a spatula or directly applied from the spout or squeezed out to lay the material. Since said composition is self-curing, neither pre-wetting nor post curing with water is required. The anionic pre-polymerized binder employed in said composition gets cured because of the air oxidation and forms reticulation network structure. Hence the pre-polymerized binder facilitates the curing process in said composition and results into the product having stronger bond strength. The product cures with ageing, improving the bond strength as well as the water resistance. The composition disclosed in accordance with the present invention is employed as a mortar, plaster/render, crack filler a repair mortar and grouting mortar and applied on clay bricks, fly ash bricks, aerated concrete blocks, cement blocks and on wet cement layer, RCC surfaces, conventionally plastered surfaces, asbestos surfaces and similar surfaces.

EXAMPLES

The invention will now be described with respect to the following examples which do not limit the invention in any way and only exemplify the invention.

Example 1

(12 ml) of water, (0.3gm) of acrylic polymer, (0.12ml) of liquid ammonia having concentration of 15%, (0.5gm) of chloromethyl-methylisothiazolone, (0.59ml) of gentamicin

sulphate and (6.18gm) of an anionic pre-polymerized acrylic-styrene copolymer were mixed at room temperature in a stainless steel pug mixture at a speed of 1400 rpm to obtain a first concentrate. To this, (8ml) of water, (47gm) of bottom ash having particle size of 60 microns, (22 gm) of silica particle mixture having particle size of 400 to 1000 microns and (7.16gm) of granite stone grit with hardness of 8 on the Mohs scale were incorporated. The whole mixture was then mixed at a speed of about 600 rpm to obtain a homogeneous mixture suitable for use in building construction having density 1.32.

The composition was then tested for tensile strength, compressive strength, shear strength, wall strength, water absorption, shrinkage, and temperature cycle and adhesion test.

It was observed that the composition prepared in accordance with abovementioned example is more suitable as an adhesive mortar as well as a grouting mortar. It has been observed that, the shelf life of the product is more than 120 days and pot life is more than 8 to 10 hrs. If the product is sealed back it can be used even after 10 to 15 days. The product performance improves with ageing.

Example 2:

12 ml of water, 0.3gm of acrylic polymer, 0.12 ml of liquid ammonia having concentration of 15%, (0.5gm) of chloromethyl-methylisothiazolone, (0.59 ml) of gentamicin sulphate and 6.2 ml of an anionic pre-polymerized styrene were mixed at room temperature in a stainless steel pug mixture at a speed of 1400 rpm to obtain a first concentrate. To this, 4 ml of water, (46.7gm) of bottom ash having particle size of 60 microns, (22gm) of silica particle mixture having particle size of 600 to 800 microns and (2 gm) of granite stone grit having particle size of 1000 microns with hardness of 8 on the Mohs scale and (5 gm) of granite stone grit having particle size of 4000 microns and hardness of 8 on the Mohs scale were incorporated. The whole mixture was then mixed at a speed of about 600 rpm to obtain a homogeneous mixture suitable for use in building construction having density of 1.34

It was observed that, the composition is suitable as an adhesive mortar which shows better hardness and faster drying than the hardness of example-1 due to the presence of styrene polymer.

Example 3

Similar procedure as described in example-1 was carried out except that the (8 gm) of pre-polymerized elastomeric acrylic emulsion as a binder was added to a first concentrate. The whole mixture was then mixed at a speed of about 600 rpm to obtain a homogeneous mixture suitable for use in building construction having density of 1.32

Said composition was then tested for tensile strength, compressive strength, shear strength, wall strength, water absorption, shrinkage, and temperature cycle and adhesion test.

Better flexibility was observed than example-1 due to the presence of elastomeric polymer, but drying was slow compared to styrene polymer and combination of styrene and acrylic polymer.

Example 4

Similar procedure as described in example-1 was carried out except that the (8 gm) of pre-polymerized shellac emulsion as a binder was added to a first concentrate. The whole mixture was then mixed at a speed of about 600 rpm to obtain a homogeneous mixture suitable for use in building construction having density 1.46

It was observed that, the composition suited better as a plastering material and as a crack filler. The material upon drying showed better water resistance than example-1, but was slightly brittle in nature. It showed good bond strength and dries faster.

Example 5

Similar procedure as described in example-1 was carried out except that the (22 gm) of pre-polymerized low viscosity vinyl acrylic emulsion as a binder was added to a first concentrate. The whole mixture was then mixed at a speed of about 600 rpm to obtain a homogeneous mixture suitable for use in building construction having density of 1.3

It was observed that the composition was suitable as a plaster. Drying time of the material was higher which affects the setting time. The weather resistance of the composition was good.

Example 6

Similar procedure as described in example-1 was carried out except that the (29 gm) of pre-polymerized copolymer of styrene-acrylate in the ratio of 50:50 was added to a first concentrate. The whole mixture was then mixed at a speed of about 600 rpm to obtain a homogeneous mixture suitable as a mortar for adhesion of masonry units having density 1.3 with improved workability.

Example 7

Similar procedure as described in example-1 was carried out except that the (10gm) of pre-polymerized acrylic and (2 gm) of CNSL emulsion as a binder were added to a first concentrate. The whole mixture was then mixed at a speed of about 600 rpm to obtain a homogeneous mixture suitable as plaster for rendering walls having density 1.23 with improved water resistance but with delayed setting time.

Example 8

Similar procedure as described in example-1 was carried out except that (1 gm) of pre-polymerized acrylic binder was added to a first concentrate. The whole mixture was then mixed at a speed of about 600 rpm to obtain a homogeneous mixture suitable for use in building construction having density 1.71

Said composition was then tested for tensile strength, compressive strength, shear strength, wall strength, water absorption, shrinkage, and temperature cycle and adhesion test. The test results are provided in table 1

TABLE 1

Sr. No.	Test name	Samples age 28 days	Samples age 120days
	PHYSICAL		
1.	color	Grey	Grey
2.	viscosity	Thick volatile Paste	Thick volatile Paste
3.	Density	@1.71 kg/l	@1.89 kg/l
4.	Drying (ambient temp of 25 ° to 30 ° c & Relative humidity of 70 %	Less than 8 hrs	Less than 8 hrs.
5.	pH	8 to 9	8 to 9
6.	Adhesion	not satisfactory	not satisfactory
7.	Shrinkage	<0.01%	<0.01%
8.	Solid content	84%	84%

Sr. No		Samples age 28 days	Samples age 120 days
	MECHANICAL		
8.	Shear Strength	0.2 kg/cm ²	0.2 kg/cm ²
9.	Bond Strength	0.052kg/cm ²	0.052kg/cm ²
10.	Water Absorption	15% by weight	15% by weight
11	Wall strength test (destruction)	Less than conventional wall strength	Less than conventional wall strength
12	Pot life	2 hrs	2 hrs
13	Shelf life	7 days	Material dries up after 15 to 20 days
	CHEMICAL		
13.	Resistance to acid	No change	No change
14.	Resistance to alkali	No change	No change

Poor bond strength, separation of ingredients in fresh material, inadequate water resistance was observed.

Example 9

Similar procedure as described in example-1 was carried out except that the (60gm) of pre-polymerized acrylic binder was added to a first concentrate. The whole mixture was then mixed at a speed of about 600 rpm to obtain a homogeneous mixture suitable for use in building construction having density 1.1

The composition was then tested for tensile strength, compressive strength, shear strength, wall strength, water absorption, shrinkage, and temperature cycle and adhesion test.

It was observed that, the composition was suitable as plaster and as crack filler. The composition showed increased drying time and hence setting time was affected. The material becomes flowy and difficult to be applied in desired thickness to function as desired for the purpose, and thus affects economics.

