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METHOD OF PREPARING INSULATING MATERIAL

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This invention relates to molded heat insulation, such as 85% magnesia and other molded insulations such as those composed primarily of diatomaceous earth, calcium carbonate and the like.

The object of the invention is to provide an inexpensive and dependable method of producing insulations low in density and having little shrinkage on drying.

Attempts have been made to improve the characteristics of such insulation by dispersing air in the magnesia mush before molding and mixing in a reagent, for example, a soluble soap. This tends to produce an insoluble magnesium soap in the mixture and to form persistent air bubbles to improve the molding and insulating characteristics of the mixture. Such prior practice has not been completely effective in avoiding variations in the product and in the amount of shrinkage. It also limits the molding pressure to that above which the air bubbles tend to collapse, and it causes the material to stick to the molds. It is also wasteful in that much of the soluble soap is carried out in the discharge from the filter molds.

In the process of this invention the above objections are overcome by the addition of an insoluble soap introduced into the magnesia mush in very small percentages. This has proven dependable and effective in reducing the drying shrinkage of the insulation and in reducing the density of the finished product. Air dispersion is dispensed with so that higher molding pressures can be used and the control of the density and shrinkage in the molded pieces is very uniform from day to day so that the forming molds may be accurately dimensioned to the predetermined size of the finished article and trimming and wastage are reduced to a minimum. The resulting composition does not stick to the molds and it maintains the strength of the molded product without the objectionable reduction present in the prior compositions.

In the process of this invention the magnesium basic carbonate is first mixed with water with or without asbestos fiber and with or without plastic or other solid ingredients or fillers until the base composition is well intermingled and homogeneous. With this there may be mixed a very small amount of insoluble soap, usually within 1% of the weight on the basis of the solids in the total mixture of raw materials.

This insoluble soap is preferably produced by dissolving a soluble soap in water and adding to it alum, preferably in water solution, the soap and alum being thoroughly mixed in proportions of three parts of soap to one part of alum. Larger proportions of alum up to one part of alum to one part of soap have been used satisfactorily, and I have found that 0.15% soluble soap and 0.05% alum by weight on the basis of weight of the total mixture of solid raw materials proves very satisfactory in effecting the desired results.

The soluble soap may be the sodium salt of oleic, stearic, or palmitic acids or of a mixture of these, but may also be sodium salt of the fatty acids contained in natural fats and oils. The setting reagent is not confined to alum but may be any of the following soluble salts:

a. All soluble salts of aluminum such as—
- Aluminum sulfate (filter alum)
- Aluminum chloride
- Aluminum nitrate
- Aluminum acetate, etc.
- True alums such as sodium alum
  - Ammonium alum
  - Potassium alum, and the like

b. Soluble salts of other trivalent metals such as chromium and ferric iron, where their color would not prove undesirable.

c. Less effective than the trivalent metals noted above are the soluble salts of the divalent metals, calcium, borium, strontium and zinc.

Some of the above salts, particularly those of chromium and ferric iron, may not be desirable where their color effect on the resulting product is objectionable.

The result of the mixture of the soluble soap with the alum is referred to as an insoluble soap, for instance, an aluminum stearate soap where the soluble soap is sodium stearate. Theoretically there is some question whether or not such compounds as aluminum stearate composed of the weakly basic aluminum hydroxide and the weakly acidic stearic acid actually form to an appreciable extent in dilute water solutions of a soluble alkali soap and alum. There is some authority to the effect that such compounds are highly hydrolyzed and that the insoluble products formed are entirely or primarily the very slightly soluble substances, aluminum hydroxide and stearic acid. Whether it is the soap itself in each particular case, the slightly soluble products of hydrolysis of the soap or a mixture of the soap and its product of hydrolysis, it is not necessary to determine. Whatever the ultimate chemical formulae may be, the resultant effect upon the molded insulation produced by the addition of the insoluble substances to the raw

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insulating materials before molding is a marked improvement in the molding and insulating properties of the composition.

Instead of first forming the insoluble soap and then mixing this with the raw materials forming the insulation, it is preferred first to add the soluble soap, such as sodium stearate, preferably dissolved in water, to a homogeneous water mix of the magnesium basic carbonate with or without other ingredients, such as the asbestos fibers and plastic and/or other solid ingredients commonly employed in these insulating compositions. The added soluble soap is thoroughly mixed into the composition and finally alum, as above described and preferably dissolved in water, is added and thoroughly mixed. The insoluble soap is thus caused to be formed in the mixture of raw materials and the mixture is then ready for molding.

In proportioning the reagent for this mixing operation, about three parts of the soluble soap to one part of alum by weight is satisfactory, but up to one part alum to one part soluble soap has been used with good effect. The total of the soluble soap and alum is less than 1% by weight on the basis of solids in the total mixture of raw materials and 0.15% soluble soap, such as sodium stearate, and 0.05% alum have been found very satisfactory in effecting the desired results. Larger amounts of soap and alum in somewhat the same proportions may be utilized when found desirable. When less than 0.15% of soluble soap is used it is preferable to still maintain the alum at 0.05% of the total solids.

A soluble stearate soap and alum have proven preferable over other soluble soaps, such as a soluble oleate soap used with alum, although other soaps, such as oleate, palmitate, etc., particularly when mixed with stearate soap and then with alum, have been found advantageous. The addition of a calcium salt to the stearate soap is also advantageous, but soluble magnesium salts appear to have little, if any, advantage over the soluble stearate soap used alone.

Only very small amounts of the added insoluble soap ingredients are required to give a very pronounced reduction in shrinkage and density of the insulating composition, and in the processes of manufacture the insoluble soap reagent of this invention is particularly advantageous in avoiding undesirable foaming of the mixture so that air or intense agitation may readily be used for mixing the raw materials without excessive troublesome frothing.

The process of this invention are not confined to 85% magnesia or basic magnesium carbonate, and are similarly advantageous with other moldable heat insulating compositions of magnesium carbonates, magnesium oxide, magnesium hydroxide, calcium carbonate, etc., either alone or in various mixtures. With all such materials and the fibrous and clayey ingredients, such as asbestos and diatomaceous earth used with them, the insoluble soap has a fixing effect on the particles of the insulating materials avoiding shrinkage and increase in density and correspondingly improving the insulation.

I claim:

1. The process of producing molded insulation comprising forming a mixture in water of particles of raw moldable heat-insulating material, adding to said water mix a small amount of soluble soap in the order of 1% or less of the weight of the solids in the total mixture of raw materials, adding a setting agent to the mixture to give a resultant insoluble soap, introducing a wet mixture of said ingredients into a mold and molding said mixture into desired form with said insoluble soap on the particles of insulating material in the mixture so as to reduce the drying shrinkage and the density of the molded composition as a whole.

2. The process as set forth in claim 1 in which the moldable heat-insulating material is of the group magnesia, carbonates of magnesia, magnesium hydroxide, diatomaceous earth and calcium carbonate.

3. The process as set forth in claim 1 in which the soluble soap is a stearate.

4. The process as set forth in claim 1 in which the setting agent is alum.

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