

Mortar composition, method of preparation thereof and use thereof

- 5 The present invention relates to dry industrial mortars and coatings, and to the methods of preparation thereof and use thereof.

Mortar compositions in the form of dry powder ready for use have been known for a long time, comprising at least one powdery binder and at least
10 one aggregate, as well as possibly at least one standard additive and/or adjuvant, and formed from particles, at least some of which, referred to as fine particles, are liable to produce an emission of dust. This type of composition, generally referred to as "industrial" mortar, is a mortar batched and mixed in the factory. It is "dry", that is to say ready to be
15 mixed with water.

Amongst the aforementioned binders, mineral binders can be cited, such as slaked lime, cements, gypsum plaster or the like, and organic binders, such as for example certain synthetic resins. As aggregates (sometimes
20 referred to as agglomerates), sand, stone powder, crushed brick or the like can be mentioned.

The expression mortar means all compositions meeting the particularities given above and therefore also coatings. "Coating layer" means a layer
25 applied in one or more passes using the same mortar, without leaving the first pass to dry before applying the second. Then the "sub-coating" or sub-layer coating is distinguished, namely the "bottom layer or layers of a system", of the "final coating" or façade coating or finishing coating, namely the "top layer of a multi-layer coating system".

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The aforementioned industrial mortars and ready dry coatings have the well-known long-standing drawback of high emission of dust both during

manufacture by mixing their constituent components, during bagging and during manipulation before mixing on the site of use.

5 This emission of dust is the subject of regulation on the protection of workers, which is continually being strengthened.

Moreover, the aforementioned emission of dust gives rise to a degradation of the local environment, in the factory and on the site, requiring particularly constraining cleaning and protection work. The problem of the
10 emission of dust is particularly critical during work in a closed habitat, in particular during renovation of inhabited interiors.

Finally, the emission of dust will mainly concern the fractions of mortars and coatings having the finest particles, which are often the low-content
15 adjuvants. These constituents are in general the most critical and the most expensive in the formulation; if they partially get into the atmosphere in the factory and/or on the site this may lead to an imbalance in the composition of the mortar and therefore to a loss of performance.

20 In any other field, it is known how to reduce the emission of dust emitted during the treatment of soil with quicklime, by the agglomeration of the lime fines by means of a non-aqueous fluid additive [EP 0880569 B2].

The addition, to the mortars and coatings, of polar organic liquids, in
25 particular functionalised polyolefins having for example carboxylic functions or any other equivalent function (alcoholic or phenolic), is known so as to improve the adhesion and workability of the compositions, for the purpose of limiting the addition of water during mixing (reduction in the water/binder ratio) [JP 08081249, JP 05058695, US 4586960]. It should
30 however be noted that in no cases have such polar compounds been deemed to reduce the emission of dust from the compositions to which they have been added.

"Workability" means all the properties of use of a mortar that confer on its suitability for use. This concept is also sometimes referred to as "plasticity".

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Compositions are known for repairing cracks in walls (see WO 00/34200). According to circumstances, these compositions are before use in the form of a paste containing a large proportion of water or in a dry form to which water is added before application. In order, after hardening of the joints, to avoid the latter emitting dust in an undesirable manner during sanding, provision is made in the document for adding to the paste containing water or to the powder mixed with water a dust-suppressant liquid additive. As an alternative, a coating of the hardened joint with a layer of the dust-suppressant liquid additive is also provided.

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The object of the present invention is the development of industrial mortar compositions or ready dry coating compositions that have a reduced emission of dust during their manufacture, their manipulation or their use on site. These compositions must maintain the physical and chemical characteristics of the mortars and coatings compared with the minimum requirements demanded by the applications, including after a storage period of several months. Another object of the present invention is to propose a method of preparing such industrial mortars or ready dry coatings, having a limited emission of dust.

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This problem is resolved according to the invention by a mortar composition as indicated at the start, which also comprises a fluid additive that consists of at least one non-polar hydrocarbon organic substance and that has a capacity for agglomeration of the said fine particles, the composition of the dry mortar comprising agglomerates of fine powders formed by the fluid additive.

