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### Description

Bleaching detergent product ✓

#### Detailed description of the invention

#### Technical Field to which the Invention Belongs

The present invention relates to a bleaching detergent product, packed in a bag, which possesses an excellent bleaching and cleansing power and excels in preservative stability as well.

#### Prior Art

The bleaching detergents are divided into chlorine and oxygen types. The bleaching detergents of the chlorine type are effectively usable only for limited kinds of fiber, unusable for fabrics bearing dyed patterns, and incapable of avoiding emission of a specific pungent odor. The bleaching detergents of the oxygen type which are free from these defects, therefore, have been remarkably disseminating recently. For the bleaching detergents of the oxygen type, sodium percarbonate and sodium perborate are popularly used as a bleaching basis from the point of view of bleaching ability and stability.

The bleaching detergents of the oxygen type are used in combination with a varying bleach activator because they have weak bleaching power as compared with the bleaching detergents of the chlorine type. Tetraethylene diamine, acetoxymethylene sulfonic acid, tetraacetyl glycolyluryl, glucose pentacetate, etc. are used as typical bleach activator. JP-A-59-22,999 discloses a bleaching agent which comprises hydrogen peroxide and a bleach activator represented by the formula:  $R-C(=O)-$

L (wherein R represents an alkyl group having about 5 - 18 carbon atoms and possessing 6 - 10 longest linear alkylalkyl chains containing a carbonyl carbon and L represents a living group), and which, by virtue of a peroxy bleaching compound, forms hydrogen peroxide and a bleach activator at a molar ratio of not less than 1.5.

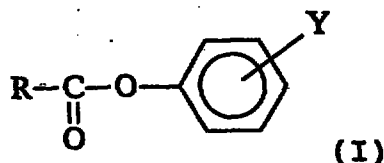
In the light of such problems as conservation of natural resources and disposal of discarded packages, the development of a commercially available bleaching agent refill packed in a small bag of thin plastic sheet has been expected. As concrete examples of the bag-like plastic container intended for such refills as mentioned above, the containers which are disclosed in JP-03-505,322 and JUM-03-123,847 may be cited. The plastic containers of this class are provided with an air vent for discharging into the ambience the oxygen released in consequence of gradual decomposition of a hydrogen peroxide discharging component contained in the bleaching agent and consequently preventing the container from being burst.

Since the plastic container of the type described above is provided with the air vent, however, the bleaching detergent of the oxygen type incorporating a bleach activator therein has the possibility that the individual particles of powder, while in storage, will agglomerate into lumps and eventually induce the phenomenon of caking. Once the caking occurs, this bleaching detergent can no longer be shipped as a commercial product because it not only incurs difficulty of use but also suffers from displeasing appearance.

Accordingly, the present invention is aimed at providing a bleaching detergent product which possesses excellent bleaching and cleansing power, avoids causing the phenomenon of caking even after a protracted storage, and allows stable preservation and which is shipped as packed in a plastic container.

#### Disclosure of invention

The present invention provides a bleaching detergent product formed from a bleaching detergent comprising (A) 1 to 80 % by weight of a substance to produce hydrogen peroxide in water, (B) 0.1 to 20 % by weight of particle including a bleach activator having the formula (I):



[wherein R is a straight-chained alkyl having 7 to 15 carbon atoms, Y is  $-\text{SO}_3\text{M}$  or  $-\text{COOM}$  (wherein M being hydrogen atom or an alkali metal)] and (C) sodium carbonate and a plastic bag having air-passing pores, a moisture permeability of  $1 \text{ g/m}^2 / 24 \text{ hrs}$  or more and a thickness of 20 to 500 microns, containing the detergent. A pack of a bleaching detergent is formed with the plastic bag. The bleaching detergent composition is contained in the bag.

The term "moisture permeating degree" as used in the present invention refers to the amount of steam which passes through a membranous substance (a plastic film forming a container in the case of the present invention), a sample under

test, during a fixed period and which is measured by the cup method specified in JIS (Japanese Industrial Standard) Z0208-1976. To be specific, the moisture permeating degree of a plastic film is determined by allowing the plastic film to stand at a temperature of  $25 \pm 0.5^{\circ}\text{C}$ , with the air on one side of the plastic film kept at a relative humidity of  $90 \pm 2\%$  and the air on the other side thereof kept in a dried state with a moisture absorbing agent (anhydrous calcium chloride), for 24 hours, measuring the mass (g) of steam which passes through the plastic film as a boundary during the standing, and reducing the found mass to a magnitude per  $\text{m}^2$  of the plastic film.

#### Mode for carrying out the invention

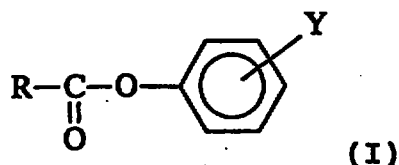
As concrete examples of the component (A) for use in the present invention which emits hydrogen peroxide in water, such inorganic peroxide salts as percarbonate salts, perborate salts and perphosphate salts may be cited. In these peroxide salts, percarbonate salts and perborate salts are preferable and percarbonate salts are particularly preferable.