Example 10

Similar procedure as described in example-1 was carried out except that (40gm) of bottom ash having particle size of 70 micron was added into the first concentrate. The whole mixture was

then mixed at a speed of about 700 rpm to obtain a homogeneous mixture suitable as adhesive mortar having density 1.39

The composition containing bottom ash with particle size at 60 to 100 microns tends to show better performance in terms of drying and setting time, resistance to water absorption and was better for bulk, can be used in lesser quantity than fly ash and suits economically.

Example 11

Similar procedure as described in example-2 was carried out except that (30gm) of bottom ash having particle size of 65 microns and (10 gm) of fly ash having particle size of 45 microns were added into the first concentrate. The whole mixture was then mixed at a speed of about 600 rpm to obtain a homogeneous mixture suitable as adhesive mortar having density of 1.38. The composition showed more water absorption, lesser resistance to water and reduced shelf life.

Example 12

Similar procedure as described in example-1 was carried out except that only (70 gm) of fly ash having particle size of less than 45 microns was added into the first concentrate. The whole mixture was then mixed at a speed of about 600 rpm to obtain a homogeneous mixture suitable as adhesive mortar having density 1.45

It was observed that the composition was too thick and the spreadability was lowered. The shelf life was reduced and with time tendency to show separation of materials.

Example 13

Similar procedure as described in example-1 was carried out except that (10 gm) of bottom ash having particle size of 70 microns and (30 gm) of fly ash having particle size of less than 45 micron were added into the first concentrate. The whole mixture was then mixed at a speed of about 600 rpm to obtain a homogeneous mixture suitable as a plaster having density of density 1.69

Composition was thicker and dries up too fast. Pot life and Shelf life were reduced with time tends to show separation of materials.

Example 14

Similar procedure as described in example-1 was carried out except that (40 gm) of bottom ash having particle size of 60 microns and (20 gm) of fly ash having particle size of less than 45 microns were added into the first concentrate. The whole mixture was then mixed at a speed of about 600 rpm to obtain a homogeneous mixture suitable as mortar as well as a grouting material having density of 1.39

It was observed that the drying time was reduced. Viscosity was better. Less water absorption and better bond strength were attained.

Example 15

Similar procedure as described in example-1 was carried out except that (25 gm) of silica having particle size of 200 microns was added into the first concentrate. The whole mixture was then mixed at a speed of about 600 rpm to obtain a homogeneous mixture suitable as a plaster and as a repair mortar having density of 1.46

Said composition was then tested for tensile strength, compressive strength, shear strength, wall strength, water absorption, shrinkage, and temperature cycle and adhesion test.

It was observed that, due to uniform size of silica, the water resistance of the composition was lowered.

Example 16

Similar procedure as described in example-1 was carried out except that (15 gm) of silica having particle size of 200 microns, (10 gm) of silica having particle size of 600 microns and (10 gm) of silica having particle size of 800 microns were added into the first concentrate. The whole mixture was then mixed at a speed of about 600 rpm to obtain a homogeneous mixture suitable as a plaster and as a repair mortar having density of 1.36 with improved water resistance due to variation in size of silica.

Example 17

Similar procedure as described in example-1 was carried out except that (5 gm) of silica having particle size of 200 microns, (12 gm) of silica having particle size of 400 microns, (10 gm) of silica having particle size of 800 microns and (10 gm) silica having particle size of

1000 microns were added into the first concentrate. The whole mixture was then mixed at a speed of about 600 rpm to obtain a homogeneous mixture suitable as a plaster and as a repair mortar having density of 1.42, with improved water resistance due to variation in size of silica.

Example 18

Similar procedure as described in example-1 was carried out except that (25 gm) of crystalline silica obtained from rice husk and having particle size of 600 microns, was added into the first concentrate. The whole mixture was then mixed at a speed of about 600 rpm to obtain a homogeneous mixture suitable as a plaster and as a repair mortar having density 1.42. It was observed that similar performance was obtained as other silica grades.

Example 19

Similar procedure as described in example-1 was carried out without adding silica into the first concentrate. The whole mixture was then mixed at a speed of about 600 rpm to obtain a homogeneous mixture suitable as an adhesive mortar having density 1.31. It was observed that water absorption was higher. Drying time was reduced with reduced shelf life & pot life. Spreadability was reduced; strength was lesser than the products with silica, but still in desirable range.

Example 20

Similar procedure as described in example-2 was carried out except that (22 gm) of quartz stone grit having particle size of about 4 mm and hardness of about 7 on the Mohs scale was added into the first concentrate. The whole mixture was then mixed at a speed of about 600 rpm to obtain a homogeneous mixture suitable as a bonding mortar and as grouting material having density of 1.42. It was observed that presence of stone grit supported in reducing the drying time. The product had bulk, reducing the spreadability. Better water resistance was offered showing excellent adhesion.

Example 21

Similar procedure as described in example-2 was carried out except that (5 gm) of quartz stone grit having particle size of about 4 mm and hardness of about 7 on the Mohs scale and (3 gm) of limestone grit having particle size of about 1 mm and hardness of about 4 on the Mohs scale were added into the first concentrate. The whole mixture was then mixed at a speed of about 600 rpm to obtain a homogeneous mixture suitable bonding mortar and as grouting material having density of 1.42

Improved water resistance, better setting time was observed. Also, the composition was found to be good for filling large gaps in construction.

Example 22

Similar procedure as described in example-2 was carried out except that (8 gm) of limestone stone grit having particle size of about 1 mm and hardness of about 7 on the Mohs scale was added into a first concentrate. The whole mixture was then mixed at a speed of about 600 rpm to obtain a homogeneous mixture suitable as bonding mortar and as grouting material having density of 1.42 which showed improved spreadability.

Example 23

Similar procedure as described in example-1 was carried out except that (10 gm) of Shahabad stone grit having particle size of 4000 microns and hardness of and (5 gm) of limestone grit having particle size of 4000 microns and hardness about 7 on the Mohs scale were added into the first concentrate. The whole mixture was then mixed at a speed of about 600 rpm to obtain a homogeneous mixture suitable as a grouting material having density of 1.42. The composition exhibited reduced spreadability and water absorption.

Example 24

Similar procedure as described in example-2 was carried out without adding stone grit into the first concentrate. The whole mixture was then mixed at a speed of about 600 rpm to obtain a homogeneous mixture suitable as plaster and repair mortar having density of 1.14. The composition exhibited high spreadability, reduced water resistance than ex 20 but within the expected range and increased drying time.

Example 25

Similar procedure as described in example-1 was carried out. (25 gm) of coir dust as a filler was incorporated into a first concentrate. The whole mixture was then mixed at a speed of about 600 rpm to obtain a homogeneous mixture suitable as a plaster and bonding mortar having density of 1.24. The composition exhibited excellent water resistance, good strength, high viscosity, reduced spreadability.

Example 26

Similar procedure as described in example-1 was carried out. (20 gm) of coir dust and (10 gm) of rubber crumbs as fillers were incorporated into a first concentrate. The whole mixture was then mixed at a speed of about 600 rpm to obtain a homogeneous mixture suitable as a bonding mortar having density of 1.2. The composition exhibited better water resistance, reduced spreadability change in colour.

Example 27

Similar procedure as described in example-1 was carried out. (2 gm) of glass beads as a filler was incorporated into the first concentrate. The whole mixture was then mixed at a speed of about 600 rpm to obtain a homogeneous mixture suitable as a plaster having density of 1.42. The composition offered resistance to thermal conductivity, shows difference of 4 to 5 ° in surfaces, easy to spread.

