

PATENT SPECIFICATION

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(21) Application No. 14656/78 (22) Filed 13 April 1978

(44) Complete Specification Published 3 December 1980

(51) INT. CL.³ C04B 33/13

(52) Index at Acceptance

C1H 120 630 690 721 732 738 742 811 C1J
12 13 14 24 4 X



(54) IMPROVEMENT IN OR RELATING TO THE MANUFACTURE OF CLAY-BASED ARTICLES

(71) I, SEANG HA PARK, of Korean Nationality of 34-26 Daeyeon-dong, Nam-ku, Busan, Korea, do hereby declare the invention for which I pray that a patent may be granted to me and the method by which it is to be performed, to be particularly described in and by the following statement:-

The present invention relates generally to a process for manufacturing clay-based articles such as clay bricks and more particularly hard and damp-proof clay bricks, such as are in general used as building materials.

Many types of bricks are known, most of which possess disadvantages such as that they are liable to crack during a dry period, that they are difficult to use with the cement or mortar used for building due to lack of adhesion between the clay bricks and the cement, or that they become damp after having been put to use on account of the physical property they possess of being able to absorb moisture.

It is an object of the present invention to provide a clay-based article in which these disadvantages are absent or are alleviated. A further object of the invention is to provide a process for manufacturing such bricks.

According to one aspect of the present invention there is provided a clay-based article composed from crushed clay powder as the major ingredient, a small amount of finely particulate ashes which have undergone complete combustion, an acid strong cement, a hardening agent and water, which have been mixed, moulded to shape and dried at ambient temperature over a prolonged period.

According to a further aspect of the present invention there is provided a process for manufacturing a clay-based article which comprises mixing crushed clay powder as the major ingredient, a small amount of finely particulate ashes which have undergone complete combustion, an acid strong cement, a hardening agent and water, moulding the mixture to shape and drying the moulded mixture at ambient temperature for a prolonged temperature.

That is to say, fine particles of completely combustible briquette ashes, acid strong cement and hardening reagent are added to powdered clay, the chief ingredient, with a sufficient quantity of water. After being mixed,

it is moulded into a desired shape and then, dried wholly in sunlight and exclusively of a furnace. In this way the clay-based articles such as bricks, of this invention produced.

The bricks of the present invention have no tendency to crack or expand and no undesirably rough surfaces. They have been subject to prolonged low temperature drying, preferably in the sun during their manufacture. They have satisfactory hardness and good adhesion with portland cement for building. Because they do not absorb moisture after use and because they have low heat conductivity, they have both water-proofing and heat-proofing effects when employed for general use as building materials.

Other objects and advantages of the products of the present invention will become apparent from the following description.

The bricks of this invention are preferably made from a mixture of 97.5% by weight of dried, crushed clay powder, 0.9% by weight of fine particles of completely burnt briquette ashes (Fly Ash), 0.9% by weight of acid strong cement and 0.7% by weight of a hardening reagent (that is, $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$). A suitable quantity of water is added together with one or more optional pigments. After mixing, the mixture is moulded into a desired shape and then dried for 5-7 days in sunlight to produce the product of this invention.

The materials used for the purposes of the present invention are as follows:-

Clay consisting mostly of SiO_2 and Al_2O_3 . Although a clay gets little out of its shape below about 700 °C, clay in itself possesses little hardness and suffers from the physical property of heavy absorbability of water. It is on account of these faults that the cement and briquette ashes should be added to the clay.

The cement employed in this invention is acid strong cement, which is generally made from 15% caustic lime and 85% non-crystalline reactive silica, the silica being derived from a powder treatment of non-crystalline unreactive silica. This cement is much more acidic than portland cement which is composed of 65% caustic lime, whereby the acid strong cement is given great durability and acts to increase the hardness of the clay bricks. Also, it greatly improves

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the adherence of the clay bricks to portland cement.

The briquette ashes used in the present invention is Fly Ash gathered, e.g., from a coal-fired power station. This Fly Ash is preferably a product of complete combustion at a high temperature, e.g., 1500 °C, in which case it does not contain any sulphurous component. Being finely particulate, it increases the thermal insulating properties of the bricks and acts to bind together the clay and the portland cement. Additionally the presence of the finely particulate briquette ashes has a water-proofing effect, and provides some protection from cracking or expansion and reduces surface roughness.

