Patented May 16, 1939 2,158,589

UNITED STATES PATENT OFFICE

2,158,589

METHOD AND COMPOSITION FOR IMPROVING MILLING PRODUCTS

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No Drawing. Application December 13, 1938, Serial No. 245,505

10 Claims. (Cl. 99—232)

My invention relates to the improvement of wheat flour and other milling products, including the baking and keeping qualities thereof, and more particularly has reference to a method and composition for the simultaneous bleaching and ageing or maturing of flour and the like. This application is a continuation-in-part of my earlier application Serial #227,016, filed August 26, 1938.

According to present commercial practice, flour is bleached and aged in separate stages of treatment. The ageing is accomplished by treatment with a gaseous maturing agent, such as nitrogen trichloride, and the bleaching by mixing with the flour certain powdered organic peroxides, notably benzoyl peroxide. While the last-mentioned step is relatively simple, the gas treatment is quite cumbersome, requiring special contacting apparatus and corrosion-resistant equipment and accurate control over the gas which presents many hazards and difficulties in use.

It is an object of this invention to bleach and age flour and the like in a single operation and to provide a finely divided or powdered composition which, when intimately mixed with the flour, functions to effect a simultaneous bleaching and ageing of the milling product. The flour is thus improved in the two respects mentioned by the simple expedient of mixing the solid composition therewith and allowing sufficient time for the desired effects to take place.

The solid bleaching and ageing composition of my invention comprises a pre-formed mixture of aniodate and an active organic peroxide, that is, an organic peroxide which is sufficiently active in powdered form to effect at least a 90% flour bleach. I have found that only certain aromatic and fatty acid peroxides are sufficiently active to cooperate with the iodates to effect the simultaneous bleaching and maturing of dry flour or other milling product.

It has heretofore been proposed to treat flour with hydrogen peroxide and other inorganic peroxides and also certain inactive organic peroxides, such as acetone peroxide and urea peroxide, in combination with various oxidizing agents, including iodates. However, these inorganic and inactive organic peroxides are not suitable in the present invention since they do not function with the iodates to simultaneously bleach and age flour and the like.

Benzoyl peroxide is the preferred aromatic peroxide of my invention. Cinnamyl peroxide and phenyl acetyl peroxide are other aromatic peroxides which I have found to be of sufficient activity and flour bleaching power for use with an iodate in accordance with the invention. Suitable active fatty acid peroxides of sufficient bleaching power for my purpose are stearyl peroxide, lauryl peroxide and palmitic acid peroxide. However, not all aromatic and fatty acid peroxides are operative in my invention; for example, phthalyl peroxide is inadequate in activity and bleaching power for use with the iodate.

Potassium iodate is the preferred reagent for use with the active aromatic or fatty acid peroxide but other iodates are, of course, suitable, particularly the iodates of the alkali metals and alkaline earth metals such as sodium, calcium, etc.

Although iodates have heretofore been used as dough maturing agents, it is believed to be fairly well recognized in the art that they have no appreciable maturing action when used in solid form upon dry flour which has been bleached or treated with active organic peroxides or other bleaching agents. However, I have found that the iodates, in finely divided or powdered form and when employed in admixture with an active aromatic or fatty acid peroxide, function with the peroxide to bring about a commercially satisfactory maturing and bleaching of dry flour. Notwithstanding the known use of iodates as dough maturing agents, as far as I am aware, it was not heretofore recognized that the iodates, in solid form, would operate to mature dry flour simultaneously with the bleaching thereof by means of an active aromatic or fatty acid peroxide. Nor was it appreciated that this ageing with a powdered iodate could be accomplished without impairment of the bleaching action of the peroxide.

