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United States Patent [19]**Nakagawa et al.**[11] **3,929,661**[45] **Dec. 30, 1975**[54] **LIQUID DETERGENT BLEACHING COMPOSITION**[75] Inventors: **Yunosuke Nakagawa**, Koshigaya;
Yoshiaki Inamoto; **Koji Aigami**,
both of Wakayama, all of Japan[73] Assignee: **Kao Soap Co., Ltd.**, Tokyo, Japan[22] Filed: **Dec. 9, 1974**[21] Appl. No.: **531,226**[30] **Foreign Application Priority Data**

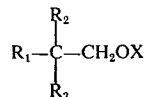
Dec. 11, 1973 Japan..... 48-139338

[52] **U.S. Cl.** **252/103**; 8/108; 252/99[51] **Int. Cl.²** **C11D 7/56**[58] **Field of Search** 252/103, 99; 8/108[56] **References Cited****FOREIGN PATENTS OR APPLICATIONS**

45-7976 3/1970 Japan..... 252/103

Primary Examiner—Mayer Weinblatt*Attorney, Agent, or Firm*—Woodhams, Blanchard and Flynn[57] **ABSTRACT**

A liquid detergent bleaching composition comprising an alkaline aqueous solution of sodium hypochlorite, which solution contains a surfactant having the formula



wherein R_1 , R_2 and R_3 , which can be the same or different, each is alkyl of 1 to 18 carbon atoms, the sum of the carbon atoms of R_1 , R_2 and R_3 being 10 to 20; and X is $-SO_3M$, $-CH_2COOM$, $-CH_2CH_2COOM$, $-(CH_2CH_2O)_nSO_3M$ or $-(CH_2CH_2O)_nCOOM$, wherein n is an integer of 1 to 40 and M is an alkali metal.

7 Claims, No Drawings

LIQUID DETERGENT BLEACHING COMPOSITION

BACKGROUND OF THE INVENTION

1. Field of the Invention

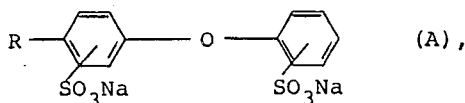
This invention relates to a liquid detergent bleaching composition possessing an excellent storage stability. The liquid detergent bleaching composition is an alkaline aqueous solution of sodium hypochlorite and contains therein a special surfactant which is scarcely decomposed after storage for a long period of time.

2. Description of the Prior Art

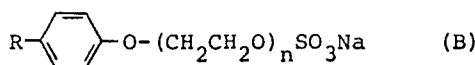
Sodium hypochlorite is now used widely for the purposes of bleaching, sterilization and deodorization. Sodium hypochlorite is also used for disinfection of tableware in public eating facilities, including company cafeterias and restaurants, and also for bleaching textiles and for deodorization of washrooms and plumbing in households because of its lowcost. It has been demanded by users to provide an improved wetting or penetrating property to sodium hypochlorite solutions, and to improve the bleaching and sterilizing powers thereof.

For this purpose, the use of a penetrating agent is necessary. However, if a general purpose surfactant of the type generally used in household soaps or synthetic detergent compositions is added to sodium hypochlorite, decomposition of sodium hypochlorite is promoted in aqueous systems and the surfactant is insoluble therein or an oxidation reaction or decomposition occurs whereby stable compositions cannot be obtained. As synthetic detergents, there are in general use anionic and nonionic surfactants such as sodium alkylbenzene sulfonates, sodium alkylsulfates and polyoxyethylene alkyl ethers. However, those compounds cannot be incorporated in aqueous sodium hypochlorite solutions so as to form stable compositions, because they are salted out or decomposed and they promote decomposition of sodium hypochlorite in strong aqueous sodium hypochlorite solutions.