The average particle diameter of the component (A) is preferably in the range of  $200 - 500 \mu\text{m}$ , and particularly preferably in the range of  $250 - 400 \mu\text{m}$ . Preferably for the sake of preventing the bleaching detergent from inducing the phenomenon of caking, the content of such minute particles as pass through a sieve of  $125 \mu\text{m}$  in diameter is not more than 20 wt. %, advantageously not more than 10 wt. %, and more advantageously not more than 5 wt. %.

The content of the component (A) in the bleaching

detergent, for the sake of facilitating combination thereof with other components and imparting ample bleaching and cleansing power to the produced composition, is in the range of 1 - 80 wt. %, preferably in the range of 5 - 70 wt. %, and particularly preferably in the range of 20 - 60 wt. %.

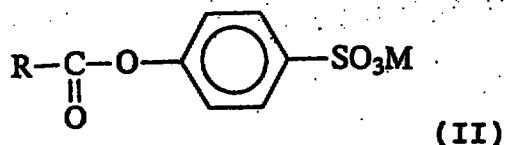
The granules of the component (B) for use in the present invention which contain a bleach activator are the granules which contain a bleach activator represented by the following formula (I):



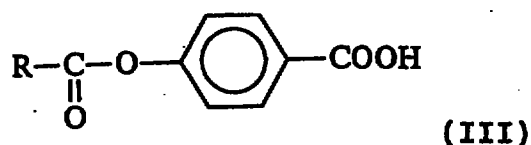
[wherein R is a alkyl group of 7 - 15 carbon atoms and Y is  $-\text{SO}_3\text{M}$  or  $-\text{COOM}$  (wherein M is a hydrogen atom or an alkali metal)].

The straight chain alkyl group represented by R in the formula (I) has 7 - 15 carbon atoms as described above for the purpose of enabling the bleach activator to secure satisfactory solubility under the standard cleansing conditions prevalent in the territory of our country and impart to the produced composition ample power for adsorbing a defiling component. As concrete examples of the alkali metal atom represented by M, sodium atom or potassium atom may be cited.

The bleach activator which is represented by the formula (I) is preferred to be a compound represented by the following formula (II) or a compound represented by the following formula (III).



[wherein R is a straight chain alkyl group of 11 - 15 carbon atoms and M is a sodium atom or potassium atom] or



[wherein R is a straight chain alkyl group of 7 - 11 carbon atoms].

The ratio of the bleach activator to the component (B), for the sake of allowing the composition to be granulated smoothly and preventing it from producing minute particles and imparting to the composition an ample bleaching ability, is preferably in the range of 10 - 95 wt. %, advantageously in the range of 20 - 80 wt. %, and particularly advantageously in the range of 30 - 70 wt. %.

The granules of the component (B) containing the bleach activator, are obtained from the bleach activator, a water-soluble binder and water, and other components which may be found necessary as occasion demands or the product of disintegration of the granules. By reducing the component (B) to the granules or the product of disintegration thereof as mentioned above, the bleach activator which is unstable by itself is enabled to acquire enhanced stability.

As concrete examples of the water-soluble binder, a water-soluble polymer, a non-ionic surfactant and an inorganic

binder may be cited. As concrete examples of the water-soluble polymer, polyethylene glycol, polypropylene glycol, carboxymethyl cellulose, sodium polyacrylate and other similar salts of polycarboxylic acids may be cited. Properly, polyethylene glycol and polypropylene glycol have molecular weights in the range of 400 - 20,000, preferably in the range of 600 - 10,000. As concrete examples of the nonionic surfactant, polyoxyethylene (number of ethylene oxide addition mols = 3 - 300) alkyl C<sub>8</sub> - C<sub>22</sub> ethers, polyoxyethylene alkylphenyl ethers, sucrose fatty acid esters, alkyl glucosides, polyoxyethylene alkyl amines, polyoxyethylene-polyoxypropylene glycols, fatty acid monoethanol amides and fatty acid diethanol amides may be cited. Sodium silicate and other similar compounds may be cited as concrete examples of the water-soluble inorganic binder. Among other water-soluble binders mentioned above, polyoxyethylene glycol and polypropylene glycol having melting points in the range of 20 - 80°C are particularly preferable.

The total ratio of the water-soluble binder and water to the component (B) is preferably in the range of 0.1 - 40 wt. %, particularly preferably in the range of 0.3 - 30 wt. %, and more preferably in the range of 0.3 - 20 wt. %.

The granules of the component (B) or the product of disintegration thereof, for the sake of enhancing the solubility thereof, may incorporate therein an anion surfactant. As concrete examples of the preferable anion surfactant, sulfuric esters of straight chain or branched chain primary or

secondary alcohols of 10 - 18 carbon atoms, sulfuric esters of ethoxylates of alcohols of 8 - 20 carbon atoms, alkylbenzene sulfonates, paraffin sulfonates,  $\alpha$ -olefin sulfonates,  $\alpha$ -sulfofatty acid salts and  $\alpha$ -sulfofatty acid alkyl esters or fatty acid salts may be cited. Particularly for the present invention, straight chain alkyl-benzene sulfonates having alkyl chains of 12 - 14 carbon atoms and alkyl sulfates of 12 - 18 carbon atoms are particularly advantageous. The counter ions are preferred to be those of alkali metals, especially sodium or potassium. The ratio of the anionic surfactant to the component (B) is preferably in the range of 0.1 - 40 wt. %, particularly preferably in the range of 0.3 - 30 wt. %, and more preferably in the range of 1 - 20 wt. %.

