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PROCESS OF MANUFACTURING A CELLULAR MATERIAL

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6 Claims. (Cl. 106—40)

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This is a continuation-in-part of our copending application for patent Serial No. 654,212, filed March 13, 1946, now abandoned.

This invention relates to a process for the manufacture of a burnt silicate product having a cellular structure.

Such products are frequently used for insulating purposes in walls and floors and one of the principal objects of the invention is to provide a product having a very low density, but very high crushing strength.

A further object of this invention is to provide a strong, granulated product, which is suitable for incorporation in concrete.

A still further object is the provision of a process for the industrial utilization of waste products or residues from the manufacture of cellulose.

Other objects and advantages will appear from the following description.

In general, the invention comprises (1) adding to plastic clay or shale or other argillaceous material, a waste product from the manufacture of cellulose in quantities of ⅛ of 1%–8% calculated as dry matter of the weight of the dry matter contents of the raw material and uniformly distributing the added material in the silicate mass; (2) introducing the mixture into a rotary kiln and (3) burning the mixture in the kiln at a certain temperature thereby producing a considerable increase of the volume of the product due to leavening or the formation of gas filled cavities in the argillaceous material. The latter becomes softened at the burning temperature thereby permitting the gas filled cavities to become evenly distributed and resulting in a highly cellular final composition.

The waste products referred to above are sulfite and sulfate lyes and their residues. It was found, for example, that by admixing Danish clay with 1% of concentrated sulfite lye, calculated on a dry basis, a unit weight of 540 lbs. per cubic yard was obtained in the final product.

The clay, before admixture, was in a moist and plastic condition, i. e. with a water content of 40%, calculated on the clay dried at 100° C. The clay was fed at the rate of 2.5 tons per hour to a brick-making machine consisting of a pugmill, two pairs of rollers and a string press. Sulfite lye with a water content of 40% was added in the pugmill at the rate of 30 kg. per hour with an equal quantity of water to uniformly distribute the lye in the clay. The clay coming from the press was cut into slices about 2 cm. thick by a rotating knife and then carried by a conveyor into a rotary kiln with a length of 23 m. and a diameter of about 2.5 m. and revolving at a rate of 1.9 R. P. M. At the intake end of the kiln, chains were suspended in the same manner as in kilns for the burning of Portland cement and at the opposite end of the kiln there was a coal dust fire. The kiln was lined with ordinary firebricks and had four radial ridges projecting inwardly about 8 cm.

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The burning was effected at a temperature of about 1100–1125° C. The resulting grainy product was then sorted into three grades of grain size; namely, 3 mm. or less, 3–12 mm. and 12–30 mm. respectively. By far the greatest portion was classified of the medium grain size and it had a unit weight of 540 lbs. per cubic yard.

A product manufactured in the same manner, but without any lye had a unit weight of 1100 lbs. per cubic yard. An admixture of 2% of sulfite lye gave a product with a unit weight of 480 lbs. per cubic yard.

Similarly, additions of ⅛ of 1%, ½ of 1%, 4% and 8% sulfate lye yielded cellular products having unit weights of 900, 700, 590 and 750 lbs. per cubic yard, respectively.

Instead of sulfite lye, other similar waste products derived by decomposition of lignin in the manufacture of cellulose may be used, such as sulfate lye, which, in additions of ¼ of 1%, ½ of 1%, 1%, 2%, 4% and 7%, gave unit weights of 790, 720, 590, 540, 680 and 760 lbs. per cubic yard, respectively.

A slate with a suction ability of 20% was crushed into pieces of a grain size of 12 mm. and moistened until saturation with a solution of sulfite lye containing 10% dry substance, whereafter it was burned in a rotary kiln at a temperature of 1225°. The resulting product consisted of rounded lumps having a unit weight of 620 lbs. per cubic yard. Without any addition of sulfite lye a unit weight of 980 lbs. per cubic yard was obtained.

In German patent specification No. 594,000 it has been suggested to manufacture highly porous refractory bricks by means of highly porous chamotte burned in a rotary kiln. A finely ground plastic clay is mixed with a similar amount of sawdust and burned whereafter the different materials are moulded to the shape wanted and burned. It is indicated to be advantageous here to add about 40% of sulfite lye or mineral glue in order to obtain a stronger brick.

The said material after its moulding is burned to a temperature, at which the sawdust and sul-

fite lye is burned out leaving cavities in the clay. The material is, however, not burned until it begins to soften, and the cellular structure of the final product could therefore not be the result of a bloating and expansion which would make the previous moulding to certain dimensions quite illusorious.

In applying the method according to the present invention sawdust in large or small quantities is of no importance and sulfite lye is only to be used in very restricted quantities.

While in the said German patent specification the addition of sulfite lye is indicated to give the same effect as mineral glue—for instance manufactured by aluminium phosphate and phosphoric acid—the effect of the restricted use of sulfite lye according to the present invention could not be obtained by substituting the sulfite lye with mineral glue.

The burning of a clay applicable for refractory purposes until bloating is furthermore practically impossible and has never been done because the necessary temperature should be at least 1600° C. The necessary amount of fuel and the necessary equipment for such burning would be too expensive.

The burning temperature necessary for making porosity by means of burning out substances is ordinarily below 1000° C.

We claim:

1. A process for the manufacture of a product having a cellular structure, said process consisting essentially of uniformly distributing in an argillaceous material ¼ of 1% to about 4%, by weight on a dry basis, of a member selected from the group consisting of sulfite and sulfate lyes, uniformly baking the resulting mixture at the softening temperature of the material, whereby the material softens and gas is produced in the material causing it to bloat under formation of a cellular structure and then cooling the resulting bloated material.

2. A process for the manufacture of a product having a cellular structure, said process consisting essentially of uniformly distributing in an argillaceous material ¼ of 1% to about 4%, by weight on a dry basis, of an aqueous solution of a member selected from the group consisting of sulfite and sulfate lyes, uniformly baking the resulting mixture at the softening temperature of the material, whereby the material softens and gas is produced in the material causing it to bloat under formation of a cellular structure and then cooling the resulting bloated material.

3. A process for the manufacture of a product having a cellular structure, said process consisting essentially of uniformly distributing sulfite lye in the proportion of about ¼ of 1% to about 4%, by weight on a dry basis, in a material selected from the group consisting of clay and slate, uniformly baking the resulting mixture at the softening temperature of the material whereby the material softens and gas is produced in the material causing it to bloat under formation of a cellular structure and then cooling the resulting bloated material.

4. A process for the manufacture of a product having a cellular structure, said process consisting essentially of uniformly distributing sulfate lye in the proportion of about ¼ of 1% to about 4%, by weight on a dry basis, in a material selected from the group consisting of clay and slate, uniformly baking the resulting mixture at the softening temperature of the material, whereby the material softens and gas is produced in the material causing it to bloat under formation of a cellular structure and then cooling the resulting bloated material.

5. A process as defined by claim 3 in which the sulfite lye is in the form of an aqueous solution.

6. A process as defined by claim 4 in which the sulfate lye is in the form of an aqueous solution.

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