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(54) **METHOD FOR PRETREATING CONTAINER, AND METHOD AND DEVICE FOR CLEANING CONTAINER**

VERFAHREN ZUR VORBEHANDLUNG EINES BEHÄLTERS UND VERFAHREN UND  
VORRICHTUNG ZUR REINIGUNG EINES BEHÄLTERS

PROCÉDÉ PERMETTANT LE PRÉTRAITEMENT D'UN RÉCIPIENT ET PROCÉDÉ ET DISPOSITIF  
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**Description**Field of the Invention

**[0001]** The present invention relates to a method for pretreating a container, comprising applying a pretreatment solution to a container to be cleaned comprising peroxide and then conveying the pretreated container into an alkaline wash tank for cleaning, wherein the alkaline wash tank is substantially free of peroxide and the pretreatment is carried out at a temperature range between 35 to 45 °C.

Background of the Invention

**[0002]** In brewery and dairy industries, containers which are repeatedly usable are often utilized to contain products, such as beverage, beer, milk, yogurt and the like, for cost saving. These containers are often glass bottles or plastic bottles. Before filling any products, the repeatedly usable containers need to be cleaned.

**[0003]** Currently, a cleaning method comprising steam and hot alkaline liquid is primarily adopted in the industries. This is a safe and automatic cleaning method, which has been extensively used in food, beverage, hygiene and pharmaceutical industries. In general, the cleaning temperature used in this cleaning method is about 80 to about 90°C, and the cleaning rate is about 24,000 to about 40,000 bottles per hour.

**[0004]** There is proposed a method in which cleaning can be conducted at relatively lower temperatures. Said method employs a cleaning additive composition containing chelating agent, peroxide and surfactant in primary alkaline wash tank and secondary alkaline wash tank to clean the repeatedly usable containers. The cleaning can be conducted at a temperature of about 50 to about 70°C. Although the method lowers the cleaning temperature to a certain extent, the overall cleaning effect and the overall cleaning cost is still not satisfactory, so further improvement is expected. Moreover, when such a method is used, peroxide decomposes and reacts in the alkaline wash tanks, whereby the additional amount of peroxides cannot be controlled, which leads to an increase in overall cleaning cost.

**[0005]** In view of the above situations, there is still a need for improving the prior art. It is desirable to be able to conduct the cleaning of container at a lower temperature, while the cost consumed can also be reduced.

Summary of the Invention

**[0006]** In view of the above discussed situations in the prior art, the present inventors have conducted comprehensive experiments and tests and finally found that: pretreating a container to be cleaned with a pretreatment solution comprising peroxide prior to cleaning of the container to be cleaned in an alkaline wash tank, and then conveying the pretreated container to an alkaline wash tank for cleaning, a comparable, or even better final cleaning effect can be achieved comparing with direct cleaning the container in the alkaline wash tank. Meanwhile, peroxide can be readily added, and the consumption of the peroxide can be well controlled, such that the overall cleaning cost is further decreased.

**[0007]** In one aspect of the present invention, there is provided a method for pretreating container, which method comprises applying the container with a pretreatment solution comprising peroxide for pretreatment, and then conveying the pretreated container into an alkaline wash tank, according to claim 1. By the method for pretreating container of the present invention, the container is pretreated by peroxide before entering into an alkaline wash tank, the consumption of peroxide is well controlled, and the overall cleaning cost is further decreased, while excellent cleaning effect is achieved.

**[0008]** In another disclosure, not according to the invention, there is provided a method for cleaning container, which method comprises the following steps: a) applying a container to be cleaned with a pretreatment solution comprising peroxide for pretreatment; b) conveying the pretreated container into an alkaline wash tank, and cleaning the container with a cleaning solution in the alkaline wash tank. By using the method for cleaning container, the overall cleaning cost is further decreased, while excellent cleaning effect is achieved.

**[0009]** In a further disclosure, not according to the invention, there is provided a device for cleaning container, which device comprises i) a container pretreatment apparatus configured to apply a pretreatment solution comprising peroxide to a container to be cleaned; ii) a container cleaning apparatus comprising at least one alkaline wash tank, which is for receiving the pretreated container from the container pretreatment apparatus and cleaning the pretreated container with a cleaning solution, wherein the cleaning solution comprises a chelating agent and a surfactant, and the container pretreatment apparatus is connected to the container cleaning apparatus with a container transfer apparatus. The device for cleaning container can be used to carry out the method for cleaning container of the present invention. Further, by using the device for cleaning container, the charges in an alkaline wash tank of a cleaning system can be controlled, the consumption of peroxide is well controlled, and overall cleaning cost is further decreased, while excellent cleaning effect is achieved.

**[0010]** In even further disclosure, not according to the invention, there is provided a container pretreatment apparatus. The container pretreatment apparatus can be readily combined with various prior art cleaning systems, without complex

modifications on the prior art cleaning systems, so that cost for installment is saved. Meanwhile, by using the container pretreatment apparatus, the charges in an alkaline wash tank of a cleaning system can be reduced, the consumption of peroxide is well controlled, and overall cleaning cost is further decreased, while excellent cleaning effect is achieved.