Attempts to attain the above object by dissolving special surfactants in aqueous sodium hypochlorite solutions have been made. As the surfactants, there have been suggested, for example, sodium alkylphenyl ether disulfonate of the following formula (A) (Japanese patent publication No. 6268/1963):



sodium alkylphenol ether sulfate of the following formula (B) (Japanese patent publication No. 2103/1968):



and sodium alkyl ether sulfate of the following formula (C):



Those surfactants have two or more hydrophilic groups such as $-\text{SO}_3\text{Na}$ and $-(\text{CH}_2\text{CH}_2\text{O})_n-$. Among the above surfactants, those having a benzene nucleus (shown in formulae (A) and (B)) are poor in biological degradability in waste water after they have been used. Therefore, it is preferred to use benzenefree surfactants such as those of formula (C). Although the alkyl ether sulfates of formula (C) are considered to be equivalent to the alkylphenol ether sulfates of formula (B), in detergent formulations compounds of formula (C) are in practice limited to those wherein n represents a number of about 1 to 3, whereas compounds of formula (B) wherein n represents a number of about 1 to 40 are used in the sodium hypochlorite solutions. Although the latter compounds wherein n represents a large number are soluble in sodium hypochlorite, the resulting composition has an impractically poor shelf life, because after storage for a long period of time, sodium hypochlorite and the surfactant are decomposed greatly.

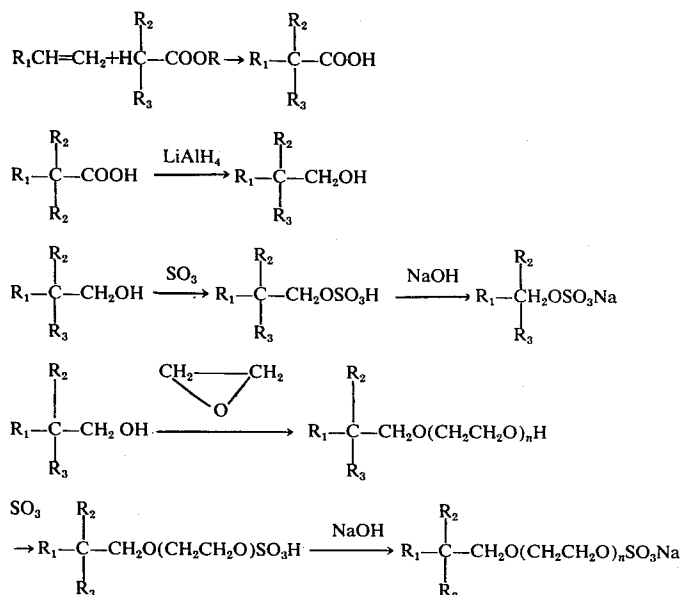
SUMMARY OF THE INVENTION

We have discovered that the compounds of the formula



wherein R_1 , R_2 and R_3 , which can be the same or different, each represent alkyl of 1 to 18 carbon atoms, the sum of the carbon atoms of R_1 , R_2 and R_3 being 10 to 20; and X represents $-\text{SO}_3\text{M}$, $-\text{CH}_2\text{COOM}$, $-\text{CH}_2\text{CH}_2\text{COOM}$, $-(\text{CH}_2\text{CH}_2\text{O})_n\text{SO}_3\text{M}$ or $-(\text{CH}_2\text{CH}_2\text{O})_n\text{CH}_2\text{COOM}$, wherein n is an integer of 1 to 40 and M is an alkali metal, derived from β, β' -dialkyl-substituted monohydric alcohols, are soluble in aqueous sodium hypochlorite solutions and they form with sodium hypochlorite stable compositions without causing serious decomposition of the sodium hypochlorite. The compounds of formula I can be used as surfactants and they have, in aqueous alkaline sodium hypochlorite solutions, a deterging power equivalent to that of the above-mentioned surfactants contained in general purpose synthetic detergent compositions. On the basis of this discovery, we have provided a liquid detergent bleaching composition in which the bleaching power and sterilizing power of sodium hypochlorite have been improved by addition of the surfactant of formula I and which composition has been further provided with a satisfactory deterging effect. Before blending of the compounds of formula I, sodium hypochlorite is converted to an aqueous alkaline solution thereof by adding an alkaline substance such as sodium hydroxide, potassium hydroxide, sodium carbonate or sodium orthophosphate, because sodium hypochlorite is easily stabilized in an aqueous alkaline solution.