The granules of the component (B) or the product of disintegration thereof, for the sake of further enhancing the stability of storage thereof, may incorporate therein an acidic substance. As concrete examples of the acidic substance, such organic acids as formic acid, propionic acid, citric acid, succinic acid, and fumaric acid, such inorganic acids as phosphoric acid and sodium sulfite and zeolite exhibiting solid acidity may be cited. Among other acidic substances cited above, fumaric acid, succinic acid and zeolite exhibiting solid acidity are particularly advantageous. The ratio of the acidic substance to the component (B) is preferably in the range of 0.1 - 40 wt. %, particularly preferably in the range of 0.1 - 30 wt. %.

Next, the method for forming the granules of the component

(B) and disintegrating the granules will be described below. For the granulation, the compact molding method may be preferably adopted for the purpose of enabling the produced granules to be easily disintegrated or dissolved in a solution, not but restricted thereto. For the compact molding, a method for compaction molding the granules into cylindrical pellets preferably having a major diameter of not less than 500  $\mu\text{m}$ , particularly preferably a major diameter in the range of 500 - 3000  $\mu\text{m}$  and more preferably a major diameter in the range of 700 - 2000  $\mu\text{m}$  by the use of an extruding pelletizer, a method for compact molding the granules into plates of a thickness preferably in the range of 200 - 1000  $\mu\text{m}$ , particularly preferably in the range of 500 - 5000  $\mu\text{m}$  by the use of two rolls in rotation and a method for compact molding the granules into tablets having a diameter preferably in the range of 500 - 10000  $\mu\text{m}$ , particularly preferable in the range of 500 - 5000  $\mu\text{m}$  by the use of a briquette may be adopted. When the granules are compressed and molded cylindrically, the major diameter of the produced cylinders is preferred to be not less than 1.1 times, particularly preferably 1.2 - 3 times and more preferably 1.3 - 2 times, the minor diameter thereof for the purpose of parting the shape of cylinder from sphere thereby decreasing the surface area of the cylinder as far as possible and decreasing the surface of contact of the granules with the component (A) and enhancing the stability of the produced composition.

As the extrusion granulators to be used for the compression molding method, the product of Fuji Powder K.K. sold

under the trademark designation of "Pelletable" and the product of Kikusui K.K. sold under the trademark designation of "Karyuki" may be cited. As the briquetters similarly usable, the product of Shinto Kogyo K.K. sold under the trademark designation of "Briquetter" and the product of Kikusui K.K. sold under the trademark designation of "Dajoki" may be cited. Among other devices mentioned above, the extrusion granulators prove to be advantageous in the sense that the produced granules excel in solubility and flowability and the devices excel in productivity. The meshes of the screens used in the extrusion granulators are preferred to have a weight average diameter in the range of 200 - 5000  $\mu\text{m}$ , and for the sake of efficiently producing pellets, in the range of 500 - 5000  $\mu\text{m}$ , and particularly advantageously in the range of 500 - 3000  $\mu\text{m}$ .

When the granules are obtained in a disintegrated form, a method of adjusting the weight average diameter of the compression molded particles in the range of 200 - 5000  $\mu\text{m}$  by the use of a particle classifying device and a method of pelletizing the granules by the use of a proprietary pelletizer sold under the trademark designation of "Marumeraizer" may be employed.

The ratio of the component (B) to the bleaching detergent, for the sake of imparting ample bleaching power to the composition and preventing the bleaching detergent from inducing the phenomenon of caking, is in the range of 0.1 - 20 wt. %, preferably in the range of 0.5 - 10 wt. %, and particularly preferably in the range of 1 - 5 wt. %.

The sodium carbonate of the component (C) to be used in the present invention functions as an alkalinizing agent for the bleaching detergent. The content of the component (C) in the bleaching detergent, in consideration of the economy and for the sake of enabling the component (B) to manifest the quality thereto sufficiently, is in the range of 1 - 60 wt. %, preferably in the range of 5 - 40 wt. %, and particularly preferably in the range of 10 - 30 wt. %.

The ratio of the amount of minute particles (passing a sieve, 125  $\mu$ m in pore diameter) tolerated to be contained in the bleaching detergent, for the sake of preventing the bleaching detergent from inducing the phenomenon of caking and enhancing the stability of the bleaching detergent, is not more than 20 wt. %, preferably not more than 15 wt. %, and particularly preferably not more than 10 wt. %. The content of organic substance in the minute particles, for the sake of preventing the composition from inducing the phenomenon of caking and enhancing the stability of the bleaching detergent, is not more than 20 wt. %, preferably not more than 10 wt. %, and more preferably not more than 5 wt. %. The term "organic substance" as used herein refers to the bleach activator, the water-soluble binder (exclusive of inorganic binder), and the surfactant which is occasionally incorporated as an arbitrary component in the bleaching detergent.

The water content in the bleaching detergent, for the sake of preventing the bleaching detergent from inducing the phenomenon of caking and enhancing the stability of the

composition, is not more than 5 wt. %, preferably in the range of 1 - 5 wt. %, and particularly preferably in the range of 1 - 3 wt. %.