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Preferably, the composition according to the invention comprises the said fluid additive in a maximum quantity of 40 g per kg, preferably 20 g per kg. Preferentially, it may contain from 4 to 10 g of fluid additive per kg of mortar composition.

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Advantageously, the fluid additive is hydrophobic and can be chosen from mineral oils, paraffin oils, paraffins, polyolefins or mixtures of these substances.

10 A person skilled in the art might expect, when the fluid additive according to the invention is added to a mortar or coating composition, a drastic drop in the essential adhesion characteristics thereof, and an impairment in performance, such as the flow, permeability to water, mixing level (water/mortar ratio), the mixing time, the setting time and the open time
15 (the maximum period after application for effecting the finishing). For finishing coatings, a prejudicial change to the colour might even be expected.

It is clear that the addition of a non-polar hydrocarbon organic substance
20 to a mortar or coating according to the invention does indeed lead to a product having a significant reduction in the emission of dust, compared with the untreated mortar or coating (without fluid additive). The comparison of the dust-creating behaviour of the treated and untreated products is obtained on the basis of the application of the French standard
25 NF P 94-103 of December 2004, concerning the "determination of the degree of emission of dust from a powdery product (DED)". This reduction in the emission of dust is maintained, including after a storage of several months.

30 In addition to the reduction of the emission of dust and against all expectations, it is also clear that the mortar composition according to the

invention exhibits no degradation in the aforementioned physical and chemical characteristics in comparison with an untreated product.

5 In addition, and unexpectedly, the mortars and ready dry coatings according to the invention often have a "workability" superior to the same untreated product.

10 The industrial mortars and ready dry coatings according to the invention therefore resolve the problem relating to the emission of dust from conventional products without the loss of any of its properties and even with an improvement in workability.

15 The present invention also concerns a method of preparing a mortar composition according to the invention. This method can advantageously comprise a mixture of the said at least one powdery binder, the said at least one aggregate and possibly the said at least one standard additive and/or adjuvant and, before this mixing, an addition of the said fluid additive to at least one constituent of the said mixture. According to another embodiment of the invention, it comprises a mixing of the said at
20 least one powdery binder, the said at least one aggregate and possibly the said at least one standard additive and/or adjuvant and, during mixing, an addition of the said fluid additive. According to yet another embodiment of the invention, it comprises a mixing the said at least one powdery binder, the said at least one aggregate and possibly the said at least one standard
25 additive and/or adjuvant and, after mixing, an addition of the said fluid additive to the mixture obtained.

30 The present invention also relates to the use of a mortar composition according to the invention for mixing thereof with water with a view to forming a mortar, a coating, a roughcast, a screed, a high-bond mortar and similar products. It also concerns the mortars, coatings, plaster, screeds and tile adhesive as obtained by means of a mortar composition according

to the invention and/or by means of a composition prepared according to a method in accordance with the invention.

Other particularities of the invention are indicated in the accompanying
5 claims.

The invention will now be described in more detail by means of non-limiting examples.

10 **Example 1**

A ready dry high-bond mortar (1) is prepared by the dry mixing of the following constituents (percentages by weight):

- 15 - 43.5% standard Portland cement CEM II B 42,5,
- 1% pozzuolanic reagent, in the form of a natural volcanic rock,
- 51.6% siliceous sand with a grain size below 750 µm,
- 20 - 3.5% polyvinyl alcohol,
- 0.4% hydroxymethylcellulose.

25 In addition, a high-bond mortar (2) with a composition identical to the previous one is prepared according to the invention by dry mixing with the supplementary addition of 0.5% of mineral oil of the Shell Ondina 917 type with respect to the total weight of the mortar composition (1) (5 g of oil/kg untreated mortar).

30 The dust-creating behaviour of the above two mortars is compared on the basis of the standard NF P 94-103 of December 2004, concerning the

"determination of the degree of emission of dust of a powdery product (DED)", under operating conditions slightly different from the standard, in order best to discriminate the emission of dust from the mortar. The negative pressure taught at

- 5 § 6.2 is 2.59 hPa instead of 5.52 hPa and the suction duration is 3 minutes instead of 4 minutes.