Example 28

Similar procedure as described in example-1 was carried out. (10 gm) of coir dust, (5 gm) of titanium dioxide, (20 gm) of coconut powder as a filler were incorporated into a first concentrate. The whole mixture was then mixed at a speed of about 600 rpm to obtain a homogeneous mixture suitable as a plaster and as crack filler having density of 1.24. The composition offered good resistance to water, easy to spread, improved hiding, colour was changed.

Example 29

Similar procedure as described in example-1 was carried out. (3 gm) of wax emulsion was incorporated into a first concentrate. The whole mixture was then mixed at a speed of about

600 rpm to obtain a homogeneous mixture suitable as plaster and crack filler having density of 1.32 which offered better water resistance.

Example 30

Similar procedure as described in example-1 was carried out. (5 gm) microcarb and (4 gm) talc was incorporated into a first concentrate. The whole mixture was then mixed at a speed of about 600 rpm to obtain a homogeneous mixture not suitable as plaster having density of 1.42. The composition exhibited higher viscosity; less spreadability and more water absorption.

Example 31

(10 ml) of demineralized water, (0.03 gm) of acrylic polymer, (0.68 ml) of liquid ammonia having concentration of 15%, (0.5 gm) of chloromethyl-methylisothiazolone, (0.9 ml) of gentamicin sulphate and (39 gm) of anionic pre-polymerized acrylic styrene copolymer were mixed in a stainless steel pug mixer at speed of about 1500 rpm to obtain a first concentrate. To this, (10 ml) of water, (36 gm) of bottom ash having particle size of about 60 microns, (20 gm) of crystalline silica having particle size of about (400 microns) and (5 gm) of quartz stone grit having hardness of about 7 on the Mohs scale were incorporated and the whole mixture was then mixed at a speed of about 500 rpm to obtain a composition suitable for use in building construction as a adhesive mortar with density 1.32. The composition exhibited higher water absorption.

Example 32

(10 ml) of demineralized water, (0.6 gm) of acrylic polymer, (0.17 ml) of liquid ammonia having concentration of 20%, (0.5 gm) of chloromethyl-methylisothiazolone, (0.6 ml) of gentamicin sulphate and (40 gm) of anionic pre-polymerized acrylic styrene copolymer were mixed in a stainless steel pug mixer at speed of about 1500 rpm to obtain a first concentrate. To this, (10 ml) of water, (1.2 gm) of titanium dioxide, (24 gm) fly ash and (9.5 gm) of talc and (1.9 gm) of wax emulsion and crystalline hydrated magnesium aluminium silicate as additives were incorporated and whole mixture was then mixed at a speed of about 500 rpm for about 45 minutes to obtain a composition not suitable as a adhesive mortar with density 1.57

The composition had lower drying and setting time, increased viscosity and needed to be diluted for improving spreadability.

Example 33

(10 ml) of demineralized water, (0.4 gm) of acrylic polymer, (0.12 ml) of liquid ammonia having concentration of 17 % , (0.7 gm) of chloromethyl-methylisothiazolone, (0.5 ml) of gentamicin sulphate and (6.2 gm) of anionic pre-polymerized acrylic styrene copolymer were mixed in a stainless steel pug mixer at speed of about 1600 rpm to obtain a first concentrate. To this, (7 ml) of water, (46.7 gm) of bottom ash having particle size of 70 microns, (22 gm) crush sand and (7.1 gm) of granite stone grit as fillers were incorporated and whole mixture was then mixed at a speed of about 400-500 rpm for about 45 minutes to obtain a composition suitable for use in building construction as an adhesive mortar with density 1.42

The composition had good strength, matched all the requirements, had higher viscosity, which reduces spread ability.

Example 34

(12 gm) of demineralized water, (0.5 gm) of acrylic polymer, (0.06 ml) of liquid ammonia having concentration of 18% , (0.6 gm) of gentamicin sulphate, (0.6 gm) of chloromethyl-methylisothiazolone, (8.13 gm) of anionic pre-polymerized acrylic copolymer were mixed in a stainless steel pug mixer at speed of about 1600 rpm to obtain a first concentrate. To this, (4 ml) of water, (47 gm) of pozzocreate 60, (21 gm) of silica particle mixture having particle size of 0.2 mm, 4 mm and 0.6 mm respectively in the proportions of 40%, 32% and 26% and (6 gm) of silica having particle size of 1 mm were incorporated and whole mixture was then mixed at a speed of about 400-500 rpm for about 45 minutes to obtain a composition suitable for use in building construction as a plaster/render having density 1.34

Good spread ability, strength, crack resistance was offered by the composition.

Example 35

(4 gm) of demineralized water, (0.4 gm) of acrylic emulsion copolymer, (0.12 ml) of liquid ammonia having concentration of 20%, (0.57 gm) of diethylene glycol, (22.7 gm) of anionic pre-polymerized acrylic styrene copolymer were mixed in a stainless steel pug mixer at speed

of about 1600 rpm to obtain a first concentrate. To this, (8 ml) of water, (2 gm) of micro carb, (1.85 gm) of vermiculite, (13.8 gm) of pozzocrete and (40 gm) of silica particle mixture having particle size of 0.2 mm, 4 mm and 0.6 mm respectively in the proportions of 40%, 32% and 26% were incorporated and whole mixture was then mixed at a speed of about 400-500 rpm for about 45 minutes to obtain a composition suitable for use in building construction as a plaster/render with density 1.42

The presence of styrene copolymer offered better hardness & improved setting time. Colour was whitish grey due to extenders offering better hiding. The vermiculite offered heat resistance.

Example 36

(12 ml) of demineralized water, (0.87 gm) of acrylic polymer, (0.27 ml) of liquid ammonia having concentration of 15%, (0.6 gm) of chloromethyl-methylisothiazolone, (0.49 ml) of gentamicin sulphate and (6.2 gm) of pre-polymerized acrylic-styrene copolymer were mixed in a stainless steel pug mixer at speed of about 1600 rpm to obtain a first concentrate. To this, (12.7 ml) of water, (40 gm) of bottom ash having particle size of 70 microns, (7 gm) of stone grit having particle size of 1 mm and (29 gm) of stone grit having particle size of 4 mm were incorporated and whole mixture was then mixed at a speed of about 400-500 rpm for about 45 minutes to obtain a composition suitable for use in building construction as a grouting mortar with density 1.6.

Desired viscosity was obtained, with good compatibility to the other surfaces and materials where the product was used.

Example 37

(12 ml) of demineralized water, (1.8 gm) of acrylic polymer, (0.5 ml) of liquid ammonia having concentration of 15%, (0.6 gm) of chloromethyl-methylisothiazolone, (0.5 ml) of gentamicin sulphate and (6.12 gm) of pre-polymerized acrylic-styrene copolymer were mixed in a stainless steel pug mixer at speed of about 1600 rpm to obtain a first concentrate. To this, (14 ml) of water, (31 gm) of bottom ash having particle size of 70 microns, (8 gm) of stone grit having particle size of 1 mm and (26 gm) of stone grit having particle size of 4 mm were incorporated and whole mixture was then mixed at a speed of about 400-500 rpm for about 45

minutes to obtain a composition suitable for use in building construction as a grouting mortar with density 1.56.

Excellent water resistance, improved applicability, excellent compatibility with other materials, desired hardness & strength were exhibited by the composition.