Although I do not wish to limit the invention to any particular theory of operation, I believe that the highly active peroxides employed in the composition of my invention function as activators or accelerators for the iodates, in addition to bleaching the flour. This theory seems to explain why the iodates in solid form mature the dry flour when used simultaneously or in admixture with the active aromatic and fatty acid peroxides whereas they have no noticeable maturing action when applied to flour which has previously been bleached by means of the peroxide. I believe that I am the first to recognize this phenomenon respecting the efficient functioning of powdered iodates as maturing agents in dry flour by virtue of their admixture with the active aromatic and fatty acid peroxides.

I am aware that sodium chlorate has heretofore been mentioned as an activator for certain organic peroxides and that the chlorates have been grouped with the iodates as suitable oxidizing agents in the treatment of animal and vegetable matter, including flour. However, the chlorates are not the equivalent of the iodates of my invention since, as shown by the experimental data hereinafter included, sodium chlorate, in combination with benzoyl peroxide, was found to have no maturing action.

The bleaching and ageing composition of this invention is an improvement on the hypochlorite composition of my prior Patent #2,087,547 which is not stable in the presence of air and hence must be handled in closed equipment to avoid reaction and other inconveniences incident to the use of chlorine. The present composition is not open to these objections. It is stable under all ordinary milling conditions and is non-corrosive.

In practicing the method of this invention, the bleaching and ageing composition is fed directly into the flour at any convenient point during the milling operation and intimately mixed therewith, by means of powder feeding machines now used in the mills, in the proportion of about one-half ounce to 196 pounds of flour. For thorough distribution of such small amounts of the composition in the flour, the composition should be in the form of a dry, free-flowing powder. A satisfactory bleaching and ageing is obtained by exposure of the flour to the action of the composition for about 24 hours.

As illustrative of the preparation of a preferred composition, dry powdered commercial grade dicalcium phosphate or other suitable carrier is added to an equal weight of dry commercial grade granular benzoyl peroxide and the mixture ground to the desired fineness. A fineness of about 85% through a 300 mesh sieve is satisfactory. With the powder thus obtained there is now mixed commercial grade dry powdered potassium iodate in the proportion of six parts iodate to 90 parts of the peroxide-phosphate mixture. The resultant mixture is then ready for use as a flour bleaching and ageing composition in the manner already described.

Since there are many grades of flour, the proportion of peroxide, iodate, and carrier, as well as the amount of the composition required for effective bleaching and ageing, should be determined by test in each particular case. In some instances, for certain kinds of flour, the proportion of iodate may be increased to as much as 9 parts or reduced to about 3 parts of the iodate to 90 parts of the peroxide-phosphate mixture. Ordinarily the proportion of 6 parts potassium iodate with 90 parts of the mixture of equal weights of benzoyl peroxide and dicalcium phosphate is satisfactory for many of the various grades of flour. The proportions here stated are, of course, by weight.

The composition of this invention improves the baking qualities of flour to a greater extent than has heretofore been accomplished to my knowledge. Loaf volume is one of the best indicators for determining the value of the baking qualities of flour. The volume of the baked loaf of bread is measured in cubic centimeters and denotes the exact size of the loaf produced. Small volume, as obtained with untreated or unmatured flour, indicates low baking strength while large volume indicates high baking strength which is apparently brought about by the maturing of the flour.

The following tabluations show, by comparison, the advantages and superiority of my composition over present practice in the art. Table I deals with a blend of hard and soft wheat flour and Table II with hard wheat baker flour. The tables show the amounts of benzoyl peroxide and potassium iodate used in the tests. In each case where benzoyl peroxide was employed, it was mixed with an equal weight of di-calcium phosphate as a carrier. This is not indicated in the tables for the sake of simplification. The laboratory tests were performed on amounts of fresh milled flour such that the treatments corresponded to the use of about ½ ounce of the compositions per 196 pound barrel of flour.