With these operating conditions, the degree of emission of dust (DED) is 34% for conventional untreated mortar (1) and only 15% for the mortar
10 treated according to the invention (2). This is a significant and unexpected reduction in the dust-creating behaviour of the mortar according to the invention compared with conventional mortar, which contains however an olefin, polyvinyl alcohol, in significant quantities. This "functionalised" olefin seems in fact to have no effect on the emission of dust from the
15 mortar composition.

Samples of conventional mortars (1) and according to the invention (2) are tested in order to check the preservation of their physical and chemical characteristics. In both cases, the "wet" mortar (after mixing) was
20 prepared with a water/mortar ratio of 0.58. The determination of the adhesion is carried out in conformity with French standard NF EN 1348. The adhesion is 0.6 N/mm² for the reference mortar (1) and 0.7 N/mm² for the mortar (2) according to the invention. These are two values that are considered to be equivalent, perfectly in accordance with the
25 specifications.

The adhesion of the high-bond mortar according to the invention is indeed maintained compared with the untreated product. In addition, an improvement in workability was observed by trade operators, during blind
30 tests, in the case of the high-bond mortar according to the invention.

Example 2

A ready dry undercoat coating (3) is prepared by the dry mixing of the following constituents (percentages by weights):

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- 23% standard Portland cement CEM II B 42,5,

- 7% slaked lime ($\text{Ca}(\text{OH})_2$),

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- 68% siliceous sand with a grain size of less than 1 mm,

- 1.5% polyvinyl alcohol,

- 0.2% surfactant,

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- 0.3% fatty acid ester.

In addition, a ready dry undercoat coating (4) with a composition identical to the previous one is prepared according to the invention by dry mixing with the supplementary addition of 0.5% of mineral oil of the Shell Ondina 917 type with respect to the total weight of coating composition (3).

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The dust-creating behaviour of the above two coatings is compared as in example 1. The degree of emission of dust (DED) is 22% for the conventional untreated reference coating (3) and only 9% for the coating treated according to the invention (4). This is a significant reduction in the dust-creating behaviour of the coating according to the invention.

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Samples of the conventional coatings (3) and according to the invention (4) are tested in example 1, in order to check the preservation of their physical and chemical characteristics. In both cases, the "wet coating" (after mixing) was prepared with a water/coating ratio of 0.23. The

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resistance to flexion and compression was determined in accordance with the French standard NF EN 1015-11 and permeability in accordance with the French standard NF EN 1323. Results of the various tests for the two coatings appear in table 1 below.

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	Reference coating (3)	Coating according to the invention (4)
Adhesion [N/mm ²]	0.5	0.5
Resistance to flexion Rf [Mpa]	2.7	2.7
Resistance to compression Rc [Mpa]	8.5	7.2

Table 1: Comparison of the physical and chemical properties of the undercoat coatings treated according to the invention (4) and reference untreated (2).

Table 1 confirms that the essential physical and chemical properties of the coating according to the invention (4) remain in accordance with the specifications, after the dust-suppressant treatment. The reduction from 8.5 to 7.2 Mpa in the resistance to compression is not significant and remains superior to a minimum of 5 Mpa. In addition, an improvement in workability was observed by trade operators, during blind tests, in the case of the coating according to the invention.

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Example 3

A ready dry finishing coating (5) is prepared by the dry mixing of the following constituents (percentages by weight):

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- 6% standard Portland cement CEM IIB42,5,

- 12% slaked lime (Ca(OH)_2),

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- 81% siliceous sand with a grain size of less than 2 mm,

- 0.3% starch,

10 - 0.3% surfactant,

- 0.4% fatty acid ester.

15 In addition, a ready dry finishing coating (6) with a composition identical to the previous one is prepared according to the invention by dry mixing with the supplementary addition of 0.7% of mineral oil of the Shell Ondina 917 type with respect to total weight of the coating composition (5).

20 The dust-generating behaviour of the above 2 coatings is compared as in examples 1 and 2. The degree of emission of dust (DED) is 17% for the untreated conventional reference coating (5) and only 8% for the coating treated according to the invention (6). Once again this is a significant reduction in the dust-generating behaviour of the coating according to the invention.