Example 38

(8.9 ml) of demineralized water, (0.69 gm) of acrylic polymer, (0.2 ml) of liquid ammonia having concentration of 20%, (0.11gm) of chloromethyl-methylisothiazolone, (0.92 ml) of gentamicin sulphate and (11.5 gm) of pre-polymerized acrylic-styrene copolymer were mixed in a stainless steel pug mixer at speed of about 1600 rpm to obtain a first concentrate. To this, (2 ml) of water, (12 gm) of bottom ash having particle size of 70 microns, (60 gm) of stone grit having particle size of 1 mm and (5 gm) of microcarb were incorporated and whole mixture was then mixed at a speed of about 400-500 rpm for about 45 minutes to obtain a composition not suitable for use in building construction as a repair mortar with density 1.38. The composition exhibited less viscosity than desired.

Example 39

(12 ml) of demineralized water, (2.3 gm) of acrylic polymer, (0.7 ml) of liquid ammonia having concentration of 20%, (0.09gm) of chloromethyl-methylisothiazolone, (0.49 ml) of gentamicin sulphate and (6.12 gm) of pre-polymerized acrylic-styrene copolymer were mixed in a stainless steel pug mixer at speed of about 1600 rpm to obtain a first concentrate. To this, (9 ml) of water, (30 gm) of bottom ash having particle size of 70 microns, (30 gm) of stone grit having particle size of 1 mm and (30 gm) of silica having particle size of 400 to 800 microns. were incorporated and whole mixture was then mixed at a speed of about 400-500 rpm for about 45 minutes to obtain a composition suitable for use in building construction as a repair mortar with density 1.36. The composition exhibited improved viscosity.

Example 40

(18 ml) of demineralized water, (1.2 gm) of hydroxyethyl cellulose, (0.3 ml) of liquid ammonia having concentration of 20%, (0.8 gm) of chloromethyl-methylisothiazolone, (1.2 ml) of mixed xylene and (12 gm) of pre-polymerized acrylic-styrene copolymer, (2 gm) of

titanium dioxide, (4 gm) of microcarb, (3 gm) of talc, (3 gm) of wax emulsion were mixed in a stainless steel pug mixer at speed of about 1600 rpm to obtain a first concentrate. To this, (3 .ml) of water, (28 gm) of bottom ash and (3 gm) of cellulose fiber were incorporated and whole mixture was then mixed at a speed of about 400-500 rpm for about 45 minutes to obtain a composition suitable for use in building construction as a crack filler having density 1.34 to 1.36

The addition of cellulosic fibers increased the viscosity and strength, but reduced spreadability and shelf life.

Example 41

(20 ml) of demineralized water, (2.1gm) of hydroxyethyl cellulose, (0.6 ml) of liquid ammonia having concentration of 20%, (0.6 gm) of chloromethyl-methylisothiazolone, (1.3ml) of gentamicin sulphate and (14 gm) of pre-polymerized acrylic-styrene copolymer, (2 gm) of titanium dioxide, (4 gm) of microcarb, (2 gm) of talc, (3 gm) of benjel B, were mixed in a stainless steel pug mixer at speed of about 1600 rpm to obtain a first concentrate. To this, (5 ml) of water, (25 gm) of fly ash was incorporated and whole mixture was then mixed at a speed of about 400-500 rpm for about 45 minutes to obtain a composition suitable for use in building construction as a crack filler with density 1.30. Desirable performance was obtained.

Example 42

(23 gm) of demineralized water, (1.05 gm) of acrylic polymer, (0.36 ml) of liquid ammonia having concentration of 18%, (0.9 gm) of chloromethyl-methylisothiazolone, (1.1ml) of gentamicin sulphate, and (13gm) of pre-polymerized acrylic-styrene copolymer, (2.gm) of wax emulsion were mixed in a stainless steel pug mixer at speed of about 1600 rpm to obtain a first concentrate. To this, (28 gm) of bottom ash having particle size of about 60 microns and (32 gm) of silica particle mixture having particle size of 0.4mm and 0.2 mm respectively in the proportions of 93.33% and 6.67% were incorporated and whole mixture was then mixed at a speed of about 400-500 rpm for about 45 minutes to obtain a composition suitable for use in building construction as a crack filler with density 1.36. The composition exhibited excellent performance, excellent bonding to other surfaces, better crack resistance, and improved shelf life.

The test results for examples 1-42, excluding example-8 are provided in the following table

TABLE 2

Sr.	Test name	Samples age 28 days	Samples age 120days
	Physical		
1	color	Grey	Grey
2	viscosity	Thick volatile Paste	Thick volatile Paste
3	Density	@1.24 to 1.69 kg/l	@1.28 to 1.72 kg/l
4	Drying (ambient temp of 25 ° to 30 ° c & Relative humidity of 70 %	@ 18 - 24 hrs	@ 18 - 24 hrs
5	pH	8 to 9	8 to 9
6	Adhesion	Good	Good
7	Shrinkage	<0.01%	<0.01%
8	Solid content	@68 to 87%	@70 to 89.%
	Mechanical		
9.	Shear Strength	> 5.5 to 6.9 kg/cm ²	>8 to 12 kg/cm ²
10	Bond Strength	>0.16 to 0.208kg/cm ²	>0.24 to 0.30 kg/cm ²
11	Compressive Strength	5.3 to 8.84 n/mm ²	>16 n/mm ²
12	Resistance to Temp. cycle(tensile strength after 10 cycles)	>7 kg/cm ²	>9 kg/cm ²
13	Water Absorption	<11.30% by weight	<10 % by weight
14	Wall strength test (destruction)	3 to 4 times Better than conventional wall	5 to 6 times Better than conventional wall
15	Pot life	>8 to 10 hrs (can be used even after 15 to 20 days if resealed & stored	>8 to 10 hrs (can be used even after 15 to 20 days if resealed & stored
16	Shelf life	>120 days	>120 days
	Chemical		
17	Resistance to acid	No change	No change
18	Resistance to alkali	No change	No change

II- The mortar compositions prepared in accordance with the present invention were evaluated by using following tests.

1. Bonding strength

A mortar layer of 4 mm thickness was applied on one surface of a burnt clay brick. Another clay brick was bonded to the burnt clay brick surface having the mortar layer. The two bricks were placed on a table to maintain a cantilever position. The two bricks were left for curing for test reports are for 28 days & 120 days without disturbing the mortar layer. After 120

days, the tensile bonding strength was checked by hanging an initial weight to one end of the clay brick. This initial weight was increased until the bond between the two bricks broke. It was observed, though the bond survived the tensile bonding strength test, the clay brick broke.

2. Shear Bonding

A mortar of 4 mm thickness and dimensions of 25 mm x 25 mm was applied on one end of a wooden ply plate having dimensions of approximately 25 mm x 75 mm. Another wooden ply plate having same dimensions was placed on the mortar layer. The assembly was allowed to cure for two days. After curing, the assembly was suspended in a vertical position from a rack on a spring balance provided with a hook attached to one of the wooden ply plate. An initial weight was hanged at the bottom of one of the wooden ply plate. This initial weight was increased at lower end of wooden ply plate until the joint between the hook and the wooden ply broke.

3. Wall Strength test

The mortar was tested as a building material in comparison with the conventional mortar. The mortar was given to several masons, engineers, architects and building contractors, to build walls by using the mortar as an adhesive material for bonding the clay bricks, concrete blocks, fly ash bricks and the like. On hardening, the walls were hammered for demolition. Strenuous efforts were required to demolish the walls and breakage of blocks/ bricks was observed while the mortar bond remains intact.

4. Water absorption test

Test 1: A mastic was made in a block having dimensions of 5cm. X 5cm. X 6 mm. The block was allowed to cure completely, followed by which it was immersed in water for 2 hrs. The block was then allowed to dry naturally for 2 hrs. This was repeated in cyclic pattern. The weight of the block before and after immersion was noted and the physical condition was observed. The difference in the weights indicates the absorption and loss of water. The physical condition of the block indicates the effects caused by the process.