The bleaching detergent of the present invention can incorporate therein an ordinary cleansing component. As concrete examples of the cleansing component, anionic surfactants, nonionic surfactants, amphoteric surfactants, and cationic surfactants may be cited. Among other cleansing components mentioned above, anionic surfactants and nonionic surfactants prove to be preferable. As concrete examples of the preferable anionic surfactant, sulfuric esters of straight chain or branched chain primary or secondary alcohols of 10 - 18 carbon atoms, sulfuric esters of ethoxylated alcohols of 8 - 20 carbon atoms, alkylbenzene sulfonates, paraffin sulfonates,  $\alpha$ -olefin sulfonates,  $\alpha$ -sulfofatty acid salts, and  $\alpha$ -sulfofatty alkyl esters or fatty acid salts may be cited. For the present invention, straight chain alkylbenzene sulfonates having alkyl chains of 12 - 14 carbon atoms and alkyl sulfates of 12 - 18 carbon atoms prove to be particularly preferable. The counter ions are preferred to be those of alkali metals, particularly sodium or potassium. As concrete examples of the preferable nonionic surfactant, polyoxyalkylene alkyl ethers, polyoxyalkylene alkylphenyl ethers, polyoxyalkylene sorbitan fatty esters, polyoxyalkylene glycol fatty esters, and polyoxyethylene polyoxypropylene block polymers may be cited. Among other nonionic surfactants, those polyoxyalkylene alkyl ethers which result from adding 4 - 20 mols of an alkylene oxide

such as ethylene oxide or propylene oxide to a straight chain or branched chain primary or secondary alcohol of 10 - 18 carbon atoms and possess an HLB value (calculated by the Griffin method) in the range of 10.5 - 15.0, preferably in the range of 11.0 - 14.5 prove to be particularly preferable.

The bleaching detergent composition of the present invention can incorporate a crystalline silicate therein. The crystalline silicate is preferred to be an alkali metal salt of silicic acid ( $\text{SiO}_2$ ). The 0.1% dispersion of this silicate has a highest pH value of not less than 11 (at 25°C). The amount of an aqueous 0.1 N hydrochloric acid solution to be required for lowering the pH value of the 0.1% dispersion is not less than 5 ml. This silicate excels not only in alkalinity but also in the alkali buffering ability. Among other alkali metal silicates, the silicates preferably having  $\text{SiO}_2/\text{M}_2\text{O}$  (wherein M is an alkali metal) value of 0.5 - 2.6, particularly preferably 1.5 - 2.6 prove to be advantageous. The crystalline silicate heretofore known in the art has a  $\text{SiO}_2/\text{Na}_2\text{O}$  value in the range of 1.9 to 4.0. The composite crystalline silicate having a ratio exceeding 2.6 proves to be unsuitable for incorporation in a high-density detergent to which the present invention may be applicable.

The crystalline silicate of the present invention possesses an ion-exchange capacity of at least 100  $\text{CaCO}_3$  mg/g, preferably in the range of 200 - 600  $\text{CaCO}_3$  mg/g. It is one of the substances of the present invention which possess an ion capturing ability. The crystalline silicate preferably has an

average particle diameter in the range of 0.1 - 100  $\mu\text{m}$ , particularly preferably in the range of 1 - 60  $\mu\text{m}$ . The term "average particle diameter" as used herein means the median diameter in the particle diameter distribution. The crystalline silicate which possesses such average particle diameter and particle diameter distribution as mentioned above can be prepared by pulverizing coarse silicate by the use of a pulverizer such as, for example, a vibration mill, hammer mill, ball mill, or roller mill.

The crystalline silicate to be advantageously used in the present invention has a composition represented by the following formula (IV):



[wherein M is a Ia group element in the Periodic Table of the Elements, Me is one member or a combination of two or more members selected from the class consisting of IIa group elements, IIb group elements, IIIa group elements, IVa group elements or VIII group elements in the Periodic Table of the Elements, and  $y/x = 0.5 - 2.6$ ,  $z/x = 0.01 - 0.9$ ,  $w = 0 - 20$  and  $n/m = 0.5 - 2.0$ ].

Me is selected from among the IIa group elements, IIb group elements, IIIa group elements, IVa group elements or VIII group elements in the Periodic Table of the Elements. As concrete examples of Me, Mg, Ca, Zn, Y, Ti, Zr, and Fe may be cited. While Me does not need to be limited to these elements, in point of resources and safety, it is preferred to be Mg or Ca. The elements mentioned above may be used either singly or in the form of a mixture of two or more members. For example,

MgO, CaO, etc. may be mixed to form a  $Me_mO_n$  component.

The ratio  $y/x$  in the formula (IV), for the sake of preventing the crystalline silicate from losing the alkalinizing ability to the extent of failing to function sufficiently as an alkalinizing agent, losing the ion-exchange capacity to the extent of failing to function sufficiently as an ion exchanger or losing the resistance to solution in water to the extent of exerting adverse effects seriously on the proofness against the phenomenon of caking, solubility, and powder properties of the composition, is preferably in the range of 0.5 - 2.6, particularly preferably in the range of 1.5 - 2.6. Then, the ratio  $z/x$  in the formula (IV), for the sake of preventing the crystalline silicate from losing the ion-exchange capacity to the extent of failing to function sufficiently as an ion exchanger or suffering the resistance to solution in water to decline to an unduly large extent, is preferably in the range of 0.01 - 0.9, particularly preferably in the range of 0.02 - 0.5.

