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METHOD OF MANUFACTURING A CELLULAR MATERIAL

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6 Claims. (Cl. 106—41)

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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 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 use of molasses and molasses residues or waste products, particularly those resulting from conventional alcohol conversion processes.

Other objects and advantages will appear from the following description.

In general, the invention comprises (1) adding to shale or plastic clay or other argillaceous material, waste products from the sugar industry in quantities of ⅛ of 1% to 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 argillaceous 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.

A substance obtained as a by-product or waste-product in the beet sugar industry, namely beet sugar molasses is suitable as an additive. It was found, for example, that by admixing Danish clay and 1% of molasses, calculated on a dry basis, a unit weight of 600 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. Molasses with a water content of 25% was added in the pugmill at the rate of 25 kg. per hour with an equal quantity of water to uniformly distribute the molasses in the clay. The clay coming from the press was cut into slices about 2 cm.

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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 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 fire-bricks and had four radial ridges projecting inwardly about 8 cm.

The burning was effected at a temperature of about 1100°–1125° C. The resulting grainy product was sorted into three grades of grain size, 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 600 lbs. per cubic yard.

A product manufactured in the same manner, but without the addition of molasses had a unit weight of 1000 lbs. per cubic yard. An admixture of 2% molasses gave a product with a unit weight 550 lbs. per cubic yard.

Similarly, additions of ⅛ of 1%, ½ of 1%, 4% and 8% molasses, yielded cellular products having unit weights of 900, 730, 700 and 900 lbs. per cubic yard, respectively.

Instead of molasses, residues obtained, for example, by utilizing the sugar content of molasses in the conventional production of alcohol, may also be used as the additive with similar results.

A molasses residue derived from the utilization of the sugar content of beet sugar molasses by alcohol fermentation gave, by additions of 1, 2 and 4% products having unit weights of 600, 560 and 690 lbs. per cubic yard, respectively.

The use of cane sugar molasses resulted in the final products having unit weights of 760, 610, 560 and 700 lbs. per cubic yard for 0.3, 1, 2 and 4%, respectively, of the molasses.

Residues in the manufacture of alcohol from cane sugar molasses, added in quantities of 0.8, 1.6 and 3.2% to the clay resulted in final products having unit weights of 670, 620 and 700 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 molasses residue 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 650 lbs. per cubic yard. Without any addition of molasses residue a unit weight of 980 lbs. per cubic yard was obtained.

It has previously been suggested to manufac-

ture highly porous refractory bricks by means of highly porous chamotte burned in a rotary kiln.

The material contains clay, sawdust and a considerable amount of molasses, and after its moulding it is burned to a temperature, at which the sawdust and molasses 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 valueless.

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

The burning of a clay applicable for refractory purposes until bloating is, futhermore, 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 molasses and molasses residue, 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 molasses and molasses residue, 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 molasses in the proportion of about ¼ of 1% to about 4%, by weight on a dry basis, in an argillaceous material, 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 molasses residue in the proportion of about ¼ of 1% to about 4%, by weight on a dry basis, in an argillaceous material 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 molasses is in the form of an aqueous solution.

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

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