Test 2 –A mastic was applied in uniform thickness of 6 mm on a glass tile. Upon hard drying the mastic was dipped in water for 24 hrs. and the change in weight was noted which indicates the water absorbed by the mastic.

5. Temperature cycle Test:

A mastic was made in a block having dimensions of 5cm X 5cm X 6mm and allowed to cure completely. The block was subjected to temperatures up to 60 ° C in a lab oven and then cooled to temperatures as low as - 6° C. The same procedure was repeated in a cyclic pattern to check the impact of temperature difference on the block. The physical condition of the block remained unchanged even after the drastic temperature variations.

6. Shrinkage test:

A mastic was applied in uniform thickness of 6 mm on a glass tile. The thickness of mastic along with glass thickness was noted. The same was measured upon hard drying to check the difference in the film thickness. Upon drying, negligible shrinkage was observed in the mastic.

7. Adhesion Test:

A mastic was applied in uniform thickness of 6 mm on a glass tile. Upon drying, the mastic was checked for a tape test to determine its adhesion to the substrate. In the tape test, a cello tape was pressed on the mastic and then removed. It was observed that no mastic adhered to the cello tape proving that the adhesion of the mastic is excellent.

1. A mortar was prepared in accordance with the recipe of example-2. This mortar was subjected to the aforesaid tests like bonding strength , Shear Bonding, Wall Strength test, Water absorption test, Temperature cycle Test, Shrinkage test, Adhesion Test, compressive test and other physical properties like colour, viscosity , density, drying /setting time , solid content and pH, pot life, shelf life ,effects of acid ,alkali. The results are tabulated in the following table.

TABLE 3

Sr. No.	Test name	Samples age 28 days	Samples age 120days
	PHYSICAL		
1.	color	Grey	Grey
2.	viscosity	Thick volatile Paste	Thick volatile Paste
3.	Density	1.45	1.48
4.	Drying (ambient temp of 25 ^o to 30 ^o c & Relative humidity of 70 %	@24 hrs	@24 hrs
5.	pH	8- 9	8 -9
6.	Adhesion	good	Good
7.	Shrinkage	<0.01%	<0.01%
8.	Solid content	81%	81%

Sr. No		Samples age 28 days	Samples age 120 days
	MECHANICAL		
8.	Shear Strength	6.95	>8 kg/cm ²
9.	Bond Strength	0.208 kg/cm ²	0.452
10.	Compressive Strength	7.1n/mm2	20.6 N/MM2
11.	Resistance to Temp. cycle(tshear strength after 10 cycles)	7.13 kg/cm2	> 8 kg /cm2
12.	Water Absorption	11.3%	11%
13	Wall strength test (destruction)	3 to 4 times stronger than conventional wall	3 to 4 times stronger than conventional wall
13	Pot life	7 to 8 hrs	6 to 7 hrs
14	Shelf life	40 days	40 days needs mixing of 3 to 4 % of water to make spreadable
	Chemical		
14.	Resistance to acid	No change	No change
15.	Resistance to alkali	No change	No change

2. A plaster /render was prepared in accordance with the recipe of ex no 34. This plaster was subjected to the aforesaid tests like bonding strength , Shear Bonding, Wall Strength test, Water absorption test, Temperature cycle Test, Shrinkage test, Adhesion Test, compressive test and other physical properties like colour, viscosity , density, drying /setting time , solid content and pH, pot life, shelf life ,effects of acid ,alkali. The results are tabulated in the following table.

TABLE 4

Sr. No.	Test name	Samples age 28 days	Samples age 120days
	PHYSICAL		
1.	Color	Grey	Grey
2.	Viscosity	Thick volatile Paste	Thick volatile Paste
3.	Density	1.35	1.37
4.	Drying (ambient temp of 25 ^o to 30 ^o c & Relative humidity of 70 %	@24 hrs	@ 24 hr
5.	Ph	8- 9	8- 9
6.	Adhesion	good	Good
7.	Shrinkage	<0.01%	<0.01%
8.	Solid content	81%	81%

Sr. No		Samples age 28 days	Samples age 120 days
	MECHANICAL		
8.	Shear Strength	6.6	>8 kg/cm ²
9.	Bond Strength	0.47	0.684
10.	Compressive Strength	6.98 n/mm ²	7.79 n/mm2
11.	Resistance to Temp. cycle(tshear strength after 10 cycles)	7.13 kg/cm2	> 8 kg /cm2
12.	Water Absorption	3.82%	3.34%
13	Wall strength test (destruction)	4 to 5 times better than conventional	4 to 5 times better than conventional
13	Pot life	8 to 9 hrs	8 to 9hrs
14	Shelf life	40 days	40 days needs mixing of 3 to 4 % of water to make spreadable
	Chemical		
14.	Resistance to acid	No change	No change
15.	Resistance to alkali	No change	No change

3. A crack filler was prepared in accordance with the recipe of ex no 42 :

This crack filler was subjected to the aforesaid tests like bonding strength , Shear Bonding, Wall Strength test, Water absorption test, Temperature cycle Test, Shrinkage test, Adhesion Test, compressive test and other physical properties like colour, viscosity , density, drying /setting time , solid content and pH, pot life, shelf life ,effects of acid ,alkali. The results are tabulated in the following table.

TABLE 5

Sr. No.	Test name	Samples age 28 days	Samples age 120days
PHYSICAL			
1.	color	Grey	Grey
2.	viscosity	Thick Paste	Thick Paste
3.	Density	1.48	1.48
4.	Drying (ambient temp of 25 ^o to 30 ^o c & Relative humidity of 70 %	4 to 6 hrs	4 to 6 hrs
5.	pH	8-9	8-9
6.	Adhesion	Good	Good
7.	Shrinkage	<0.01%	< 0.01%
8.	Solid content	79.85	75.82

Sr. No		Samples age 28 days	Samples age 120 days
MECHANICAL			
8.	Shear Strength	7.58 kg/cm ²	12 kg/cm2
9.	Bond Strength	0.6	0.7
10.	Compressive Strength	7.1n/mm2	7.79 n/mm2
11.	Resistance to Temp. cycle(tshear strength after 10 cycles)	9.3	13.4
12.	Water Absorption	47.18	44.28
13	Wall strength test (destruction)	N.A	N.A
13	Pot life	12 to 15 hrs can be reused after 15 to 20 days if seales & kept	12 to 15 hrs can be reused after 15 to 20 days if seales & kept
14	Shelf life	> 180 days days	> 180 days
Chemical			
14.	Resistance to acid	No change	No change
15.	Resistance to alkali	No change	No change

4. A grouting mortar was prepared in accordance with the recipe of example- 37. This grouting mortar was subjected to the aforesaid tests like bonding strength , Shear Bonding, Wall Strength test, Water absorption test, Temperature cycle Test, Shrinkage test, Adhesion Test, compressive test and other physical properties like colour, viscosity , density, drying /setting time , solid content and pH, pot life, shelf life ,effects of acid ,alkali. The results are tabulated in the following table.