The values of  $x$ ,  $y$ , and  $z$  impose no restriction particularly but require only to be so related as to satisfy the  $y/x$  ratio and  $z/x$  ratio mentioned above. When the component,  $x(M_2O)$ , mentioned above is  $x'(Na_2O) \cdot x''(K_2O)$ , for example,  $x$  denotes  $x' + x''$ . This relation holds good for  $z$  where the component,  $z(Me_mO_n)$ , is composed of two or more compounds. The ratio  $n/m$  denotes the number of oxygen ions coordinated to the relevant elements. It is substantially selected from among the values of 0.5, 1.0, 1.5, and 2.0.

Further, a crystalline silicate of a composition represented by the following formula (V) may be also used:



[wherein M is an alkali metal,  $x' = 1.5 - 2.6$  and  $y' = 0 - 20$ ].

In the formula (V), M is selected from among the Ia group elements in the Periodic Table of the Elements. For examples, Na and K may be cited. These elements may be used singly. Otherwise, for example,  $Na_2O$  and  $K_2O$  may be mixed to form a  $M_2O$  component. The values  $x'$  and  $y'$  are preferred to satisfy the expressions,  $1.7 \leq x' \leq 2.2$  and  $y' = 0$ . The crystalline silicate having a cation-exchange capacity in the range of 100 - 400  $CaCO_3$  mg/g may be effectively used. This crystalline silicate constitutes itself one of the substances of the present invention which possess an ion capturing ability.

The crystalline silicate represented by the general formula (V) is obtained by firing amorphous vitreous sodium silicate at a temperature in the range of 200 - 1000°C thereby imparting crystallinity thereto. The method for synthesizing this crystalline silicate is described in detail in Phys. Chem. Glasses. 7, p 127 - p. 138 (1966), Z. Kristallogr., 129, p. 396 -p.404 (1969), etc., for example. The crystalline silicate represented by the formula (V) is obtained as a proprietary product ( $\delta$ - $Na_2Si_2O_5$ ) of Hoechst Co. sold in the form of powder or granules under the trademark designation of "Na-SKS-6."

The species of crystalline silicate represented by the formulas (IV) and (V) in the present invention may be used either singly or in the form of a mixture of two or more members. The

ratio of the crystalline silicate to the bleaching detergent is preferably in the range of 0.1 - 10 wt. %, particularly preferably in the range of 1 - 5 wt. %.

The bleaching detergent of the present invention is preferred to incorporate therein a copolymer or homopolymer of a carboxylic acid type monomer having a molecular weight in the range of several hundreds - 100,000.

The carboxylic acid type polymer functions not only to occlude metal ions but also to implement dispersion of dirt of solid particles from clothes into a laundering bath and ensure prevention of the dispersed solid particles from adhering again to the clothes. As concrete examples of the carboxylic acid type polymer, homopolymers or copolymers of acrylic acid, methacrylic acid, and itaconic acid may be cited. The copolymers are properly the products of copolymerization of the monomers mentioned above with maleic acid. They are preferred to have molecular weights in the range of 5,000 - 1,000,000. Such aminocarboxylic acid type polymers as polyglycidylidic acid polymer, carboxymethyl cellulose and other similar cellulose derivatives, and polyaspartates may be cited as concrete examples of other preferable polymers. These polymers possess the ability to occlude metal ions, dispersing ability, and ability to prevent dispersed dirt from defiling clothes again. The ratio of the carboxylic acid type polymer to the bleaching detergent is preferably in the range of 0.5 - 20 wt. %, more preferably in the range of 1 - 10 wt. %.

The bleaching detergent of the present invention is

allowed to incorporate further therein such components as mentioned at line 44, column 8, page 5, through line 17, column 11, page 7 of JP-A-08-218,093. It is particularly preferred to incorporate therein organic metal ion occluding agents such as citric acid, extenders such as sodium sulfate, dispersants such as polyethylene glycol and polyvinyl alcohol, color transfer preventing agents such as polyvinyl pyrrolidone, enzymes such as protease, cellulase, amylase, and lipase, enzyme stabilizers such as boron compounds and sodium sulfite, biphenyl type and stilbene type fluorescent dyes, silicone type and silica type defoaming agents, antioxidants, coloring agents, and perfumes as occasion demands.

The present invention is the bleaching detergent product packed in a plastic container having a moisture permeating degree of not less than  $1 \text{ g/m}^2 \cdot 24 \text{ hr}$  and a thickness in the range of 20 - 500  $\mu\text{m}$  and provided with an air vent. The moisture permeating degree of this plastic container is preferably not less than  $1.1 \text{ g/m}^2 \cdot 24 \text{ hr}$ , particularly preferably  $1.5 \text{ g/m}^2 \cdot 24 \text{ hr}$ . The air vent is formed at a proper portion of the container, generally in the upper part of the container (in the proximity of an opening to be used in dispensing the detergent during use) to secure a state of proper ventilation between the interior of the container and the ambience. No particular restriction is imposed on the shape and size of the air vent. A circular air vent, preferably 0.1 - 5 mm, particularly preferably 0.1 - 1 mm, in diameter or a linear air vent, preferably 0.1 - 5 mm, particularly preferably 1 - 3 mm, in width may be formed. The transmittance of the plastic

container to light of 200 - 800 nm is preferably not more than 30%, particularly preferably not more than 20%, and more preferably not more than 10%.