## Detailed description of the Invention

**[0011]** It is further to be understood that all terminology used herein is for the purpose of describing particular embodiments only, and is not intended to be limiting in any manner or scope. For example, as used in this specification and the appended claims, the singular forms "a," "an" and "the" can include plural referents unless the content clearly indicates otherwise. Further, all units, prefixes, and symbols may be denoted in its SI accepted form. Numeric ranges recited within the specification are inclusive of the numbers defining the range and include each integer within the defined range.

**[0012]** So that the present invention may be more readily understood, certain terms are first defined. Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which embodiments of the invention pertain. Many methods and materials similar, modified, or equivalent to those described herein can be used in the practice of the embodiments of the present invention without undue experimentation, the preferred materials and methods are described herein. In describing and claiming the embodiments of the present invention, the following terminology will be used in accordance with the definitions set out below.

**[0013]** The term "about," as used herein, refers to variation in the numerical quantity that can occur, for example, through typical measuring and liquid handling procedures used for making concentrates or use solutions in the real world; through inadvertent error in these procedures; through differences in the manufacture, source, or purity of the ingredients used to make the compositions or carry out the methods; and the like. The term "about" also encompasses amounts that differ due to different equilibrium conditions for a composition resulting from a particular initial mixture.

**[0014]** In the context of the present application, "pretreatment," "pretreating" or "pretreat" is intended to mean subjecting a container to a preliminary treatment before the container enters into any alkaline wash tank in a container cleaning apparatus. Such a "pretreatment," "pretreating" or "pretreat" includes any pretreatment before the container enters into a container cleaning apparatus, and/or any pretreatment after the container enters into a container cleaning apparatus but before it enters into any alkaline wash tank in the container cleaning apparatus. When the container cleaning apparatus comprises more than one alkaline wash tank, the "pretreatment" of the present invention also includes the "pretreatment" conducted when the container is between any two adjacent alkaline wash tanks.

**[0015]** For saving cost, beer brewery or dairy often recycles containers for containing products such as beer, milk, yogurt and various other beverages. After removing the soils inside these recycled containers and cleaning them, the containers are returned back to the factory for reuse. Container cleaning devices currently adopted by the plants usually feed the recycled containers into the alkaline wash tanks of the devices directly, fill the container with an alkaline cleaning solution comprising various cleaning agents, and then subject the cleaned container with high temperature steam for treatment. In prior art, the cleaning temperature in an alkaline wash tank is often around 80-90°C. A container cleaning apparatus generally may comprise at least one alkaline wash tank. A container cleaning apparatus may also comprise more alkaline wash tanks, such as two, three, etc., for more complete cleaning.

**[0016]** Containers recycled from outside include soils. These soils comprise, but not limited to, label, mud, mold spot, oil and the like. For various reasons, soils present in a recycled container may cover a large area inside and outside the container. For a complete cleaning, there is proposed a process in the prior art, wherein peroxide is added in an alkaline cleaning solution in an alkaline wash tank. Although such a process lowers the cleaning temperature to a certain extent, and achieves a good cleaning effect, the addition amount of peroxide is difficult to control due to the easy decomposition of peroxide, resulting in an increase in overall cleaning cost. Attempts have been conducted to pretreating the container with an alkaline solution or water. However, the results of these solutions are not desired, in particular to decrease cleaning temperature for low temperature cleaning. Moreover, the amount of used peroxide also cannot be controlled. Further, since alkaline solution is used for pretreatment, corrosion to device will be increased. Regarding a pretreatment with water, water can be only utilized by its solubility and mechanical impact. Water will not chemically react with any soils in the container. Therefore, the removal effect on soils is not desired. The inventors of the present invention have conducted long term comprehensive studies, and found that the above mentioned problems can be successfully resolved by precleaning or pretreating a container to be cleaned with a peroxide solution, then cleaning the container in an alkaline wash tank.

**[0017]** Therefore, according to one aspect of the present invention, there is provided a method for pretreating container according to claim 1, the method comprises before conveying a container into an alkaline wash tank, applying a pretreatment solution comprising peroxide to the container for pretreatment. The container can be a glass container or a plastic container, such as a beer bottle, a beverage bottle and a milk bottle. The soils comprised in the container include, but are not limited to, label, mud, mold spot and the like. The duration for carrying out the pretreatment method of the present invention can be determined according to the level of soils on a container and the intended precleaning effect. It is generally about 3 to about 10 minutes, preferably about 5 to about 8 minutes, Since the temperature at which the

precleaning is conducted is relatively low, the energy consumed will be correspondingly low.

**[0018]** It is well known that peroxide has some oxidative properties. The inventors of the present invention have found that peroxide can chemically react with the soils on a container. For example, peroxide can interact with some metal ions such as iron, manganese and copper and the like present in mold spot or mud. These metal ions function like a catalyst to facilitate the decomposition of peroxide into oxygen and water. Oxygen releases from the soils and forms many tiny bubbles. These bubbles can break the soils through mechanical power, so as to separate them from the container wall to be washed off. Further, peroxide can also oxidatively decompose the organics and mold spot through its own oxidative properties to separate the soil from container wall to be easily washed off.

