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AERATION OF PLASTER OF PARIS COMPOSITIONS

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1 Claim. (Cl. 106—87)

The present invention relates to the aeration of plaster of Paris compositions, particularly for the manufacture of articles such as plaster boards.

In the manufacture of plaster boards of the kind in which the plaster forms the core of the board and has a paper covering constituted by paper sheets known as "liners," a bond is formed between the core and the paper, the bond being due to the strong needle-shaped crystals of hydrated gypsum $CaSO_4,2H_2O$, which are formed in the core during rehydration of the plaster, and which attach themselves to the liners. In the process of manufacturing these boards, the dry plaster is generally spread uon a belt, and soaked in water by drawing the belt slowly through a water-bath to ensure that the plaster acquires a workable consistency. After this operation, a plaster of Paris from one source will be in the state of a quite light liquid slurry, while plaster from another source will have a more muddy and heavier consistency, and if it is required to form porous boards of the same density from two such different plasters the aeration of the plaster having the more muddy and heavier consistency will require the evolution of a greater volume of aerating gas, and a higher gas pressure, than will the aeration of the other plaster.

The aeration of plaster of Paris compositions for making plaster boards, by oxygen gas set free as a result of a chemical reaction has already been proposed; in particular, it has been proposed for this purpose to liberate oxygen by means of the reaction of an oxidising agent with barium peroxide in the presence of hydrochloric acid or nitric acid or both.

It has now been found that in the application of this known process to the manufacture of plaster boards from certain kinds of plaster of Paris, the use of mineral acids presents certain disadvantages. The chief of these disadvantages is that with a plaster of Paris, which gives a slurry of a muddy and heavy consistency and the aeration of which calls for a high concentration of reagents in order that the necessary gas pressure and aeration volume may be produced, the presence of a mineral acid in the necessary high concentration causes the plaster of Paris to be deleteriously attacked. In the manufacture of plaster boards which have a covering constituted by paper liners, the action of mineral acids at high concentrations on the plaster is to produce "blistering," that is a tearing away of the paper liners from the core, some of the plaster coming away with the paper.

The principal object of the present invention is to avoid the disadvantages referred to, and the invention accordingly provides a process for aerating plaster of Paris compositions which comprises the use of acetic acid, in place of the mineral acids previously employed.

Acetic acid has the advantage over mineral acids that it may be used at any concentration without deleteriously affecting the plaster core of plaster boards, when high concentrations of acid are necessary by reasons of the nature of the plaster and of the slurry made therefrom.

According to the present invention the process for producing an aerated plaster of Paris composition comprises the steps of forming a slurry of plaster of Paris and water and producing bubbles of oxygen in said slurry by the reaction of potassium permanganate with barium peroxide in the presence of acetic acid.

In carrying out the invention, there is added to the slurry of plaster of Paris and water, a solution of potassium permanganate, and there is also added to the slurry barium peroxide dissolved in acetic acid. The two solutions must of course be added to the slurry from different sources, and preferably only mingle in the slurry, but they may be added to the slurry simultaneously and preferably one behind the other on the belt which carries the slurry to the mixer.

The barium peroxide in the presence of acetic acid reacts with the potassium permanganate to evolve oxygen gas.

The chemical reaction in the processes of this invention has the advantage that it does not occur immediately the reagent substances come together, but takes place after a retardation of a few seconds; this enables a good dispersion of the reagent substances throughout the slurry to be produced by a rapid stirring. Thereafter the reaction goes rapidly to completion with the production of a very large number of minute oxygen bubbles, the final aerated product being thereby further advantageously characterized by a great number of small voids and being therefore of greater strength than if the voids were larger and fewer in number. With the present invention the use of soaps, gums or resins is quite unnecessary and is undesirable, because although these substances tend to ensure the production of small bubbles, they have the disadvantage that they retard the completion of the chemical reaction to such an extent that in the manufacture of plaster board for example, the reaction is not completed before the plaster enters the liners, and in such manufacture it is essential that this reaction should have reached completion before the plaster enters the liners; moreover such substances as soap, gum and resin, in the presence of an acid, considerably decrease the volume of aeration to an extent which may correspond to as much as sixty per cent.

In the preferred method of carrying the invention into effect, the aeration reagents are made up into two solutions as previously stated which

are added to the slurry of plaster of Paris either as the slurry is travelling on the soak belt, or while travelling on a cross belt onto which the soak belt discharges. In either case the addition is made to the slurry shortly before it reaches the mixing vessel into which it is discharged and wherein it is vigorously stirred and from which it emerges in the case of plaster board manufacture with liners, to be spread on to one liner and then covered by another.

The advantages gained by the use of the present invention will be still further made clear by the example given below, in which are given the quantities necessary for the aeration of a slurry of about 6,800 lbs. plaster of Paris.

Example

Solution (*a*)		
Water	gallons	About 15
Potassium permanganate	ounces	24
Solution (*b*)		
Water	gallons	About 35
Acetic acid (concentrated to 99% by weight)	gallons	0.65
Barium peroxide	lbs	5

The reaction between these two solutions engenders a gas pressure of about 60 mm. of mercury.

The results of the reaction are as follows:

Reaction periods		Aeration, volume in c. c.	Pressure in mm. in mercury	
Retardation in secs.	Duration in secs.		Freshly made	After 20 hrs.
3	48	570	60	60

The figure of aeration volume given above is the result of the reaction between 100 c. c. of solution *a* and 250 c. c. of solution *b* when mixed together, without the slurry, in an open vessel, the volume of the resultant foam produced being measured; and those relating to pressure were obtained by measuring the gas pressure produced when 10 c. c. of solution *a* and 25 c. c. of solution *b* reacted in a conical flask of 560 c. c. volume, the latter being connected to a mercury manometer, and such pressure was found when the atmospheric pressure was 762 mm. and at a temperature of 20° C.

The above example is given to illustrate the order of the proportions in which the various reagents may be employed, and it is to be understood that the compounding of the two solutions can depart widely from the examples, depending upon the nature of the plaster of Paris used, upon the gas pressure desired, and upon the volume of gas which it is desired to generate.

I claim:

A process for producing aerated plaster of Paris compositions and articles made therefrom, comprising the steps of forming a slurry of plaster of Paris and water and producing bubbles of oxygen in said slurry by the reaction of potassium permanganate with barium peroxide, in the presence of acetic acid.

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