PROCESS FOR THE PRODUCTION OF ALKALI PERBORATES AND PERCARBONATES
Filed July 23, 1969

INVENTORS

INVENTORS

ATTORNEYS
ABSTRACT OF THE DISCLOSURE

Alkali perborates and percarbonates are spray dried by a process wherein the spray charge contains only the stable base components and the active oxygen carrier is directly led into the spray charge before the atomization and the mixture is then sprayed and dried in a spray tower.

The present invention is concerned with a process for the production of alkali perborates and percarbonates by spray drying processes. The alkali perborates and percarbonates (also called alkali peroxo-borates and alkali carbonate peroxyhydroxides) are extensively used for the production of powdered washing, bleaching and purifying agents.

The production of powdered washing, bleaching and purifying agents, spray drying processes are employed predominantly. In these processes a spray charge consisting of an aqueous solution of the active washing agent, washing assistant agent and additives is atomized through a spray device in a tower. Hot air is injected into the spray tower in order to remove excess water. There is obtained a dry, voluminous powder, the so-called spray product. The active oxygen carrier is introduced into the spray charge. Due to the relatively difficult solubility of alkali perborate or percarbonate in aqueous solution whereby the active oxygen containing compounds precipitate as a crystalline product. The spray process is separated off and carefully dried.

It is detrimental to the mixing of the spray product and the active oxygen containing compounds that the individual particles of both components are very different in form and density on account of their different methods of production as a result of which it is difficult to obtain homogeneous mixtures.

To eliminate this advantage of different granular structure between the washing agent-spray product and the bleaching agent it was attempted to likewise prepare the perborate and percarbonate by spray drying processes. However, great difficulties were encountered. On account of the relatively difficult solubility of alkali perborate or percarbonate a spray charge it is necessary to operate with very dilute solutions, about 2-4 weight percent aqueous solutions. If the temperature of the spray charge is raised in order to increase the solubility a destruction of the active oxygen already occurs in the solution being sprayed. This leads to active oxygen loss and to irregularity in the spraying process.

It has now been found that alkali perborates or percarbonates can be produced in spraying drying processes if the spray charge only contains the stable base compo-
Referring more specifically to the drawing, there is provided an atomizer 1 into which are introduced the active oxygen carrier over liquid conduit 2, spray charge through conduit 3 and compressed air through conduit 4. In zone 5, the reaction occurs, the mist goes out from the atomization zone 6 into the drying chamber (not shown) and is dried in a known manner.

EXAMPLE 1

In order to produce a spray charge 13.3 parts by weight of sodium metaborate (NaBO₂) and 137 parts by weight of sodium sulfate (Na₂SO₄) were dissolved in 1036 parts by weight of water with heating to 40°C. This solution was sprayed into an atomization drier over a period of 45 minutes. Shortly before the spray nozzle (about 6 inch) to the spray charge, there was homogeneously added 292 parts of hydrogen peroxide (23.7 weight percent in water), which contained 0.4% magnesium chloride (MgCl₂). The temperature of the drying air amounted to 98°C at the entrance to the tower and to 50°C at the exit. There was obtained 206 grams of sodium perborate with an active oxygen content of 15.04% which corresponds to a yield based on the active oxygen of 95%.

EXAMPLE 2

To produce a spray charge 252 parts by weight of sodium metaborate (NaBO₂) and 137 parts by weight of sodium sulfate (Na₂SO₄) were dissolved in 1036 parts by weight of water with heating to 40°C. This solution was processed in the course of an hour in an atomization drier while there was added homogeneously to the liquid stream shortly (6 inch) before the spray nozzle 282 parts by weight of hydrogen peroxide (49 weight percent) which contained 0.5% magnesium chloride. The temperature of the drying air at the entrance to the tower was 163°C and at the exit 93°C. There was obtained 544 grams of sodium perborate with an active oxygen content of 11.00%, corresponding to an active oxygen yield of 92%.

EXAMPLE 3

1094 parts by weight of potassium metaborate (KBO₂) were dissolved in 1734 parts by weight of water and cooled to 20°C to form a spray charge. The solution was sprayed into an atomization drier in the course of 195 minutes. Shortly (6 inch) before the spray nozzle 2660 parts by weight of hydrogen peroxide (34.4 weight percent) containing 0.5% magnesium chloride (MgCl₂) were homogeneously added. The temperature of the drying air at the entrance to the tower amounted to 103°C and at the exit 71°C. There were obtained 2030 grams of potassium perborate with an active oxygen content of 20.11%, corresponding to an active oxygen yield of 95%.

EXAMPLE 4

261.3 parts by weight of sodium carbonate (Na₂CO₃), 42.7 parts by weight of sodium bicarbonate (NaHCO₃) and 1.2 parts by weight of sodium pyrophosphate (Na₂HPO₄) were dissolved in 1188.8 parts of water with heating and then cooled to 18°C to form a spray charge. This solution was added to a spray tower in the course of 68 minutes while shortly (6 inch) before the spray nozzle as homogeneously as possible there were added 322 parts by weight of hydrogen peroxide (34 weight percent) which contained 0.5% magnesium chloride. The temperature of the drying air amounted to 73°C at the entrance and to 46°C at the exit. The product obtained (412 g.) had an active oxygen content of 11.95% which amounted to a yield of 95% based on the active oxygen.

EXAMPLE 5

As a spray charge 18.3 parts by weight of sodium hydroxide (NaOH) were dissolved in 91.5 parts by weight of water. This solution was sprayed into an atomization drier in the course of 65 minutes. Shortly (6 inch) before the spray nozzle, there were homogeneously added 87.2 parts by weight of borax (Na₃B₄O₇·10H₂O) dissolved in 92.3 parts by weight of hydrogen peroxide (35 weight percent). The temperature of the drying air amounted to 90°C at the entrance to the tower and to 48°C at the exit. There were obtained 101 grams of sodium perborate with an active oxygen content of 14.5% corresponding to an active oxygen yield of 96%.

What is claimed is:

1. A process for spray drying alkali perborate or alkali percarbonate comprising employing as a spray charge the stable base component and adding the active oxygen carrier immediately before the atomization of the spray charge in the spray tower and thereafter drying the mixture.

2. A process according to claim 1 wherein hydrogen peroxide is the active oxygen carrier.

3. A process according to claim 1 wherein the spray charge contains only the acid or the alkali component of the borate or carbonate and the other of the alkali or acid component is added with the active oxygen carrier.

4. A process according to claim 3 wherein the active oxygen carrier is hydrogen peroxide.

5. A process according to claim 1 wherein the basis component contains alkali metal borate or carbonate.

6. A process according to claim 1 wherein the spray charge is in the form of an aqueous solution having a concentration of 20 to 100%.

7. A process according to claim 6 wherein the active oxygen carrier is hydrogen peroxide and the drying temperature is 60 to 200°C.

8. A process according to claim 1 wherein an inert salt is included in the components to be sprayed.

References Cited

UNITED STATES PATENTS

2,323,727 2/1941 Peterkin et al. 34—9
3,409,567 9/1967 Flack et al. 34—9X

JOHN J. CAMBY, Primary Examiner

U.S. Cl. X.R.

34—17