**[0019]** There is no particular limitation on the peroxide used in the peroxide solution in the method of the present invention. The peroxide that can be used includes, but not limited to, sodium percarbonate, sodium perborate, peroacetic acid, peroctanoic acid, peroxy sulfonated oleic acid and hydrogen peroxide, and any mixture of them. Other peroxides well known to those skilled in the art can also be used. In view of the ready availability and cleaning effect, hydrogen peroxide is preferably used. Further, by using a hydrogen peroxide solution to clean, a container will not have any odor, which is suitable for food and beverage industries. In a preferable aspect of the present invention, the pretreatment solution of the present invention contains peroxide as the only active ingredient, and the peroxide is such as hydrogen peroxide.

**[0020]** The concentration of the peroxide solution used in the method of the present invention is often less than 1 wt%. In the container cleaning, bubbles released from peroxide solution may fortify the generation of bubbles in a cleaning system. Although the bubbles thus generated may contribute to the mechanical power for cleaning, cleaning efficiency will be lowered because excess bubbles will make the contact between glass bottles and cleaning solution insufficient. Further, excessive bubbles will also lead to an extended spray cleaning procedure that follows, and a risk of existence of residual cleaning solution. Moreover, excessive bubbles may impair the cleaning effect. Based on above and cost considerations, in certain aspects, the concentration of the pretreatment solution comprising peroxide of the present invention can be about 0.2 to about 1wt%, such as about 0.3 to about 0.5wt%.

**[0021]** The pretreatment solution comprising peroxide of the present invention is formulated by solving peroxide in water. The water source for formulating the peroxide solution can be such as tap water, soft water, deionized water and the like. In view of the cost, tap water is preferred. Moreover, even tap water of very low cost, the excellent effects of the present invention can still be achieved.

**[0022]** In the pretreatment solution comprising peroxide of the present invention, other agents in addition to peroxide can also be present, such as alkaline agent, disinfect agent, surfactant and the like. However, these other agents are only optional. In an embodiment, the pretreatment solution comprising peroxide of the present invention contains only peroxide as active ingredient. The peroxide may be hydrogen peroxide.

**[0023]** In a method for cleaning container and the device for cleaning container, the alkaline wash tank used comprises alkaline cleaning solution. In view of easy availability and easy maintenance, the alkaline cleaning solution comprises sodium hydroxide in an embodiment of the invention. The concentration of the alkaline cleaning solution may be between 1.5-3.5wt%.

**[0024]** The container cleaning apparatus comprises at least one alkaline wash tank. In some disclosure, not according to the invention, the container cleaning apparatus comprises two alkaline wash tanks, one of which is primary alkaline wash tank, and the other is secondary alkaline wash tank, wherein the secondary alkaline wash tank is positioned downstream of the primary alkaline wash tank, and the two alkaline wash tank is connected by a container transfer apparatus. By using the container pretreatment method of the present invention, treatment temperature in alkaline wash tanks can be lowered to a range of about 40 to about 80°C, and more particularly, can be lowered to a range of about 60 to about 70°C. Since cleaning is conducted at a relatively low temperature, labels on recycled containers will not be significantly broken due to the high reactivity of the alkaline solution at high temperature in alkaline wash tank. Therefore, by using the pretreatment method of present invention, low temperature cleaning is achieved in a container cleaning device, which is helpful for release of unbroken labels on recycled containers, convenient for cleaning and maintenance of alkaline wash tank, lowering the corrosion on glass bottles, while the processing site is more safe and the operating environment for workers is more friendly.

**[0025]** In the present invention, the alkaline solution used in the alkaline wash tank for container cleaning is not particularly limited, and can be those commonly used in container cleaning industry. Generally speaking, alkaline solution mainly comprises alkali metal hydroxides, such as sodium hydroxide, and potassium hydroxide and the like, and alkali earth metal hydroxides, such as calcium hydroxides and the like. The alkaline solution may also comprises some additives for improving cleaning effect. The additives comprise, but not limited to, chelating agent, peroxide and surfactant, etc. These additives are all well known to those skilled in the art.

**[0026]** The alkaline cleaning solution contained in the alkaline wash tank of the present invention can further comprises additives, such as a chelating agent, a peroxide and a surfactant. The chelating agent can be those known to a person skilled in the art. In particular, the chelating agent can be selected from, but not limited to, any one or more of the following: ethylenediamine tetraacetic acid tetrasodium, ethylenediamine tetraacetic acid disodium, glutamic acid diacetic acid