TABLE 6

Sr. No.	Test name	Samples age 28 days	Samples age 120days
	PHYSICAL		
1.	color	Grey	Grey
2.	viscosity	Thick volatile Paste	Thick volatile Paste
3.	Density	1.56	1.56
4.	Drying (ambient temp of 25 ⁰ to 30 ⁰ c & Relative humidity of 70 %	5 to 6 hrs	5 to 6 hrs
5.	pH	8 – 9	8 – 9
6.	Adhesion	excellent	Excellent
7.	Shrinkage	<0.01%	<0.01%
8.	Solid content	80 %	80%

Sr. No		Samples age 28 days	Samples age 120 days
	MECHANICAL		
8.	Shear Strength	5.5 kg/cm ²	> 8
9.	Bond Strength	0.24	0.46
10.	Compressive Strength	8	14
11.	Resistance to Temp. cycle(tshear strength after 10 cycles)	7.13 kg/cm2	> 8 kg /cm2
12.	Water Absorption	4	3.4 %
13	Wall strength test (destruction)	NA	NA
13	Pot life	12 to 15 hrs can be reused after 15 to 20 days if seales & kept	12 to 15 hrs can be reused after 15 to 20 days if seales & kept
14	Shelf life	>180 DAYS	>180 DAYS
	Chemical		
14.	Resistance to acid	No change	No change
15.	Resistance to alkali	No change	No change

5. A repair mortar was prepared in accordance with the recipe of example-39 This repair mortar was subjected to the aforesaid tests like bonding strength, Shear Bonding, Wall Strength test, Water absorption test, Temperature cycle Test, Shrinkage test, Adhesion Test, compressive test and other physical properties like colour, viscosity, density, drying /setting time, solid content and pH, pot life, shelf life, effects of acid, alkali. The results are tabulated in the following table.

TABLE 7

Sr. No.	Test name	Samples age 28 days	Samples age 120days
	PHYSICAL		
1.	color	Grey	Grey
2.	viscosity	Thick volatile Paste	Thick volatile Paste
3.	Density	1.36	1.36
4.	Drying (ambient temp of 25 ⁰ to 30 ⁰ c & Relative humidity of 70 %	7 TO 8 hrs	7 to 8 hrs
5.	pH	8 - 9	8 - 9
6.	Adhesion	excellent	Excellent
7.	Shrinkage	<0.01%	<0.01%
8.	Solid content	78%	78%

Sr. No		Samples age 28 days	Samples age 120 days
	MECHANICAL		
8.	Shear Strength	5.34	>8
9.	Bond Strength	0.5	0.7
10.	Compressive Strength	7	12
11.	Resistance to Temp. cycle (tshear strength after 10 cycles)	7.5	8.9
12.	Water Absorption	5 %	4.2%
13	Wall strength test (destruction)	NA	NA
13	Pot life	12 to 15 hrs can be reused after 15 to 20 days if seales & kept	12 to 15 hrs can be reused after 15 to 20 days if seales & kept
14	Shelf life	>180 DAYS	>180 DAYS
	Chemical		
14.	Resistance to acid	No change	No change
15.	Resistance to alkali	No change	No change

III) Comparative analysis of the construction composition prepared in a conventional manner, the composition disclosed in PCT application and the composition prepared in accordance with the present invention.

9 compositions were made by employing the recipe of conventional mortar containing Portland cement and sand in ratio of 1:6. Essential amount of water was added to make the composition applicable as a brick laying mortar. The compositions were subjected to the

aforesaid bonding strength, Shear Bonding, Wall Strength test, Water absorption test, Temperature cycle Test, Shrinkage test, Adhesion Test and compressive test as well as other physical properties, such as colour, viscosity, density, drying /setting time, solid content and pH, pot life, shelf life, effects of acid, alkali.

50 compositions were made of varying proportions within the range according to PCT application and the compositions were subjected to the above tests

50 compositions were made in accordance with examples 1 to 7 and 9 to 42 of the present invention and subjected to the above tests.

The comparative results obtained from the tests conducted are listed below:

Tests Conducted	Sample age	Unit	Composition prepared in conventional manner	Composition prepared in accordance with the invention disclosed in the PCT application	Composition prepared in accordance with the present invention
Compressive Strength	28 days	n/mm ²	@2.56 to 3.02 n/mm ²	> 5.3 to 8.84 n/mm ²	>16 n/mm ²
Shear strength for 6 mm thick material	28 days	Kg/cm ²	@ 0.7 to 1.2	@ 7.2 to 7.8	>8.9
bonding strength for 6 mm thick material	28 days	Kg/cm ²	@0.028 to 0.04	0.2 to 0.3	0.4 to 0.6
Wall strength test	28 days	Visual		4 to 5 times more than conventional wall	5 to 6 times more than conventional wall
Water absorption test	7 days to 240 days	% age of absorption	@ 7 to 9 %	Reduces from 17% to 9% with aging	Reduces from 12 % to 9 %
Temperature cycle tests (strength after 10 temperature cycles)	28 days	10 cycles	@1.4	>7	>9

Shrinkage test	28 days	% age	> 2 to 3%	<0.1%	<0.01%
Physical condition in dry state after application	28 days		Brittle	elastic	Elastic
Adhesion Test	28 days		Good	Excellent	Excellent
PHYSICAL TESTS					
color			Grey	Grey	Grey
viscosity			Thick paste	Thick Paste	Thick volatile Paste
Density			3.02	1.21 to 1.45	1.35 – 1.56
Drying (ambient temp of 25 ° to 30 ° c & Relative humidity of 70 %			24 hrs	24 hrs	7 TO 8 hrs
pH			8- 9	8 - 9	8 - 9
Adhesion			good	excellent	excellent
Shrinkage			2 to 3 %	<0.01%	<0.01%
Solid content			84.5 to 86		75 – 81 %

The test results shows that the composition disclosed in accordance with the present invention offers many advantages over the composition prepared in conventional manner and composition prepared in accordance with the PCT application cited above.

1. The density of the composition of the present invention is almost half the conventional material and little more than the composition disclosed in our PCT application, thus the material is almost 50 % lighter than the conventional material, which eases the application reducing the labour effort. The speed of construction is increased by almost 30 to 40 %, labour requirement is less as no help is needed in material handling on site, no time is required for pre wetting, post curing and cleaning.
2. The bond strength is about 3 to 5 times greater than the conventional material at 28 days and increases with age.
3. The shear strength is 10 to 12 times more than conventional material and increases with age.

4. The compressive strength is 2.5 to 3 times greater than the conventional material.
5. The drying time is almost the same or slightly greater than the conventional material.
The drying time of the composition of the present invention is inversely proportional to temperature and directly proportional to humidity.
6. The pH is alkaline and matches the currently known materials which make it similar in performance to acid and alkali resistant.
7. Shelf life is not applicable to the conventional material as it is on site preparation, while the shelf life of the composition of the present invention is much better than the composition according to the PCT application.
8. The pot life is 5 to 7 times better than the conventional mortar. The composition of the present invention can be reused even after 15 to 20 days by repacking it. This is not at all possible with the conventional material. This enables the reusing of the material and minimizes or almost eliminates wastage.
9. The composition of the present invention shows flexibility due to the presence of polymers while the conventional material is brittle upon drying.
10. The conventional material debonds and cracks if not cured with sufficient amount of water, while the composition of the present invention does not need any water curing but sets with air drying.
11. If the ratio of cement and water in the conventional material is not maintained, the optimum strength is not achieved by the material. The water mixed in the composition is used for hydration to form calcium hydrate sulphate, which gives strength to the material. The composition of the present invention uses water only as a carrier medium.

