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CEMENT-CONTAINING 2-COMPONENT MORTAR FOR TIE RODSBackground Information and Prior Art

Numerous 2-component mortars are known for fastening anchoring means such as tie rods and the like in boreholes. 2-Component mortars are understood to be curable compositions, which contain, on the one hand, curable, components and, on the other, curing agents separately from one another, for example, in cartridges or foil pouches, so that they can be stored. To initiate the curing, the components are brought into reactive contact, for example, by destroying the walls separating them in the borehole or by pressing them jointly out of the foil pouch. 2-Component mortars, which contain polymerizable organic compounds as curable components and, initially separately herefrom until used, the corresponding curing agent, are widespread. On the other hand, cement mortar or plaster mortar, which was used quite commonly in the past, has moved into the background.

A plurality of anchorages is produced in boreholes by mineral seating materials in the widest sense, such as natural stones, such as a rock, or artificial stones, such as concrete,

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tiles, artificial or natural masonry and the like. The use of a cement mortar for such fastenings, that is, a mineral silicate composition for a seating material, which once again is a mineral silicate, must therefore seem as conforming to the system.

Object of the Invention

The present invention relates to an improvement in such a conventional mortar composition and, especially, to achieving high pull-out values and control of high curing rates.

Summary of the Invention

This objective is accomplished by using a curable 2-component mortar composition with finely divided cement as curable component and with water glass as curing agent, the curable component and the curing agent being separated to inhibit reaction and brought together under use conditions so that they may react in order to fasten tie rods and similar anchoring means in boreholes in mineral, silicate seating materials or substrates.

Instead of the finely divided cements, which in particular have proven their value, mixtures of such cements with cements of usual particle size can also be used. It has

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meanwhile been shown that the proportion of finely grained cements should, as far as possible, be at least about 40% by weight, based on the total weight of the cement, even if lower proportions of finely divided cement are entirely usable in special cases. For the present invention, finely divided cements are understood to be cements with a specific surface area of 3 to 8 and especially of 4 to 7 m²/g, as measured by the BET method. As cements, Portland cements, aluminate cements or aluminous clay cements and their mixtures are preferred. Moreover, the introduction of aluminum-containing compounds, such as aluminate cements, which make aluminum ions available during the curing reaction for forming cured products, have a favorable effect on the stability of the cured product.

As alkali water glass, especially sodium silicate, but also potassium silicate or mixtures of these two, have proven their value. When mixtures of finely divided cement and water glass are used pursuant to the invention, the curing reaction proceeds comparatively very rapidly and, to a noticeable extent, also in the direction of the formation of zeolitic compounds. Water glass preparations, the alkali silicate concentration of which generally is between 20 and 60% by weight, based on the total weight of aqueous carrier and alkali silicate, can be used. For the sake of simplicity, conventional commercial

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concentrations of 30 to 55% by weight are preferred. The concentration relates here to the total weight of the water glass. Analytically, any precipitates, such as more or less hydrated silica, are also included with the alkali silicate contained. The ratio by weight of the water, contained in the water glass as curing agent, to cement is not critical. However, when water glasses of the usual concentration are used, the ratio should fall within the range of about 0.2 to 2.5 : 1 and especially of 0.3 to 1.7 : 1.

The 2-component mortar composition, used pursuant to the invention, may contain conventional, for example, also known mortar additives, such as fillers, thickeners, solvents, dispersants, thixotropic materials, inert liquid carriers, stabilizers, means for controlling the curing rate, wetting agents and/or the like. These additives may be contained in the component containing the curable material and/or in the component containing the curing agent. As filler, sand, quartz, very fine sand, chalk, kaolin, organic fibers and the like can be contained in amounts up to 80% by weight, based on the total weight of the mortar. The component, containing the curable cement, may contain known additives, such as phthalates, mineral oil, castor oil or isofols, in order to facilitate the mixing. The viscosity of such cement pastes, containing inert carriers,

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can be controlled by thickening agents, thixotropic materials, such as pyrogenic silica and the like. Likewise, the viscosity of the water glass can also be controlled by conventional additives affecting viscosity and thixotropy, to promote the mixing process of the curable component with the curing agent component.

Generally, the mortar compositions, used pursuant to the invention, contain 20 to 55% by weight and preferably 25 to 45% by weight of finely divided cement, based on the weight of the mortar component without the curing agent.

It has turned out that the mortar composition, used pursuant to the invention, cures exceptionally quickly. Some delay to the curing process can be achieved by using a cement, which contains, aside from the finely divided cement used pursuant to the invention, also cement portions having a coarser grain, such as standard cements with a specific surface area of 0.5 to 1.1 m²/g as measured by the BET method. Pursuant to the invention, the curing can also be controlled by retarding substances, preferably alkali phosphates, such as trisodium orthophosphate, including the hydrates.