tetrasodium, methylglycine diacetic acid, polymethacrylic acid, polymethacrylic acid sodium, aminotrimethylenephosphonic acid, hydroxyethylene diphosphonic acid, ethylenediamine tetramethylenephosphonic acid, diethylenetriamine pentamethylenephosphonic acid, 2-phosphonic acid butane-1,2,4-tricarboxylic acid, polyol phosphonic acid ester, phosphonylhydroxyacetic acid, 1,6-hexenediamine tetramethylenephosphonic acid, polyaminopolyethermethylenephosphonic acid and dihexenetriamine pentamethylenephosphonic acid. The peroxide can be those used for precleaning the container to be cleaned. In particular, the peroxide comprises, but not limited to, sodium percarbonate, sodium perborate, peracetic acid, peroctanoic acid, peroxy sulfonated oleic acid and hydrogen peroxide, and any mixture of them. The surfactant can be a surfactant commonly used in the art. However, in the present invention, surfactant is optionally present. In particular, defoamers and surfactants that can be used in the present invention comprises, but not limited to, polyether-siliconopolymer, aliphatic alcohol polyoxyethylenepolyoxypropylene ether, ethylenediaminepolyoxyethylenepolyoxypropyleneether, and any mixture of them. In the cleaning solution of the present invention, the present amount of the chelating agent can be for example about 0.05 to about 0.5wt%, the present amount of peroxide can be for example about 0.1 to about 0.5wt%, the present amount of surfactant can be for example 0 to about 0.5wt%, wherein the above weight percents are all based on the alkaline cleaning solution.

**[0027]** By using the method for pretreating container and the method for cleaning container of the present invention, the amount of peroxide can be well controlled during the whole process. By using the method for pretreating container of the present invention, the amount of peroxide used in an alkaline wash tank can be reduced to 0. That is to say, there is no need to add any peroxide in the alkaline wash tank. The alkaline wash tank is substantially free of any peroxide. By "substantially" it means the cleaning solution in the alkaline wash tank comprises less than 5 wt% of peroxide, or less than 3 wt% of peroxide, or even less than 1 wt% of peroxide. In the most preferred embodiment, the cleaning solution in the alkaline wash tank is completely free of any peroxide.

**[0028]** The pretreatment method of the present invention can be primarily classified into two manners, i.e. "outside dosing manner" and "inside dosing manner". The detailed description for the two dosing manners is as follows.

**[0029]** The term "outside dosing manner" used in the present application means, the step of applying a pretreatment solution comprising peroxide to a container to be cleaned for precleaning step is carried out before the container to be cleaned enters into a container cleaning apparatus comprising an alkaline wash tank, which container cleaning apparatus comprises at least one alkaline wash tank. Then, the pretreated container to be cleaned enters into the container cleaning apparatus and enters into the alkaline wash tank therein, wherein the container is cleaned with a cleaning solution in the alkaline wash tank. In such an embodiment, the device for cleaning container has the following configuration in which the container pretreatment apparatus and the container cleaning apparatus are separately disposed. By using such an "outside dosing manner", there is no need to make any modification on prior art cleaning system. The pretreatment for a container can be achieved by mounting a simple container pretreatment apparatus before entering into the cleaning system. By using such a dosing manner, the purpose of saving cost is achieved. Further, by using such a dosing manner, the additional position and additional amount of peroxide can be accurately controlled, thereby peroxide is sufficiently used and the overall amount of peroxide is lowered.

**[0030]** The term "inside dosing manner" used in the present application means, the step of applying the pretreatment solution comprising peroxide to a container to be cleaned is carried out inside a container cleaning apparatus comprising an alkaline wash tank. The container to be cleaned enters into the container cleaning apparatus first. Then, the container enters into an alkaline wash tank therein, and is cleaned with a cleaning solution in the alkaline wash tank. The device for cleaning container has the following configuration, wherein the container pretreatment apparatus is disposed inside the container cleaning apparatus. That is, one or more lines of nozzles can be placed before each of the alkaline wash tank. Before the container to be cleaned enters into an alkaline wash tank, the pretreatment solution of the present invention is applied to the containers. Then, the container enters into the alkaline wash tank. At this time, the pretreatment solution reacts with the alkaline solution in the alkaline wash tank to release bubbles for breaking the soils. By using such an "inside dosing manner", the peroxide solution used in the pretreatment step can be heated together with the cleaning solution in the alkaline wash tank, which means the energy supply in the prior art cleaning system and the water spray configurations in the can sufficiently used, resulting in more savings on energy cost. Further, by using such a dosing manner, the addition position and addition amount of peroxide can also be accurately controlled, thereby peroxide is sufficiently used and the overall amount of peroxide is lowered.

**[0031]** Taking a double-ended bottle washing machines having three alkaline wash tanks with the volumes of 40 tons, 30 tons and 18 tons respectively and process temperature of 70, 83, and 75°C respectively, from a beer brewery. If the cleaning temperature for the recycled glass bottles is decreased from a setup temperature to 60°C, the energy saving in a heating stage will be 5,698,400 KJ, which represents a 28% decrease comparing the previous process. Further, since glass bottles will entrain some cleaning solution with the movement of a bottle box, and the cleaning solution lost caused by overflow between alkaline wash tanks in a bottle washing machine, energy consumption also exists. Since the overall cleaning solution temperature is decreased by the present invention, newly complementary alkaline solution, the heating of the glass bottle does not need to reach the temperature in the previous process, therefore, further energy saving can be achieved after the stabilization of the bottle washing machine.