The compounds of the above formula I are obtained by synthesizing tertiary carboxylic acids, reducing the resulting tertiary carboxylic acids into alcohols with lithium aluminum hydride or the like and then converting the alcohols into sulfonated or carboxylated products by a known method to obtain the corresponding surfactants of formula I. The reaction scheme is shown below:

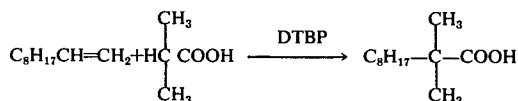


Sodium hypochlorite is prepared by introducing chlorine into sodium hydroxide. By this reaction, sodium chloride is by-produced in substantially the same amount as sodium hypochlorite. The sodium chloride thus by-produced is removed, if necessary, before use of the sodium hypochlorite.

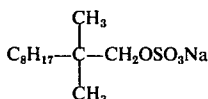
The liquid detergent bleaching composition of the present invention consists essentially of (a) 0.5 to 10 wt. %, preferably 1 to 7 wt. %, of sodium hypochlorite, (b) 0.1 to 20 wt. %, preferably 0.5 to 8 wt. %, of a surfactant of the above general formula I, (c) 0.1 to 5 wt. %, preferably 0.5 to 2 wt. %, of water-soluble alkaline substance and the balance is water. If necessary, a perfume, another chlorine-resistant surfactant, chlorine-resistant fluorescent dye, etc., can be added thereto.

The present invention will be further described by reference to the following illustrative Examples.

EXAMPLE 1



1-Decene was reacted with isobutyric acid in the presence of di-tert.-butyl peroxide (DTBP) at 140°C. as shown by the above reaction to synthesize the corresponding tertiary carboxylic acid. The tertiary carboxylic acid thus obtained was then reduced to an alcohol in the presence of lithium aluminum hydride, then sulfonated with SO₃ and finally neutralized with sodium hydroxide to obtain a surfactant of the formula:



Two parts by weight of the surfactant were dissolved in 48 parts by weight of water at room temperature. The resulting solution was mixed with 50 parts by

weight of an alkaline aqueous sodium hypochlorite solution containing 12 wt. % of sodium hypochlorite, 0.5 wt. % of sodium chloride and 2.0 wt. % of sodium hydroxide. The condition of the mixture was observed. For comparison, the same operation was repeated by using sodium n-dodecylsulfate (C₁₂H₂₅OSO₃Na) and the condition of that product was observed.

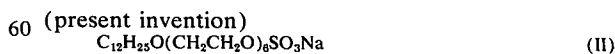
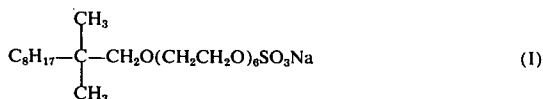
As a result, it was noted that a transparent solution was obtained when the surfactant of the present invention was used at room temperature, whereas a transparent solution was not obtained, but rather white turbidity and precipitation occurred when sodium n-dodecylsulfate was used as surfactant at room temperature.

EXAMPLE 2

A liquid detergent bleaching agent of the following composition was heated at 90°C. for 5 hours. The available chlorine concentration in the sodium hypochlorite was measured before and after the heating to establish the degree of decomposition of sodium hypochlorite that occurred as a result of the heating.

Sodium hypochlorite	6.0 wt. %
Sodium chloride	0.25 wt. %
Sodium hydroxide	1.0 wt. %
Surfactant* (I or II)	3.0 wt. %
Water	Balance

*The following two surfactants were respectively used:



(control)

The results were as follows:

Surfactant used	Available chlorine concentration	
	Before heating	After heating
I (present invention)	5.70 %	3.05 %
II (comparative)	5.70 %	2.70 %

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Thus, as compared with conventional surfactant II, the degree of decomposition of sodium hypochlorite was smaller and the storage stability was improved when the surfactant I of the present invention was used.

