Claims

1. An activator composition mixable with ~~A cementitious binder comprising at least 90% by weight of~~ a non-OPC hydraulically-active material comprising ground granulated blast furnace slag (GGBS), pulverised fuel ash (PFA) or a mixture of GGBS and PFA, ~~at least 0.1% by weight of~~ the activator composition comprising an activator, which is CaO or lime, and a polycarboxylate-ether-based (PCE) superplasticiser.

~~2. A cementitious binder according to claim 1, in which the hydraulically-active material comprises at least 50% or 70% or 80% or 90% GGBS, PFA or the mixture of GGBS and PFA.~~

~~3.~~2. An activator composition ~~cementitious binder~~ according to claim 1 ~~or 2~~, in which the activator and the PCE superplasticiser ~~is a polycarboxylate-ether-based (PCE) superplasticiser~~are mixed in a weight ratio of between 1:1 and 38:1.

~~4. A cementitious binder according to claim 1, 2 or 3, comprising at least 90% of the hydraulically-active material, with the remainder comprising the CaO and the superplasticiser.~~

~~5. A cementitious binder according to any preceding claim, which consists of GGBS, PFA or the mixture of GGBS and PFA, the CaO and the superplasticiser.~~

~~6.~~3. An activator composition ~~cementitious binder~~ according to ~~any preceding~~ claim 1 or 2, ~~comprising an activator composition which comprises the CaO, optionally comprising the superplasticiser, and optionally further~~ comprising a further component , which is microsilica and/or PFA, preferably super-fine pulverised fuel ash (PFA).

~~7. A cementitious binder according to any preceding claim, comprising at least 0.1wt% or 1wt% or 2wt% CaO, and preferably an amount equal to or greater than about 2.5wt%, 3wt%, 4wt%, 5wt%, 6wt%, 7wt% or 8wt% CaO.~~

~~8. A cementitious binder according to any preceding claim, comprising greater than 93%, 95%, 96%, 97% or 98% by weight hydraulically-active material.~~

~~9. A cementitious binder according to any preceding claim, comprising between 0.2% and 2%, or between 0.3% and 1.2%, or between 0.4% and 0.7% superplasticiser.~~

~~10. A cementitious binder according to any preceding claim, in which the superplasticiser is in powder form and the binder comprises more than 0.2%, 0.25%, 0.3%, 0.35% or 0.4% and/or less than 0.7%, 0.75%, 1% or 1.2% superplasticiser.~~

~~11. A cementitous binder according to any preceding claim, in which the superplasticiser is in liquid form and the binder comprises more than 0.2% or 0.5% and less than 2% superplasticiser.~~

4. An activator composition according to claim 3, in which the activator and the further component are mixed in a weight ratio of between 1.2:1 and 3:1.

5. An activator composition according to any preceding claim, in which the activator composition is contained within one or more water-soluble packages and is releasable from the one or more water-soluble packages on contact with water.

6. An activator composition according to any preceding claim, in which the PCE superplasticiser is in powder form.

7. An activator composition according to any preceding claim, in which a predetermined quantity of the activator composition is packaged in a package for use in mixing with a hydraulically-active material, the package preferably releasing the activator composition on contact with water.

8. An activator composition according to any preceding claim, in which the activator and the PCE superplasticiser are mixed in a weight ratio of between

1:1 and 6:1.

9. An activator composition for combining with a hydraulically-active material comprising ground granulated blast furnace slag (GGBS), pulverised fuel ash (PFA) or a mixture of GGBS and PFA, the activator composition comprising a first component consisting of CaO or lime and a second component consisting of a superplasticiser such as a PCE superplasticiser.

10. An activator composition according to claim 9, in which the activator and the superplasticiser are mixed in a weight ratio of between 1:1 and 38:1.

11. An activator composition according to claim 9 or 10, in which the superplasticiser is in powder form.

12. An activator composition according to claim 9, 10 or 11, further comprising a third component consisting of microsilica, PFA, or a mixture of microsilica and PFA, the PFA preferably being super-fine PFA.

13. An activator composition according to claim 12, in which the activator and the further component are mixed in a weight ratio of between 1.2:1 and 3:1.

14. An activator composition according to any of claims 9 to 13, in which a predetermined quantity of the activator composition is packaged in a package for use in mixing with a hydraulically-active material, the package preferably releasing the activator composition on contact with water.

15. An activator composition according to any of claims 9 to 14, in which the activator and the superplasticiser are mixed in a weight ratio of between 1:1 and 6:1.

16. An activator composition according to any of claims 1 to 15, in which the activator composition is in powdered form.

17. An activator composition according to any of claims 1 to 16, in which the activator composition is pre-blended.

~~12. A method of making a concrete, mortar, grout or render, comprising the steps of mixing together in a predetermined proportion;~~
~~a) a cementitious binder;~~
~~b) aggregate particles; and~~
~~c) water;~~
~~in which the cementitious binder is a binder as defined in any preceding claim.~~

~~13. A method according to claim 12, in which the weight ratio of water to the cementitious binder is between 0.15:1 and 0.45:1, preferably between 0.2:1 and 0.4:1, preferably between 0.25:1 and 0.35:1, for example about 0.3:1, where non-absorbent aggregates are used.~~

~~14. A method according to claim 12 or 13, in which the volume ratio of the cementitious binder to the aggregate particles is between 1:3 and 1:15, preferably between 1:4 and 1:8.~~

~~15. A method of making a concrete, mortar, grout or render, comprising the steps of mixing together in a predetermined proportion;~~
~~a) a hydraulically-active material comprising GGBS, PFA or a mixture of GGBS and PFA;~~
~~b) an activator composition comprising or consisting of CaO;~~
~~c) aggregate particles;~~
~~d) water; and~~
~~e) a superplasticiser, which optionally forms a component of the activator composition;~~
~~in which the hydraulically-active material, the activator composition and the superplasticiser (which optionally forms a component of the activator composition) combine to form a cementitious binder as defined in any of claims 1 to 11.~~