**[0032]** The method for pretreating container and the method for cleaning container can be used in many prior art container cleaning devices. Container cleaning devices primarily comprise bottle washing machine, such as bottle washing machines made by KRONES, Germany, bottle washing machines made by Nanjing Light Industry Machinery Group, Hefei Zhongchen Light Industrial Machinery Co., Ltd. and the like. One skilled in the art would know that the above exemplification is not an exhaustive for container cleaning devices suitable for the method of the present invention. The method of the present invention can be applied using various container cleaning device in the art.

**[0033]** For further illustrating the excellent effects of the container pretreatment method of the present invention, the following examples are provided for more detailed description of the present invention.

#### Examples

**[0034]** Embodiments of the present invention are further defined in the following nonlimiting Examples. It should be understood that these Examples, while indicating certain embodiments of the invention, are given by way of illustration only. From the above discussion and these Examples, one skilled in the art can ascertain the essential characteristics of this invention.

#### Part A: Verification on mold spot cleaning and label removal effects

**[0035]** In the following experiments, the experiments were conducted on recycled glass bottles provided by a beer brewery to verify the effects of the present invention. The glass bottles are conventional 550ml glass beer bottle.

**[0036]** The mold spot coverage level on the recycled beer bottle is rated according to the following scaling:

5: mold spot covers the beer bottle bottom at an area of 60% or above, and the mold spot per se is dry and adhered to the bottle bottom;

4.5: mold spot covers the beer bottle bottom at an area of 50% or above but less than 60%, and the mold spot per se is dry and adhered to the bottle bottom;

4: mold spot covers the beer bottle bottom at an area of 40% or above but less than 50%, and the mold spot per se is dry and adhered to the bottle bottom;

3.5: mold spot covers the beer bottle bottom at an area of 30% or above but less than 40%, and the mold spot per se is dry and adhered to the bottle bottom;

3: mold spot covers the beer bottle bottom at an area of 20% or above but less than 30%, and the mold spot per se is dry and adhered to the bottle bottom;

2.5: mold spot covers the beer bottle bottom at an area of 10% or above but less than 20%;

2: mold spot covers the beer bottle bottom at an area of 5% or above but less than 10%;

1.5: mold spot covers the beer bottle bottom at an area of 3% or above but less than 5%;

1: mold spot covers the beer bottle bottom at an area of 1% or above but less than 3%;

0.5: mold spot covers the beer bottle bottom at an area of greater than 0% but less than 1%;

0: no mold spot.

**[0037]** Mold spot removal rate:

Mold spot removal rate can be expressed by the following formula:

$$\text{Mold spot removal rate} = (\text{Mold spot level before cleaning} - \text{Mold spot level after cleaning}) / \text{Mold spot level before cleaning} \times 100\%$$

Comparative Example A1: Blank test -- Conventional cleaning manner, no pretreatment

**[0038]** Two glass beer bottle with A1 foil package and front and back labels were selected by eye observation, and pictures were taken. In Comparative Example A1, no pretreatment was carried out on the beer bottle to be cleaned. A cleaning solution (which comprises 3 wt% sodium hydroxide, 500 ppm gluconic acid, 1500 ppm Bo-Cleaner C, 120 ppm Bo-Cleaner D, 100 ppm on-alkyl terminated aliphatic alcohol alkoxypolymer (BASF (China)) and 90 ppm methylenediaminepolyoxypropyleneether (Clariant Germany Inc.) was formulated by tap water in a lab environment. The cleaning solution was heated to a temperature of 60°C and held, then the two bottles were soaked into the cleaning solution at the same time. The bottles were removed from the cleaning solution and left at room temperature. After 10 minutes, the bottles were emptied. The bottles were washed with warm water and then with cool water. Next, the bottles were stained with methylthionine chloride. Mold levels on the bottle bottom were rated through eye observation and pictures were

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taken. Meanwhile, the time for Al foil package and front and back labels removal time of the beer bottle was counted.

**[0039]** The procedure of Comparative Example A1 was repeated to respectively carry out Comparative Example A2-A4.

**[0040]** The results of Comparative Example A1-A4 are summarized in the following table 1-1 and 1-2.

Table 1-1: Mold spot removal

| Comparative Example No. | mold spot level before cleaning | mold spot level after cleaning | mold spot removal rate |
|-------------------------|---------------------------------|--------------------------------|------------------------|
| C.E.A1                  | 4                               | 2.5                            | 37.50%                 |
| C.E.A2                  | 3.5                             | 3                              | 14.29%                 |
| C.E.A3                  | 4.5                             | 3                              | 33.33%                 |
| C.E.A4                  | 4                               | 0                              | 100.00%                |

Table 1-2: Label removal time (min)

| Comparative Example No.                                                                                                                             | Al foil removal time | Front label removal time | Back label removal time |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|--------------------------|-------------------------|
| C.E.A1                                                                                                                                              | 10                   | Failure*                 | 10                      |
| C.E.A2                                                                                                                                              | 10                   | 10                       | Failure*                |
| C.E.A3                                                                                                                                              | 10                   | 10                       | Failure*                |
| C.E.A4                                                                                                                                              | 10                   | 10                       | 4                       |
| Average Time                                                                                                                                        | 10                   | 10.75                    | 10                      |
| *When calculating average time, the experiment marked with "failure" is counted as 13 minutes. A "failure" resulted when the label was not removed. |                      |                          |                         |