Yet another object of the invention is the use of curable, 2-component mortar compositions with finely divided cement and water glass as a two-chamber or multi-chamber device for fastening anchoring means in boreholes (TRANSLATOR'S NOTE: sic!).

A further object of the invention is the use of the inventive, above-described 2-component mortar composition with finely divided cement as curable components and alkali silicate as curing agent for fastening anchoring means, such as tie rods and the like in boreholes. In particular, the invention also relates to the packaging of the inventive 2-component mortar in two-chamber or multi-chamber systems. These include, in particular, cartridges of glass, plastic or ceramic, in the interior of which the curable components are disposed separately from the respective curing agent by destructible walls. Such cartridge systems are inserted in the boreholes. To initiate the curing reaction, the cartridges, including the partitions contained therein, are destroyed, for example, by driving in the tie rods. Such two-chamber and multi-chamber systems also include foil systems with two or more foil pouches for separating curable components from curing agents. The contents of the foil bag can be injected together into a borehole, using, for example a static mixer. As explained previously, these

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cartridge and foil systems contain, aside from the reactive components, separated to prevent a reaction, further components of the mortar, such as fillers, solvents, thickeners, thixotropic agents, agents that control the curing rate and the like.

Example:

sodium silicate ("GVZ" = 2.7)	20.8% by weight
sodium phosphate retarder	0.8% by weight
quartz sand (average particle size 0.24 mm)	39.8% by weight
powdered quartz (specific BET surface area of approx. 0.9 m ² /g)	24.3% by weight
Portland cement (specific BET surface area of about 4.4 m ² /g)	9.3% by weight
castor oil	5.0% by weight

In the case of two-chamber systems, water glass is in the one chamber and cement and castor oil in the other. The quartz filler or thickening agent generally is in the water glass chamber but may also be distributed in both chambers.

Claims

1. A method of fastening tie rods and similar anchoring means in boreholes, which comprises placing the anchoring means in the borehole with a curable 2-component mortar composition with cement as curable component and with water glass as curing agent, the curable component and the curing agent being separated to inhibit reaction and mixing the components to bring about the reaction and to fasten the anchoring means, wherein the cement is finely divided cement with a specific surface area of 3-8 m²/g (BET) and is present in an amount of at least 40% by weight based on the total amount of cement.

2. The method in accordance with claim 1, wherein the cement has a specific BET surface area of 4 to 7 m²/g.

3. The method in accordance with claims 1 or 2, wherein the alkali silicate (water glass) is sodium and/or potassium silicate.

4. The method of claim 1 wherein the alkali silicate concentration is 20 to 60% by weight, based on the total weight of the aqueous silicate.

5. The method of claim 1, wherein the ratio by weight of water, contained in the silicate, to cement is 0.2 to 2.5:1 and preferably 0.3 to 1.7:1.

6. The method of claim 1, wherein additional fillers, thickeners, solvents, dispersants, thixotropic agents, inert liquid carriers, stabilizers, means for controlling the curing rate, wetting agents and/or other known mortar additives of the curable component and/or curing agent are used.

7. The method of claim 1, wherein 20 to 50% by weight of finely divided cement, based on the weight of the mortar components without curing agent are present.

8. The method of claim 1, wherein substances, which retard the curing process, preferable alkali phosphates, are contained.

9. The method using a curable 2-component mortar composition with finely divided cement with a specific surface area of 3-8 m²/g (BET) and present in an amount of at least 40% by weight based on the total amount of cement, as curable component and water glass as curing agent, the curable component and the curing agent being contained separately, so as to inhibit reaction, in a two-chamber or multi-chamber device and, under use conditions, being caused to react for fastening anchoring means in boreholes.

10. The method using a curable 2-component mortar composition with finely divided cement with a specific surface area of 4-7 m²/g (BET) and present in an amount of at least 40% by weight based on the total amount of cement, as curable component and water glass as curing agent, the curable component and the curing agent being contained separately, so as to inhibit reaction, in a two-chamber or multi-chamber device and, under use conditions, being caused to react for fastening anchoring means in boreholes.

11. A curable 2-component mortar composition with finely divided cement with a specific surface area of 3-8 m²/g (BET) and present in an amount of at least 40% by weight based on the total amount of cement, as curable component and with water glass as curing agent, the curable component and the curing agent being separated to inhibit reaction and, for use, being mixed to bring about the reaction for fastening tie rods and similar anchoring means in boreholes.