~~16. A method according to claim 15, in which components a), b) and e) combine to form a binder component of the concrete, mortar, grout or render, and the volume ratio of the binder component to component c) is between 1:3 and 1:15 and preferably between 1:4 and 1:8.~~

~~17. A method according to claim 15 or 16, in which components a), b) and e) combine to form a binder component of the concrete, mortar, grout or render, and the weight ratio of component d) to the binder component is between 0.15:1 and 0.45:1, preferably between 0.2:1 and 0.4:1, preferably between 0.25:1 and 0.35:1, for example about 0.3:1, where non-absorbent aggregates are used.~~

~~18. A method according to any of claims 15 to 17, in which the activator composition is contained within one or more water-soluble packages and is released from the one or more water-soluble packages as they are dissolved by the water.~~

~~19. A concrete, mortar, grout or render comprising a cementitious binder as defined in any of claims 1 to 11.~~

~~20. A concrete, mortar, grout or render formed by the method defined in any of claims 12 to 18.~~

~~21. A concrete, mortar, grout, or render according to claim 19 or 20, in which the weight ratio of water to binder is between 0.2:1 and 0.4:1, preferably between 0.25:1 and 0.35:1, for example about 0.3:1, where non-absorbent aggregates are used.~~

~~22. A concrete, mortar, grout or render according to any of claims 19 to 21, which has a compressive strength of greater than 15 MPa after 7 days, greater than 20 MPa after 14 days, and greater than 30 MPa after 28 days.~~

~~23.~~18. Use of an activator composition in combination with a hydraulically-active material comprising ground granulated blast furnace slag (GGBS), pulverised fuel ash (PFA), or a mixture of GGBS and PFA to form a cementitious binder, the activator composition comprising CaO or lime and a polycarboxylate-ether-based (PCE) superplasticiser, in which the proportion of hydraulically-active material by weight in the resulting binder is greater than 90%, and the proportion of activator composition by weight in the resulting binder is less than 10%~~, and in which the binder comprises a superplasticiser such as a PCE~~.

~~24. Use of an activator composition according to claim 23, in which the activator composition comprises the superplasticiser.~~

~~25.~~19. Use of an activator composition as defined in claim ~~23 or 24~~18, comprising the step of adding to the hydraulically-active material a predetermined quantity of the activator composition contained in a package, preferably a water-soluble package.

~~26. An activator composition for combining with a hydraulically-active material comprising ground granulated blastfurnace slag (GGBS), pulverised fuel ash (PFA), or a mixture of GGBS and PFA in combination with a superplasticiser such as PCE to form a cementitious binder, the activator composition comprising a first component consisting of CaO, and a second component consisting of microsilica and/or pulverised fuel ash (PFA), preferably in a superfine form, in which the first component and the second component are mixed in a weight ratio of between 1.2:1 and 3:1.~~

~~27. An activator composition according to claim 26, in which the superplasticiser is a component of the activator composition.~~

~~28. An activator composition according to claim 26 or 27, in which the CaO comprises lime.~~

~~29. An activator composition for combining with a hydraulically-active material comprising GGBS, PFA or a mixture of GGBS and PFA, the activator composition comprising a first component consisting of CaO and a second component consisting of a superplasticiser such as PCE superplasticiser.~~

~~30. An activator composition according to claim 29, in which the superplasticiser is in powder form.~~

~~31. An activator composition according to claim 29 or 30, further comprising a third component consisting of microsilica, PFA, or a mixture of microsilica and PFA, the PFA preferably being super-fine PFA.~~

~~32. An activator composition according to any of claims 26 to 31, in which a predetermined quantity of the activator composition is packaged in a package for use in mixing with a hydraulically-active material, the package preferably releasing the activator composition on contact with water.~~

~~33. A cementitious binder comprising;~~
~~more than 90% of a hydraulically-active material comprising GGBS, PFA or a mixture of GGBS and PFA;~~
~~between 0.1% and 9% CaO; and~~
~~between 0.2% and 2% superplasticiser, such as a PCE superplasticiser.~~

~~34. A cementitious binder according to claim 33, comprising,~~
~~between 94-97wt% of the hydraulically-active material;~~
~~between 1.5-3.5wt% CaO; and~~
~~between 0.2-2wt% superplasticiser.~~

~~35. A cementitious binder according to claim 33 or 34, comprising between 1-2.5wt% microsilica and/or pulverised fuel ash (PFA), preferably super-fine PFA.~~

~~36. A concrete, mortar, grout or render comprising a cementitious binder formed from a combination of 94-97wt% of a hydraulically-active material comprising ground granulated blastfurnace slag (GGBS), pulverised fuel ash (PFA), or a mixture of GGBS and PFA, 3-6wt% of an activator composition, and aggregate particles bound together by the binder,~~
~~in which the activator composition comprises a first component consisting of CaO and a second component consisting of microsilica and/or pulverised fuel ash (PFA), preferably in super fine form, the ratio of the first component to the second component being between 1.2:1 and 3:1 by weight,~~
~~and in which the binder comprises a superplasticiser such as a PCE, optionally forming part of the activator composition.~~

~~37. A concrete, mortar, grout or render according to claim 35, in which the CaO is lime.~~

~~38. A concrete, mortar, grout or render comprising a cementitious binder according to any of claims 33 to 37.~~

~~39. A concrete, mortar, grout, render or binder as defined in any preceding claim that does not contain ordinary Portland cement (OPC).~~