As concrete examples of the plastic material to be used for the plastic container described above, which selected from linear low-density polyethylene, low-density polyethylene, unstretched polypropylene, stretched nylon, stretched polypropylene, and polyethylene terephthalate may be cited. And these plastic materials may be used either singly or in the form of a mixture of two or more members. A plastic film having a multilayer structure is also usable. A multilayer plastic film using an inner layer of linear low-density polyethylene and an outer layer of a plastic substance which is possessed of mechanical strength such as stretched nylon or stretched polypropylene may be cited as an example of the plastic film having a multilayer structure. The component layers of the multilayer plastic film have a thickness which properly falls in the range of about 5 - 300  $\mu\text{m}$ . The plastic container may be further provided with a barrier layer, a pin-hole preventing layer, a tear inducing layer, etc.

The plastic film to form the plastic container is produced easily by the known method. As concrete examples of the method which is available for the production of a layered film, the dry laminate method, T-die method, coextrusion laminate method, inflation method, and tandem laminate method may be cited. Though the shape of the plastic packing container is not limited, the container is used advantageously in the form of a bag (small

bag) having a prescribed inner volume produced by matching two sheets of plastic film having a given size with each other and heat-sealing the peripheries.

#### Example

The present invention will be described more specifically below with examples, not but restricted thereto.

##### Production Example 1: (Production of bleach activator (a))

In 300 g of dimethyl formamide (DMF), 100 g (0.46 mol) of preliminarily dehydrated sodium p-phenolsulfonate (produced by Wako Junyaku K.K.) was dispersed. The resultant dispersion was kept stirring with a mechanical stirrer and lauric acid chloride (produced by Wako Junyaku K.K.) was added dropwise thereto at 50°C over 30 minutes. After the dropwise addition was completed, the resultant reaction mixture was left aging for three hours. The aged reaction mixture was distilled under a reduced pressure (0.5 - 1 mmHg) at 100°C and DMF was evaporated. The residue was washed with acetone and recrystallized from water/acetone (1/1 mol) to obtain the title agent in a yield of 85%.

##### Production Example 2: (Production of bleach activator (b))

A bleach activator was obtained by following the procedure of Production Example 1 while using myristic acid chloride (produced by Wako Junyaku K.K.) in the place of the lauric acid chloride. Yield 75%.

##### Production Example 3: (Production of bleach activator (c))

A bleach activator was obtained by following the procedure of Production Example 1 while using p-phenol carboxylic dehydrate in the place of the sodium p-phenol sulfonate. Yield

65%.

Production Example 4: (Production of component (B))

A mixing device (made by Fukae Kogyo K.K. and sold under the trademark designation of "High-speed Mixer, FS-GC-10") was charged with a total of 5 kg of raw materials, i.e. 2.7 kg severally of the bleach activator obtained in Production Examples 1 - 3 and TAED (made by Hoechst Co.) as a bleach activator for Comparative Example, 0.6 kg of polyethylene glycol (molecular weight 6000, PEG 6000), and 1.7 kg of sodium alkyl sulfate ( $C_{12}$ ). The raw materials in the mixing device were mixed, with the jacket temperature at 80°C, the revolution number of main shaft at 200 rpm, and the revolution number of crushing vanes at 1500 rpm, and were heated meanwhile. When the temperature of the resulting powder reached 70°C, the produced mixture was extracted from the mixing device. Then, the produced mixture was compactly molded by a pelletizer (made by Fuji Powder K.K. and sold under the trademark of "Pelletable EXD-100") through a screen having a pore diameter of 800  $\mu$ m. The resulting pellets were cooled with a vibration cooler (made by Fuji Powder K.K. and sold under the trademark designation of "Vibro-Flow Drier VDF/6000"). The cooled pellets were disintegrated with a particle adjusting device (made by Fuji Powder K.K. and sold under the trademark of Knife Cutter FL-200"). The resulting particles were classified by a classifying device (made by Tokuju Seisakusho K.K. and sold under the trademark of "Juen Shindofurui") to obtain granules having particle diameter of 350 - 1400  $\mu$ m (weight average diameter 900  $\mu$ m, 125  $\mu$ m pass 2 wt. %)

and containing the bleach activator.

Production Example 5: (Production of small plastic bag 1)

Two sets each having a sheet of stretched nylon, 20  $\mu\text{m}$  in thickness, a sheet of linear low-density polyethylene, 100  $\mu\text{m}$  in thickness, and a sheet of stretched nylon, 15  $\mu\text{m}$  in thickness, superposed square in the order mentioned were prepared, piled one over the other of the sets with the stretched nylon sheets of a thickness of 15  $\mu\text{m}$  falling inside. The three matched sides of the piled sets were heat sealed and an air vent, 0.5 mm in diameter, was formed to afford a small bag 1 having an inner volume of 500 ml. This small bag 1 was found to have a moisture permeating degree of 12.5  $\text{g/m}^2 \cdot 24 \text{ hr}$ .