Comparative Example A5: Precleaning with an alkaline solution

**[0041]** Two glass beer bottle with Al foil package and front and back labels were selected by eye observation, and pictures were taken. In Comparative Example A5, a pretreatment solution was prepared by using tap water in a lab environment, the solution comprised 0.2wt% Stabilon BPU (Ecolab) and 3wt% sodium hydroxide. The pretreatment solution was heated to a temperature of 45°C, then 60 ml pretreatment solution was added into the two bottles, and the two bottles were left under room temperature environment. After 5 minutes, the bottles were emptied. Next, the bottles were soaked into a 60°C alkaline cleaning solution comprising 0.2wt% BPU and 3wt% sodium hydroxide. After 10 minutes, the bottles were emptied. The bottles were then cleaned with warm water followed by cool water. Next the bottles were stained with methylthionine chloride. Mold spot level of the bottle bottom was rated through eye observation and pictures were taken. Meanwhile, the time for Al foil package and front and back labels removal time of the beer bottle was counted.

**[0042]** The procedure of Comparative Example A5 was repeated to respectively carry out Comparative Example A5-A8.

**[0043]** The results of Comparative Example A5-A8 are summarized in the following table 2-1 and 2-2.

Table 2-1: Mold spot removal

| Comparative Example No. | mold spot level before cleaning | mold spot level after cleaning | mold spot removal rate |
|-------------------------|---------------------------------|--------------------------------|------------------------|
| C.E.A5                  | 5                               | 3                              | 40%                    |
| C.E.A6                  | 4.5                             | 3                              | 33.33%                 |
| C.E.A7                  | 5                               | 3                              | 40%                    |
| C.E.A8                  | 4.5                             | 3                              | 33.33%                 |

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Table 2-2: Label removal time (min)

| Comparative Example No.                                                                                                                             | Al foil removal time | Front label removal time | Back label removal time |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|--------------------------|-------------------------|
| C.E.A5                                                                                                                                              | Failure*             | 7                        | Failure*                |
| C.E.A6                                                                                                                                              | Failure*             | 4                        | 4                       |
| C.E.A7                                                                                                                                              | Failure*             | 4                        | 10                      |
| C.E.A8                                                                                                                                              | 10                   | 4                        | 4                       |
| Average Time                                                                                                                                        | 12.25                | 4.75                     | 7.75                    |
| *When calculating average time, the experiment marked with "failure" is counted as 13 minutes. A "failure" resulted when the label was not removed. |                      |                          |                         |

Comparative Example A9: Cleaning with an alkaline solution, no precleaning

**[0044]** Two glass beer bottles with Al foil package and front and back labels were selected by eye observation, and pictures were taken. In Comparative Example A9, the cleaning solution was prepared by tap water in a lab environment, the solution comprised 0.2wt% Stabilon BPU (Ecolab) and 3wt% sodium hydroxide. The cleaning solution was heated to a temperature of 80°C and held, then the two bottles were soaked in the cleaning solution at the same time. After 10 minutes the bottles were emptied. The bottles were then cleaned with warm water followed by cool water. Next the bottles were stained with methylthionine chloride. Mold spot levels on the bottle bottoms were rated through eye observation and pictures were taken. Meanwhile, the time for Al foil package and front and back labels removal time of the beer bottle was counted.

**[0045]** The procedure of Comparative Example A9 was repeated to respectively carry out Comparative Example A10-A13.

**[0046]** The results of Comparative Example A9-A14 are summarized in the following table 3-1 and 3-2.

Table 3-1: Mold spot removal

| Comparative Example No. | mold spot level before cleaning | mold spot level after cleaning | mold spot removal rate |
|-------------------------|---------------------------------|--------------------------------|------------------------|
| C.E.A9                  | 5                               | 3.5                            | 30%                    |
| C.E.A10                 | 4.5                             | 0                              | 100%                   |
| C.E.A11                 | 5                               | 1.5                            | 70%                    |
| C.E.A12                 | 4.5                             | 2.5                            | 44.44%                 |
| C.E.A13                 | 4.5                             | 2                              | 55.56%                 |
| C.E.A14                 | 4                               | 1.5                            | 62.50%                 |

Table 3-2: Label removal time (min)

| Comparative Example No.                                                                                                                             | Al foil removal time | Front label removal time | Back label removal time |
|-----------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|--------------------------|-------------------------|
| C.E.A9                                                                                                                                              | 4                    | 4                        | Failure                 |
| C.E.A10                                                                                                                                             | 5                    | 4                        | 5                       |
| C.E.A11                                                                                                                                             | 4                    | 4                        | 4                       |
| C.E.A12                                                                                                                                             | 4                    | 4                        | 4                       |
| C.E.A13                                                                                                                                             | 4                    | 4                        | 7                       |
| C.E.A14                                                                                                                                             | 4                    | 4                        | 4                       |
| Average Time                                                                                                                                        | 4.17                 | 4                        | 6.17                    |
| *When calculating average time, the experiment marked with "failure" is counted as 13 minutes. A "failure" resulted when the label was not removed. |                      |                          |                         |