EXAMPLE 3

A detergent bleaching agent of the following composition was prepared:

$\begin{array}{c} \text{CH}_3 \\ \\ \text{C}_8\text{H}_{17}-\text{C}-\text{CH}_2\text{O}(\text{CH}_2\text{CH}_2\text{O})_{20}\text{SO}_3\text{Na} \\ \\ \text{CH}_3 \end{array}$	3.0 wt. %
$\text{C}_{12}\text{H}_{25}\text{OSO}_3\text{Na}$	1.0 wt. %
Sodium hypochlorite	5.0 wt. %
Sodium hydroxide	1.0 wt. %
Water	Balance

The detergent bleaching agent was in the form of a transparent stable solution, which exhibited excellent 20
deterging and bleaching powers in washing diapers. The available chlorine remaining after storage at room temperature for 6 months was 90 % (percent of original available chlorine).

EXAMPLE 4

A detergent bleaching agent of the following composition was prepared:

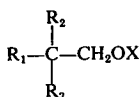
$\begin{array}{c} \text{CH}_3 \\ \\ \text{C}_{12}\text{H}_{25}-\text{C}-\text{CH}_2\text{O}(\text{CH}_2\text{CH}_2\text{O})_8\text{CH}_2\text{COONa} \\ \\ \text{C}_2\text{H}_5 \end{array}$	4.0 wt. %
Sodium hypochlorite	2.0 wt. %
Sodium chloride	1.0 wt. %
Sodium hydroxide	4.0 wt. %
Water	Balance

This detergent bleaching agent was also in the form of a transparent, stable solution, which exhibited excellent 40
deterging and bleaching powers in washing diapers.

The embodiments of the invention in which an exclusive property or privilege is claimed are defined as follows:

1. A liquid detergent bleaching composition, consisting essentially of a stabilized, alkaline, aqueous solution of

- from 0.5 to 10 percent by weight of sodium hypochlorite,
- from 0.1 to 20 percent by weight of surfactant 50
having the formula



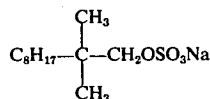
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wherein R_1 , R_2 and R_3 , which can be the same or different, each is alkyl having 1 to 18 carbon atoms, the sum of the carbon atoms of R_1 , R_2 and R_3 being from 10 to 20, and X is $-\text{SO}_3\text{M}$, $-\text{CH}_2\text{COOM}$, $-\text{CH}_2\text{CH}_2\text{COOM}$, $-(\text{CH}_2\text{CH}_2\text{O})_n\text{SO}_3\text{M}$ or $-(\text{CH}_2\text{CH}_2\text{O})_n\text{CH}_2\text{COOM}$, wherein n is an integer from 1 to 40 and M is an alkali metal c. from 0.1 to 5 percent by weight of a water-soluble inorganic alkali effective for stabilizing said sodium hypochlorite in aqueous alkaline solution, and d. the balance water.

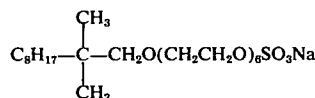
2. A composition as claimed in claim 1, consisting essentially of from 1 to 7 percent by weight of sodium hypochlorite, from 0.5 to 8 percent by weight of said surfactant, from 0.5 to 2 percent by weight of said alkali and the balance water.

3. A composition as claimed in claim 1, in which said alkali is selected from the group consisting of sodium hydroxide, potassium hydroxide, sodium carbonate and sodium orthophosphate.

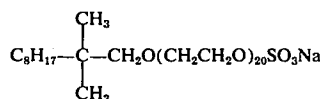
4. A composition as claimed in claim 1 in which said surfactant has the formula



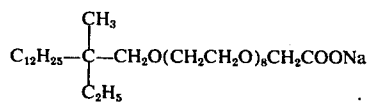
5. A composition as claimed in claim 1 in which said surfactant has the formula



6. A composition as claimed in claim 1 in which said surfactant has the formula



7. A composition as claimed in claim 1 in which said surfactant has the formula



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