Production Example 6: (Production of small plastic bag 2)

Two sets each having a sheet of stretched nylon, 20  $\mu\text{m}$  in thickness, a sheet of linear low-density polyethylene, 50  $\mu\text{m}$  in thickness, and a sheet of stretched nylon, 15  $\mu\text{m}$  in thickness, superposed square in the order mentioned were prepared, piled one over the other of the sets with the stretched nylon sheets of a thickness of 15  $\mu\text{m}$  falling inside. The three matched sides of the piled sets were heat sealed and an air vent, 0.5 mm in diameter, was formed to afford a small bag 2 having an inner volume of 500 ml. This small bag 2 was found to have a moisture permeating degree of 32  $\text{g/m}^2 \cdot 24 \text{ hr}$ .

Production Example 7: (Production of small plastic bag 3)

Two sets each having a sheet of stretched nylon, 20  $\mu\text{m}$  in thickness, a sheet of linear low-density polyethylene, 100  $\mu\text{m}$  in thickness, an aluminum foil, 10  $\mu\text{m}$  in thickness, and a sheet

of stretched nylon, 15  $\mu\text{m}$  in thickness, superposed square in the order mentioned were prepared, piled one over the other of the sets with the stretched nylon sheets of a thickness of 15  $\mu\text{m}$  falling inside. The three matched sides of the piled sets were heat sealed and an air vent, 0.5 mm in diameter, was formed to afford a small bag 3 having an inner volume of 500 ml. This small bag 3 was found to have a moisture permeating degree of 0.03  $\text{g}/\text{m}^2\cdot 24$  hr.

**Production Example 8: (Production of small plastic bag 4)**

Two sets each having a sheet of stretched nylon, 20  $\mu\text{m}$  in thickness, a sheet of linear low-density polyethylene, 100  $\mu\text{m}$  in thickness, and a sheet of stretched nylon, 15  $\mu\text{m}$  in thickness, superposed square in the order mentioned were prepared.

Silicate oxide was vacuum evaporated on the surfaces of the stretched nylon sheets of a thickness of 20  $\mu\text{m}$ , which form the outermost layers of the laminate. The two sets of laminates were piled one over the other with the stretched nylon sheets of a thickness of 15  $\mu\text{m}$  falling inside. The three matched sides of the piled sets were heat sealed and an air vent, 0.5 mm in diameter, was formed to afford a small bag 4 having an inner volume of 500 ml. This small bag 4 was found to have a moisture permeating degree of 4  $\text{g}/\text{m}^2\cdot 24$  hr.

**Examples 1 - 11 and Comparative Examples 1 - 4:**

Bleaching detergent product of Examples and Comparative Examples were obtained by packing the components (A) - (C) and other components as shown in Table 1 in the small bags 1 to 4. These packs were tested for the property of inducing the

phenomenon of caking by the following method. The expression "Softanol 120 (made by Nihon Shokubai K.K.)" appearing in Table 1 denotes a nonionic surfactant. The results are shown in Table 1.

(Test for caking property)

The portions, 200 g each, of the bleaching detergent products of Examples and Comparative Examples packed in the small bags 1 - 4 were left standing for four weeks in a constant temperature constant humidity bath kept at temperature of 30°C and humidity of 60%. The compositions were taken out from the small bags 1 - 4 and gently poured onto a sieve, 1 x 1 cm in mesh size. Thereafter, the samples remaining on the sieve were weighed. The caking ratios of the samples were calculated in accordance with the following formula.

$$\text{Caking ratio (\%)} = \frac{\text{Weight of sample remained on sieve}}{\text{weight of sample}} \times 100$$