## Comparative Example A1: Precleaning with a hydrogen peroxide solution --"inside dosing"

**[0047]** Two glass beer bottles with Al foil package and front and back labels were selected by eye observation, and pictures were taken. In this example, under lab environment, hydrogen peroxide (50wt%, Mitsubishi Gas Chemical Shanghai Commerce Limited) was added to tap water to prepare a pretreatment solution with a hydrogen peroxide content of 0.3wt%. The pretreatment solution was heated to a temperature of 60°C and held. The cleaning solution comprised 3wt% sodium hydroxide solution, 500 ppm gluconic acid, 1500 ppm Bo-Cleaner C, 120 ppm Bo-Cleaner D, 100 ppm non-alkyl terminated aliphatic alcohol alkoxy polymer (BASF (China)), 90 ppm ethylenediamine polyoxypropylene ether (Clariant Germany Inc.), 120 ppm phosphate (Dow Chemicals (Shanghai) Ltd.), 100 ppm aliphatic alcohol polyoxyethylene ether (Dow Chemicals (Shanghai) Ltd.) and 160 ppm Genapol DF 5050 (Clariant Germany Inc.). The recycled bottle was soaked in the cleaning solution. After 4 minutes the cleaning solution was emptied and about 60 ml pretreatment solution was added into the bottle. The two bottles were immediately soaked in the cleaning solution. After 6 minutes the bottles were emptied. The bottles were cleaned with warm water followed by cool water. The bottles were stained by methylthionine chloride. Mold levels on the bottle bottom were rated through eye observation and pictures were taken.

**[0048]** The procedure of Comparative Example A1 was repeated to respectively carry out Example A2-A5.

**[0049]** The results of Comparative Example A1-A5 are summarized in the following table 4.

Table 4: Mold spot removal

| Example No. | Mold spot level before cleaning | Mold spot level after cleaning | Mold spot removal rate |
|-------------|---------------------------------|--------------------------------|------------------------|
| Ex.A1       | 5                               | 0                              | 100%                   |
| Ex.A2       | 4                               | 1                              | 75%                    |
| Ex.A3       | 5                               | 3                              | 40%                    |
| Ex.A4       | 4.5                             | 1                              | 77.78%                 |
| Ex.A5       | 5                               | 1                              | 80%                    |

## Comparative Example 6: hydrogen peroxide pretreatment solution cleaning -- "outside dosing"

**[0050]** Two glass beer bottles with Al foil packages and front and back labels were selected by eye observation, and pictures were taken. In this example, under lab environment, hydrogen peroxide (50 wt%, Mitsubishi Gas Chemical Shanghai Commerce Limited) was added to tap water to prepare a pretreatment solution with a hydrogen peroxide content of 0.5wt%, and used as such. Fifty ml pretreatment solution was added into the two bottles, and the two bottles were left under room temperature environment for 4 minutes and then emptied. Next, the bottles were soaked in the alkaline cleaning solution as in Comparative Example 1. After 10 minutes the bottles were emptied. Next the bottles were cleaned with warm water followed by cool water. The bottles were stained with methylthionine chloride. Mold levels on the bottle bottom were rated through eye observation and pictures were taken. Meanwhile, the time for Al foil package and front and back labels removal time of the beer bottle was counted.

**[0051]** The procedure of Comparative Example A6 was repeated to respectively carry out Example A7-A9.

**[0052]** The results of Comparative Example A6-A9 are summarized in the following table 5-1 and 5-2.

Table 5-1: Mold spot level

| Example No. | Mold spot level before cleaning | Mold spot level after cleaning | Mold spot removal rate |
|-------------|---------------------------------|--------------------------------|------------------------|
| Ex.A6       | 4                               | 2                              | 50%                    |
| Ex.A7       | 4                               | 2                              | 50%                    |
| Ex.A8       | 4                               | 1                              | 75%                    |
| Ex.A9       | 4                               | 1                              | 75%                    |

Table 5-2: Label removal time (min)

| Comparative Example No. | Al foil removal time | Front label removal time | Back label removal time |
|-------------------------|----------------------|--------------------------|-------------------------|
| Ex.A6                   | 7                    | 7                        | 7                       |

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(continued)

| Comparative Example No. | Al foil removal time | Front label removal time | Back label removal time |
|-------------------------|----------------------|--------------------------|-------------------------|
| Ex.A7                   | 4                    | 4                        | 4                       |
| Ex.A8                   | 7                    | 4                        | 7                       |
| Ex.A9                   | 7                    | 7                        | 4                       |
| Average Time            | 6.25                 | 5.5                      | 5.5                     |

Example A10: hydrogen peroxide pretreatment solution cleaning --"outside dosing"

**[0053]** Two glass beer bottle with Al foil package and front and back labels were selected by eye observation, and were taken pictures. In this example, under lab environment, hydrogen peroxide (50 wt%, Mitsubishi Gas Chemical Shanghai Commerce Limited) was added to tap water to prepare a pretreatment solution with a hydrogen peroxide content of 0.5wt%. The pretreatment solution was heated to 45°C for use. Thirty ml of the pretreatment solution was added into the two bottles, and the two bottles were left under room temperature environment for 4 minutes and then emptied. Next, the bottles were soaked into the alkaline cleaning solution as in Comparative Example 1. After 10 minutes, the bottles were emptied. The bottles were cleaned with warm water followed by cool water. The bottles were stained by methylthionine chloride. Mold levels on the bottle bottom were rated through eye observation and pictures were taken.