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Samples of the conventional coatings (5) and according to the invention (6) are tested, in order to check the maintenance of their physical and chemical characteristics. In both cases, the "wet" coating (after mixing) was prepared with a water/coating ratio of 0.22. A test of permeability to water was carried out on the two coatings, in accordance with French standard NF EN 1323.

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The permeability to water of the reference coating (5) is 0.002 ml/min.cm² and that of the coating according to the invention (6) is 0.001 ml/min.cm². These two values are significantly different for a person skilled in the art. The coating according to the invention (6) affords an acknowledged
5 improvement to the impermeability of the coating. Moreover, no significant difference in colour was observed between the two coatings. Finally, an improvement to workability was observed by trade operators, during blind tests, in the case of the coating according to the invention.

10 These examples together illustrate perfectly the significant reduction in the emission of dust of the mortars and coatings according to the invention, compared with the same untreated products. Moreover, they confirm the absence of degradation of the properties of the mortars and coatings according to the invention, despite the addition of mineral oil to their
15 composition. Finally, the improvement in workability of the mortars and coatings according to the invention also appears.

It must be understood that the present invention is in no way limited to the embodiments described above and that many modifications can be made
20 thereto without departing from the scope of the accompanying claims.

As other examples of fluid additives according to the invention, available on the market, it is possible for example to cite a white mineral oil, a polyalpha-olefin (of the Nextbase 2002 type from Neste), a poly-intra-olefin
25 (of the MX2101 type from Mixoil), etc.

CLAIMS

1. Mortar composition in the form of dry powder, ready for use,

5 comprising at least one powdery binder and at least one aggregate, as well as possibly at least one standard additive and/or adjuvant, and

formed from particles, at least some of which, referred to as fine particles, are liable to produce an emission of dust,

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characterised in that it also comprises a fluid additive that consists of at least one non-polar hydrocarbon organic substance and that has a capacity for agglomeration of the said fine particles, and in that the dry mortar composition comprises agglomerates of fine particles formed by the

15 fluid additive.

2. Mortar composition according to claim 1, characterised in that it comprises the said fluid additive in a maximum quantity of 40 g per kg of mortar composition.

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3. Mortar composition according to one or other of claims 1 and 2, characterised in that the fluid additive is hydrophobic.

4. Mortar composition according to any one of claims 1 to 3, characterised

25 in that the fluid additive is chosen from amongst mineral oils, paraffin oils, paraffins, polyolefins or mixtures of these substances.

5. Mortar composition according to any one of claims 1 to 4, characterised in that the binder is chosen from mineral binders and organic binders.

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6. Mortar composition according to claim 5, characterised in that the mineral binders are chosen from cements, slaked lime, gypsum plaster and mixtures thereof.

5 7. Method of preparing a mortar composition according to any one of claims 1 to 6, characterised in that it comprises a mixture of the said at least one powdery binder, the said at least one aggregate as well as possibly the said at least one standard additive and/or adjuvant and, before this mixing, an addition of the said fluid additive to at least one
10 constituent of the said mixture.

8. Method of preparing a mortar composition according to any one of claims 1 to 6, characterised in that it comprises a mixing of the said at least one powdery binder, the said at least one aggregate as well as
15 possibly the said at least one standard additive and/or adjuvant, and, during the mixing, an addition of the said fluid additive.

9. Method of preparing a mortar composition according to any one of claims 1 to 6, characterised in that it comprises a mixing of the said at least one powdery binder, the said at least one aggregate as well as
20 possibly the said at least one standard additive and/or adjuvant and, after the mixing, an additional of the said fluid additive to the mixture obtained.

10. Use of a mortar composition according to any one of claims 1 to 6, for
25 mixing it with water with a view to forming a mortar, a coating, a roughcast, a screed, a high-bond mortar and similar products.

11. Mortars, coatings, roughcasts, screeds and high-bond mortars, as obtained by means of a mortar composition according to any one of claims
30 1 to 6 and/or by means of a composition prepared according to any one of claims 7 to 9.