Table 1

|   |                                                                                             | Example |     |     |     |     |     |     |     |    |     |     | Comparative Example |     |     |     |
|---|---------------------------------------------------------------------------------------------|---------|-----|-----|-----|-----|-----|-----|-----|----|-----|-----|---------------------|-----|-----|-----|
|   |                                                                                             | 1       | 2   | 3   | 4   | 5   | 6   | 7   | 8   | 9  | 10  | 11  | 1                   | 2   | 3   | 4   |
| A | Sodium percarbonate<br>average particle diameter 450 $\mu$ ,<br>not more than 125 $\mu$ 11% | 60      | 60  | 60  | 60  | 60  | 60  | 60  | 60  | 60 | 60  | 60  | 60                  | 60  | 60  | 60  |
| B | Bleach activator a)                                                                         | 5       |     |     | 5   | 5   | 5   | 5   | 5   | 2  |     | 3   |                     | 5   | 25  | 1   |
|   | b)                                                                                          |         | 5   |     |     |     |     |     |     |    |     |     |                     |     |     |     |
|   | c)                                                                                          |         |     | 5   |     |     |     |     |     |    | 3   |     |                     |     |     |     |
|   | TAED (made by Hoechst Co.)                                                                  |         |     |     |     |     |     |     |     |    |     |     | 5                   |     |     |     |
|   | Sodium alkyl sulfate                                                                        | 1       | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1  |     | 0.5 | 1                   | 1   | 1   | 1   |
|   | Polyethylene glycol                                                                         | 1       | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1  |     | 0.5 | 1                   | 1   | 1   | 1   |
| C | Sodium carbonate, average particle<br>diameter 260 $\mu$ , 125 $\mu$ pass 8 wt. %           | 30      | 30  | 30  | 30  | 30  | 30  | 30  | 1   | 50 | 20  | 20  | 30                  | 30  | 10  | 10  |
|   | Nonionic surfactant (average alkyl chain<br>length C = 12, POE = 6.5)                       | 1       | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1  |     | 1   | 1                   | 1   | 1   | 1   |
|   | Alkylbenzene sodium sulfonate                                                               | 1       | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1  |     |     | 1                   | 1   | 1   | 1   |
|   | Magnesium sulfate                                                                           | 0.5     | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 0.5 | 1  |     |     | 0.5                 | 0.5 | 0.5 | 0.5 |
|   | Glauber's salt                                                                              | Balance |     |     |     |     |     |     |     |    |     |     |                     |     |     |     |
|   | Protease                                                                                    | 1       | 1   | 1   | 1   | 1   | 1   | 1   | 1   | 1  | 1   | 1   | 1                   | 1   | 1   | 1   |
|   | Perfume                                                                                     | 0.1     | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | 1  | 0.1 | 0.1 | 0.1                 | 0.1 | 0.1 | 0.1 |
|   | Small packing bag                                                                           | 1       | 1   | 1   | 1   | 1   | 2   | 4   | 1   | 1  | 1   | 1   | 1                   | 3   | 1   | 1   |
|   | Caking ratio (%)                                                                            | 5       | 3   | 2   | 2   | 2   | 1   | 2   | 4   | 2  | 4   | 5   | 16                  | 22  | 18  | 19  |

It is clearly noted from Table 1 that the bleaching detergent products of Examples 1 - 11 invariably showed low caking ratios and retained a good state as a product. In contrast, the product of Comparative Example 1 using a different bleach activator of the present invention, that of Comparative Example 2 using a plastic container having a moisture permeating degree lower than the level specified by the present invention, that of Comparative Example 3 containing the component (B) out of the ratio specified by the present invention and that of Comparative Example 4 containing the component (A) out of the ratio specified by the present invention invariably showed caking ratios exceeding 10% and proves as rejectable as a product. When the products of Examples 1 - 11 after the test were used in laundering clothes of such synthetic fibers as acryl, polyester, and polyamide types in a commercially available washing machine, they exhibited excellent bleaching and cleansing effects.

#### Effect of the Invention

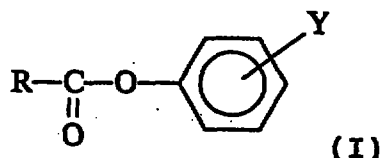
The bleaching detergent product of the present invention hardly induce the phenomenon of caking even after a protracted storage. Since it is therefore capable of retaining the stability of a bleach activator, and enabled to retain an excellent bleaching and cleansing power for a long time. It allows the manufacture to preserve the products easily prior to shipment, reduce the occurrence of rejects in the interval between the time of manufacture and the time of shipment, and improve the yield of products. The consumer is enabled to

retain for a long time the bleaching and cleansing power initially possessed by the bleaching detergent at the time of purchase because the quality of the bleaching detergent remains stable during the periods of normal use.



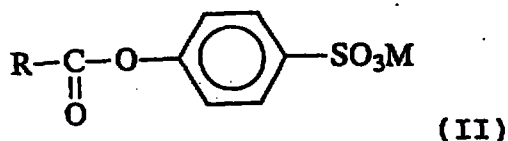
### Claims

1. A bleaching detergent product formed from a bleaching detergent comprising (A) 1 to 80 % by weight of a substance to produce hydrogen peroxide in water, (B) 0.1 to 20 % by weight of particle including a bleach activator having the formula (I):

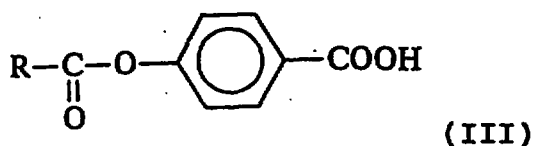


[wherein R is a straight-chained alkyl having 7 to 15 carbon atoms, Y is  $-\text{SO}_3\text{M}$  or  $-\text{COOM}$  (wherein M being hydrogen atom or an alkali metal)] and (C) sodium carbonate and a plastic bag having air-passing pores, a moisture permeability of  $1 \text{ g/m}^2$  /24 hrs or more and a thickness of 20 to 500 microns, containing the detergent.

2. The product as set forth in Claim 1, wherein the bleach activator of the component (B) is represented by the following formula (II) or (III):



wherein R is a straight chain alkyl group of 11 - 15 carbon atoms and M is a sodium atom or potassium atom;



wherein R is a straight chain alkyl group of 7 - 11 carbon atoms.

3. The product as set forth in Claim 1, wherein the minute



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powder content of the bleaching detergent which passes through a sieve of not more than 125  $\mu\text{m}$  in pore diameter is not more than 10 wt. %.

4. The product as set forth in Claim 1, wherein the water content of the bleaching detergent is not more than 5 wt. %.