The presence as a hardening reagent of $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$, increases the strength of the clay bricks, and also provides an early hardness and a damp-proofing effect, and what is more, makes it possible for the bricks to be mass-produced and dried at air temperatures of less than 0 °C, because the freezing point of its solution is low. (-41 °C in case of 40% solution).

EXAMPLE

	Clay	2200g
	Fly Ash	20g
	Acid strong cement	20g
30	$\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$	16g

The above quantities of material were mixed with about 450 cc of water and moulded into a desired shape. Thereafter drying was effected for 5-7 days at ambient temperature (15-25 °C).

Clay bricks were manufactured in this process which proved to be satisfactory in use.

Although it has been indicated hereinbefore that the briquette ashes employed in this invention are the products of complete combustion it is possible they may instead be completely combustible.

Although the present invention has been described with reference mainly to bricks it is clearly applicable to and embraces clay-based products in general as defined by the scope of the appended claims.

WHAT I CLAIM IS:-

- 50 1. A clay-based article composed of crushed clay powder as the major ingredient, a small amount of finely particulate ashes which have undergone complete combustion, an acid strong cement, a hardening agent and water, which have been mixed, moulded to shape and dried at ambient temperature over a prolonged period.
2. An article according to claim 1, wherein the crushed clay powder has been dried, before mixing with the other ingredients.
3. An article according to claim 1 or 2, wherein the ashes constitute fly ash derived from the complete combustion of coal at high temperature.
- 65 4. An article according to any preceding

claim, wherein the ashes are free of sulphurous components.

5. An article according to any preceding claim, wherein the acid strong cement is derived from the reaction product of a mixture of 15% by weight lime and 85% by weight non-crystalline silica.

6. An article according to any preceding claim, wherein the hardening agent comprises calcium chloride. 75

7. An article according to any preceding claim, wherein the calcium chloride comprises the hexahydrate.

8. An article according to any preceding claim, which contains one or more pigments. 80

9. An article according to any preceding claim, which has been dried in sunlight for from five to seven days.

10. An article according to any preceding claim and constituting a clay brick. 85

11. A clay-based article substantially as hereinbefore described, or with reference to the foregoing example.

12. A process for manufacturing a clay-based article which comprises mixing crushed clay powder as the major ingredient, a small amount of finely particulate ashes which have undergone complete combustion, an acid strong cement, a hardening agent and water, moulding the mixture to shape and drying the moulded mixture at ambient temperature for a prolonged temperature. 90

13. A process according to claim 12, wherein the crushed clay powder has been dried before mixing with the other ingredients. 100

14. A process according to claim 12 or 13, wherein the ashes constitute fly ash derived from the complete combustion of coal at high temperature.

15. A process according to claim 12, 13 or 14, wherein the ashes are free of sulphurous components. 105

16. A process according to any one of claims 12 to 15, wherein the acid strong cement is derived from the reaction product of a mixture of 15% by weight lime and 85% by weight non-crystalline silica. 110

17. A process according to any one of claims 12 to 16, wherein the hardening agent comprises calcium chloride. 115

18. A process according to any one of claims 12 to 17, wherein the calcium chloride comprises the hexahydrate.

19. A process according to any one of claims 12 to 18, wherein one or more pigments are included in the mixture. 120

20. A process according to any one of claims 12 to 19, wherein the moulded product is dried in sunlight for from five to seven days. 125

21. A process according to any one of claims 12 to 20 for manufacturing a brick.

22. A process for manufacturing a clay-based article substantially as hereinbefore described, or with reference to the foregoing 130



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the adherence of the clay bricks to portland cement.

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The presence as a hardening reagent of $\text{CaCl}_2 \cdot 6\text{H}_2\text{O}$, increases the strength of the clay bricks, and also provides an early hardness and a damp-proofing effect, and what is more, makes it possible for the bricks to be mass-produced and dried at air temperatures of less than 0 °C, because the freezing point of its solution is low. (-41 °C in case of 40% solution).

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example.

23. A clay-based article manufactured by a process as claimed in any one of claims 12 to 22.

STANLEY, POPPLEWELL,
FRANCIS & ROSS,
Chartered Patent Agents,
1 Dyers' Building
Holborn, London EC1N 2JT
Agents for the Applicant

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Printed for Her Majesty's Stationery Office by MULTIPLEX techniques Ltd., St. Mary Cray, Kent. 1980. Published at the Patent Office, 25 Southampton Buildings, London WC2 1AY, from which copies may be obtained.