TABLE I

Blend of hard and soft wheat flour

	Loaf volume c. c.	Crumb color	Texture
Untreated	582	92	95
Mill treated nitrogen trichloride and benzoyl peroxide	602	98	98
Laboratory treated 45 gm. benzoyl peroxide and 3 gm. potassium iodate	630	99	99
Laboratory treated 45 gm. benzoyl peroxide	538	97	95
Laboratory treated 45 gm. benzoyl peroxide 20 gm. sodium chlorate	560	97	95

TABLE II

Hard wheat baker flour

	Loaf volume c. c.	Crumb color	Texture
Untreated	598	92	95
Mill treated nitrogen trichloride and benzoyl peroxide	681	97	98
Laboratory treated 45 gm. benzoyl peroxide and 3 gm. potassium iodate	758	99	99
Laboratory treated 45 gm. benzoyl peroxide	560	95	95
Laboratory treated 45 gm. benzoyl peroxide and 20 gm. sodium chlorate	580	95	95

It will be observed from these tables that with the compositions of this invention there was obtained about twice as much improvement as with the two-stage nitrogen trichloride, benzoyl peroxide method now in general use for bleaching and ageing flour. It will also be noted that no maturing was obtained with a composition containing as much as 20 parts sodium chlorate to 45 parts benzoyl peroxide.

In the appended claims, I have characterized the peroxides as active and as having substantial flour bleaching properties in order to distinguish from those aromatic and fatty acid peroxides, such as phthalyl peroxide, which are of insufficient activity and bleaching power to effect a commercial bleach. By "substantial flour bleaching properties" is meant the ability to bleach flour satisfactorily for commercial purposes, that is, to effect at least a 90% bleach. The inorganic peroxides and the organic peroxides not of aromatic or fatty acid derivation are entirely too inactive for use with the iodates in accordance with this invention.

Having described my invention, I claim:

1. A method for improving wheat flour and other milling products which comprises intimately mixing with the dry milling product a powdered iodate and a powdered active organic peroxide selected from the group consisting of the aromatic and fatty acid peroxides having substantial flour bleaching properties, and sub-

jecting the milling product in dry form to the simultaneous action of the iodate and peroxide for a sufficient time to bleach and mature the product.

2. A method for improving wheat flour and other milling products which comprises intimately mixing with the dry milling product a powdered iodate and a powdered active aromatic peroxide having substantial flour bleaching properties, and subjecting the milling product in dry form to the simultaneous action of the iodate and peroxide for a sufficient time to bleach and mature the product.

3. A method for improving wheat flour and other milling products which comprises intimately mixing with the dry milling product a powdered iodate and a powdered active fatty acid peroxide having substantial flour bleaching properties, and subjecting the milling product in dry form to the simultaneous action of the iodate and peroxide for a sufficient time to bleach and mature the product.

4. A method for improving wheat flour and other milling products which comprises intimately mixing powdered benzoyl peroxide and a powdered iodate with the dry milling product and subjecting the latter in dry form to the simultaneous action of the peroxide and iodate for a sufficient time to bleach and mature the milling product.

5. A method for improving wheat flour and other milling products which comprises intimately mixing powdered benzoyl peroxide and potassium iodate with the dry milling product and subjecting the latter in dry form to the simultaneous action of the peroxide and iodate for a sufficient time to bleach and mature the milling product.

6. A flour bleaching and ageing composition comprising a dry, free-flowing powdered mixture of an iodate and an active organic peroxide selected from the group consisting of the aromatic and fatty acid peroxides having substantial flour bleaching properties.

7. A flour bleaching and ageing composition comprising a dry, free-flowing powdered mixture of an iodate and an active aromatic peroxide having substantial flour bleaching properties.

8. A flour bleaching and ageing composition comprising a dry, free-flowing powdered mixture of an iodate and an active fatty acid peroxide having substantial flour bleaching properties.

9. A flour bleaching and maturing composition comprising a dry, free-flowing powdered mixture of benzoyl peroxide and an iodate.

10. A flour bleaching and maturing composition comprising a dry, free-flowing powdered mixture of benzoyl peroxide and potassium iodate.

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