TECHNICAL ADVANCEMENT

A composition suitable for use in building construction disclosed in accordance with the present invention is designed to offer total replacement of the conventional Portland cement based mortars, plaster/render, grouting mortar and crack filling material. Furthermore, the invention also provides a process for producing said composition which is a cool green process since the process in accordance with the present invention does not use Portland cement hence there is no carbon dioxide releasement which supports in preventing global

warming. The composition of the present invention eliminates one of the major pollutants of the environment like bottom ash and/or fly ash, hence the invention offers an environmental friendly and eco-friendly product which is non-hazardous to the applicators and end-users. The composition needs minimal efforts to apply and creates excellent bonding as compared to the conventional compositions employed in the building construction. The composition disclosed in accordance with the present invention is ready to use, wet mix adhesive and needs very minimal amount of water for workability. Also, since there is no wastage of material during the application, the construction site remains clean. Also, the product is self curing and therefore, on application it does not require pre wetting and post curing with water. Thus, the entire water in the product is evaporated and returns to environment which saves almost 100% water. Additionally, the composition adds value to the construction by providing a composition which is crack resistant and therefore limits seepage of water or moisture. Thus, the composition limits the growth of fungus which otherwise causes damage to the construction. The composition of the present invention provides better weather resistance thus enhances the life of the construction. On scraping, the walls constructed using said composition; the material can be easily recycled or disposed of safely in a land fill.

ECONOMIC SIGNIFICANCE:

Conventional composition employed in the building construction is mainly based on Portland cement, sand and water in which all the ingredients are mixed on-site. On the other hand, the composition prepared in accordance with the present invention is in ready to use form and no pre-wetting and post curing with water is required hence no extra supervision is required which not only saves the time and labour but also water.

In conventional cementitious mortars, raw material handling, mixing and curing involves more transportation cost, labour and time and thus increases the overall capital investment. Furthermore, conventional cementitious mortar needs a separate inventory for sand, cement and water; however, the composition prepared in accordance with present invention is a one time inventory thus further saving ample amount of time, transportation and capital. Hence, the overall cost of the masonry work involved in the building construction is reduced by 2-3%.

While considerable emphasis has been placed herein on the specific ingredients of the preferred composition, it will be appreciated that many additional ingredients can be added and that many changes can be made in the preferred composition without departing from the principles of the invention. These and other changes in the preferred composition of the invention will be apparent to those skilled in the art from the disclosure herein, whereby it is to be distinctly understood that the foregoing descriptive matter is to be interpreted merely as illustrative of the invention and not as a limitation.

CLAIMS:

1. A composition suitable for use in building construction comprising
 - a. water in an amount of about 4% to about 49% of the mass of the total composition;
 - b. a thickener in an amount of about 0.15% to about 4% of the mass of the total composition;
 - c. a pH stabilizer in an amount of about 0.45% to about 1.5% of the mass of the total composition;
 - d. a preservative in an amount of about 0.05% to about 1.25% of the mass of the total composition;
 - e. a coalescing agent in an amount of about 0.22% to about 2.25% of the mass of the total composition;
 - f. an anionic pre-polymerized binder having intrinsic viscosity in the range of 250 cps to 4000 cps in an amount of about 2% to about 45% of the mass of the total composition;
 - g. bottom ash of particle size of above 45 microns in an amount of about 4.5% to about 76% of the mass of the total composition;
 - h. silica particle mixture with particle size in the range of about 100 microns to about 4000 microns in an amount of about 0% to about 73.5% of the mass of the total composition;
 - i. stone grit of hardness of greater than 2 on the Mohs scale in an amount of about 0 % to about 50 % of the mass of the total composition;
 - j. a filler in an amount of about 0 % to about 55 % of the mass of the total composition;
 - k. an extender in an amount of about 0 % to about 75 % of the mass of the total composition; and
 - l. optionally at least one additive selected from a group of additives consisting of a water proofing/repellant agent, a dispersing agent and a wax emulsion.

2. A composition suitable for use in building construction as claimed in claim 1, wherein the water is selected from a group consisting of demineralized water obtained by reverse osmosis, distilled water, deionized water, soft water and demineralized water free from bacteria.
3. A composition suitable for use in building construction as claimed in claim 1, wherein the thickener is at least one selected from cellulosic or non-cellulosic compounds which include acrylic polymer, acrylic emulsion copolymer, hydroxyethylcellulose, acrylic copolymer and crystalline hydrated magnesium aluminium silicate.
4. A composition suitable for use in building construction as claimed in claim 1, wherein the thickener is an acrylic polymer.
5. A composition suitable for use in building construction as claimed in claim 1, wherein the pH stabilizer is selected from a group consisting of liquid ammonia, triethylamine, ammonium chloride and ammonium hydroxide.
6. A composition suitable for use in building construction as claimed in claim 1, wherein the pH stabilizer is liquid ammonia having concentration in the range of 15% to 30%.
7. A composition suitable for use in building construction as claimed in claim 1, wherein the pH stabilizer is triethylamine.
8. A composition suitable for use in building construction as claimed in claim 1, wherein the preservative is selected from a group consisting of chloromethyl-methylisothiazolone formaldehyde, carbendazim-octylisothiazolone and isothiazolinones.
9. A composition suitable for use in building construction as claimed in claim 1, wherein the coalescing agent is selected from a group consisting of monoethylene glycol,

diethylene glycol, propylene glycol, taxonol, mixed xylene, gentamicin sulphate and hexane.

10. A composition suitable for use in building construction as claimed in claim 1, wherein the anionic pre-polymerized binder is water dispersible.
11. A composition suitable for use in building construction as claimed in claim 1, wherein the anionic pre-polymerized binder is a homopolymer.
12. A composition suitable for use in building construction as claimed in claim 1, wherein the anionic pre-polymerized binder is selected from a group consisting of acrylic polymer, styrene polymer, CNSL emulsion, shellac emulsion, low viscosity vinyl acrylic polymer, elastomeric acrylic emulsion and silicon emulsion.
13. A composition suitable for use in building construction as claimed in claim 1, wherein the anionic pre-polymerized acrylic and styrene copolymer is in the ratio of 70 to about 30 by mass.
14. A composition suitable for use in building construction as claimed in claim 1, wherein the anionic pre-polymerized binder is acrylic and styrene copolymer in the ratio of 50 to about 50 by mass.
15. A composition suitable for use in building construction as claimed in claim 1, wherein the glass transition temperature of the anionic pre-polymerized binder is in the range of about 10⁰C to 50⁰C.
16. A composition suitable for use in building construction as claimed in claim 1, wherein the glass transition temperature of the anionic pre-polymerized binder is in range of about 10⁰C to 30⁰C.

17. A composition suitable for use in building construction as claimed in claim 1, wherein the anionic pre-polymerized binder contains particulate monomeric units in the form of suspended monomeric particles having particle size below 8 microns, preferably in the range of 4 to 5 microns.
18. A composition suitable for use in building construction as claimed in claim 1, wherein the pH of the anionic prepolymerized binder is in the range of 3 to 10.
19. A composition suitable for use in building construction as claimed in claim 1, wherein the bottom ash is ash obtained from a wet and/or dry bottom coal combustion boiler and has moisture content less than about 0.5%.
20. A composition suitable for use in building construction as claimed in claim 1, wherein said composition includes fly ash in an amount of 0% to 76% of the mass of the total composition.
21. A composition suitable for use in building construction as claimed in claim 1, wherein the silica used is at least one silica selected from a group consisting of crystalline silica derived from rice husk, foundry silica, quarry silica, river bed silica and seashore silica, used after desalinization.
22. A composition suitable for use in building construction as claimed in claim 1, wherein said composition includes a silica particle mixture having particle size of 1.7 mm, 1.4 mm, 0.4 mm and 0.2mm respectively in the proportions of about 10%, 30%, 14% and 55% of the total mass of silica.
23. A composition suitable for use in building construction as claimed in claim 1, wherein said composition comprises silica particle mixture having particle size of 0.4mm and 0.2 mm respectively in the proportions of 93.33% and 6.67% of the total mass of silica.

24. A composition suitable for use in building construction as claimed in claim 1, wherein said composition comprises silica particle mixture having particle size of 0.2 mm and 0.6 mm respectively in the proportions of 10% and 90%.
25. A composition suitable for use in building construction as claimed in claim 1, wherein the stone grit has irregular shapes and has a particle size in the range of 1mm to 4mm.
26. A composition suitable for use in building construction as claimed in claim 1, wherein the stone grit is selected from the grit of stones selected from Shahabad stone grit, kotta stone grit, basalt stone grit, granite stone grit, sandstone stone grit, limestone stone grit, marble stone grit, soapstone stone grit and slate stone grit.
27. A composition suitable for use in building construction as claimed in claim 1, wherein the filler is at least one filler selected from a group of fillers consisting of coir dust, coconut powder, polystyrene balls, plastic wastes, rubber crumbs, glass beads, coir mesh, cork chips, natural fibers, synthetic fibers, glass fibers, ceramic spheres, powdered titanium oxide, calcium carbonate, iron oxide, mica, vermiculite and perlite.
28. A composition suitable for use in building construction as claimed in claim 1, wherein the extender is at least one extender selected from a group of extenders consisting of china clay, chalk, talc, barites, quartz powder and dolomite.
29. A composition suitable for use in building construction as claimed in claim 1, wherein the composition includes wax emulsion in an amount of about 0.1% to about 5% of the mass of the total composition.
30. A composition suitable for use in building construction as claimed in claim 1, wherein the water proofing/repellant agent is calcium stearate.
31. A composition suitable for use in building construction as claimed in claim 1 in the form of mortar, comprising the following ingredients:

- demineralized water in an amount of about 32% to about 37% of mass of the total composition;
- acrylic polymer in an amount of about 1.25% to about 1.5 % of mass of the total composition;
- liquid ammonia in an amount of about 0.38% to about 0.45% of the mass of the total composition;
- chloromethyl-methylisothiazolone formaldehyde in an amount of about 0.6 % to about 1.2% of the mass of the total composition;
- gentamicin sulphate in an amount of about 0.3% to about 0.5% of the mass of the total composition;
- water dispersible anionic pre-polymerized Acrylic-styrene binder in an amount of about 6% to about 6.6% of the mass of the total composition;
- bottom ash of particle size above 45 microns in an amount of about 28% to about 34% of the mass of the total composition;
- silica particle mixture with particle size in the range of 400 micron to 1000 micron in an amount of about 22% to about 28% of the mass of the total composition;
- stone grit having particle size of 4 mm in an amount of about 20% to about 24% of mass of the total composition; and
- stone grit having particle size of 1 mm in an amount of about 6% to about 8% of mass of the total composition.

32. A composition suitable for use in building construction as claimed in claim 1 in the form of plaster/render, comprising the following ingredients:

- demineralized water in an amount of about 32% to about 34% of mass of the total composition;
- acrylic polymer in an amount of about 0.9% to about 1.9 % of mass of the total composition;
- liquid ammonia in an amount of about 0.25% to about 0.39% of the mass of the total composition;

- chloromethyl-methylisothiazolone formaldehyde in an amount of about 0.05 % to about 1% of the mass of the total composition;
- gentamicin sulphate in an amount of about 0.3% to about 0.5% of the mass of the total composition;
- water dispersible anionic pre-polymerized Acrylic-styrene binder in an amount of about 6% to about 6.5% of the mass of the total composition;
- bottom ash of particle size above 45 microns in an amount of about 25% to about 35% of the mass of the total composition; and
- silica particle mixture with particle size in the range of 400 micron to 1000 micron in an amount of about 22% to about 27% of the mass of the total composition.

33. A composition suitable for use in building construction as claimed in claim 1 in the form of grouting mortar, comprising the following ingredients:

- demineralized water in an amount of about 26.3% to about 27% of mass of the total composition;
- acrylic polymer in an amount of about 1.2% to about 2 % of mass of the total composition;
- liquid ammonia in an amount of about 0.3 % to about 0.7 % of the mass of the total composition;
- carbendazim-octylisothiazolone in an amount of about 0.5 % to about 1% of the mass of the total composition;
- gentamicin sulphate in an amount of about 0.3% to about 0.6% of the mass of the total composition;
- water dispersible anionic pre-polymerized Acrylic-styrene binder in an amount of about 6% to about 6.6% of the mass of the total composition;
- bottom ash of particle size above 45 microns in an amount of about 28% to about 32% of the mass of the total composition;
- silica particle mixture with particle size in the range of 400 micron to 1000 micron in an amount of about 22% to about 27% of the mass of the total composition;

- stone grit having particle size of 4 mm in an amount of about 25% to about 27% of mass of the total composition; and
- stone grit having particle size of 1 mm in an amount of about 7% to about 8.5% of mass of the total composition.

34. A composition suitable for use in building construction as claimed in claim 1 in the form of repair mortar, comprising the following ingredients:

- demineralized water in an amount of about 21% to about 22.3% of mass of the total composition;
- acrylic polymer in an amount of about 2% to about 2.4 % of mass of the total composition;
- liquid ammonia in an amount of about 0.5 % to about 0.8 % of the mass of the total composition;
- isothiazolinones in an amount of about 0.5 % to about 1.2% of the mass of the total composition;
- gentamicin sulphate in an amount of about 0.3% to about 0.6% of the mass of the total composition;
- water dispersible anionic pre-polymerized Acrylic-styrene binder in an amount of about 6% to about 6.6% of the mass of the total composition;
- bottom ash of particle size in the range of 60 micron to 80 micron in an amount of about 28% to about 32% of the mass of the total composition;
- silica particle mixture with particle size in the range of 400 micron to 1000 micron in an amount of about 32% to about 36% of the mass of the total composition; and
- stone grit having particle size of 1 mm in an amount of about 5% to about 5.5% of mass of the total composition.

35. A composition suitable for use in building construction as claimed in claim 1 in the form of crack filler, comprising the following ingredients:

- demineralized water in an amount of about 22% to about 22.5% of mass of the total composition;

- acrylic polymer in an amount of about 1% to about 1.27 % of mass of the total composition;
- liquid ammonia in an amount of about 0.3 % to about 0.4 % of the mass of the total composition;
- isothiazolinones in an amount of about 0.1 % to about 1 % of the mass of the total composition;
- gentamicin sulphate in an amount of about 1 % to about 1.2 % of the mass of the total composition;
- water dispersible anionic pre-polymerized Acrylic-styrene binder in an amount of about 12% to about 14% of the mass of the total composition;
- bottom ash of particle size above 45 microns in an amount of about 27% to about 29% of the mass of the total composition; and
- silica particle mixture with particle size in the range of 400 micron to 1000 micron in an amount of about 32% to about 33.5% of the mass of the total composition.

36. A process for manufacturing of composition suitable for use in building construction comprising following steps:

- a. mixing at temperature in the range of 30⁰C to 40⁰C water, a thickener, a pH stabilizer, a preservative, a coalescing agent and an anionic pre-polymerized binder to a stainless steel high speed disperser at a speed of about 1200-1700 rpm for 2 to 3 hrs. to obtain a first concentrate;
- b. adding appropriate amount of water, bottom ash, silica and stone grit at a speed of about 700 to 800 rpm to the first concentrate; and
- c. mixing the complete mixture at a speed of about 400-800 rpm to obtain the composition suitable for use in building construction.

37. A process as claimed in claim 36, wherein the thickener and the pH stabilizer are added simultaneously.

38. A process as claimed in claim 36, wherein the process step (a) is carried out at a speed of about 1400-1500 rpm.
39. A process as claimed in claim 36, wherein the process step (c) is carried out at a speed of about 600-700 rpm.