**[0054]** The procedures of Example A10 as repeated to respectively carry out Example A11-A15.

**[0055]** The results of Example A10-A15 are summarized in the following table 6.

Table 6-1: Mold spot removal

| Example No. | Mold spot level before cleaning | Mold spot level after cleaning | Mold spot removal rate |
|-------------|---------------------------------|--------------------------------|------------------------|
| Ex.A10      | 4                               | 0                              | 100%                   |
| Ex.A11      | 4.5                             | 3                              | 33.33%                 |
| Ex.A12      | 4.5                             | 1                              | 77.78%                 |
| Ex.A13      | 5                               | 2.5                            | 50%                    |
| Ex.A14      | 4                               | 0                              | 100%                   |
| Ex.A15      | 4                               | 0.5                            | 87.5%                  |

Table 6-2; Label removal time (min)

| Comparative Example No. | Al foil removal time | Front label removal time | Back label removal time |
|-------------------------|----------------------|--------------------------|-------------------------|
| Ex.A10                  | 7                    | 4                        | 7                       |
| Ex.A11                  | 7                    | 7                        | 4                       |
| Ex.A12                  | 7                    | 7                        | 4                       |
| Ex.A13                  | 7                    | 7                        | 4                       |
| Ex.A14                  | 10                   | 4                        | 7                       |
| Ex.A15                  | 7                    | 4                        | 7                       |
| Average Time            | 7.5                  | 5.5                      | 5.5                     |

**[0056]** The following table 7 summarizes average mold spot cleaning effect of each of Comparative Examples and Examples in the above Part A. The average mold spot cleaning effects are the arithmetic average of the mold spot removal rate obtained from the each set of Comparative Examples and Examples.

Table 7

| No.                        | Cleaning Manner                                                               | Average cleaning effect on mold spot |
|----------------------------|-------------------------------------------------------------------------------|--------------------------------------|
| Comparative Example A1-A4  | Conventional cleaning manner, no pretreatment, cleaning temperature 60°C      | 46.28%                               |
| Comparative Example A5-A8  | Precleaning with an alkaline solution, cleaning temperature 60°C              | 36.67%                               |
| Comparative Example A9-A14 | Cleaning with an alkaline solution, no precleaning, cleaning temperature 80°C | 62.50%                               |
| Comparative Example A1-A5  | Precleaning with hydrogen peroxide pretreatment solution - "inside dosing"    | 73.20%                               |
| Comparative Example A6-A9  | Precleaning with hydrogen peroxide pretreatment solution - "outside dosing"   | 67.5%                                |
| Example A10-A15            | Precleaning with hydrogen peroxide pretreatment solution - "outside dosing"   | 74.77%                               |

#### Part B: Verification on mud cleaning effect

**[0057]** In the following experiments, recycled glass bottles provided by a beer brewery were used for experiments to verify the effect of the present invention. The glass bottles are conventional 550ml glass beer bottles.

**[0058]** The mud coverage level on recycled beer bottles is rated according to the following scaling:

- 5: mud covers inside and outside the beer bottle at an area of 60% or above;
- 4.5: mud covers inside and outside the beer bottle at an area of 50% or above but less than 60%;
- 4: mud covers inside and outside the beer bottle at an area of 40% or above but less than 50%;
- 3.5: mud covers inside and outside the beer bottle at an area of 30% or above but less than 40%;
- 3: mud covers inside and outside the beer bottle at an area of 20% or above but less than 30%;
- 2.5: mud covers inside and outside the beer bottle at an area of 10% or above but less than 20%;
- 2: mud covers inside and outside the beer bottle at an area of 5% or above but less than 10%;
- 1.5: mud covers inside and outside the beer bottle at an area of 3% or above but less than 5%;
- 1: mud covers inside and outside the beer bottle at an area of 1% or above but less than 3%;
- 0.5: mud covers inside and outside the beer bottle at an area of less than 1%;
- 0: no mud.

#### **[0059]** Mud removal rate

Mud removal rate can be expressed by the following formula:

$$\text{Mud removal rate} = (\text{Mud level before cleaning} - \text{Mud level after cleaning}) / \text{Mud level before cleaning} \times 100\%$$

Comparative Example B1: Blank test -- conventional cleaning manner, no pretreatment

**[0060]** Two glass beer bottles with relatively high mud coverage level were selected through eye observation, and pictures were taken. In Comparative Example B1, no pretreatment was carried out on the beer bottles to be cleaned. Under lab environment, tap water was used to prepare a cleaning aqueous solution, which comprises 3wt% sodium hydroxide, 500ppm gluconic acid, 1500 ppm Bo-Cleaner C (Ecolab), 120 ppm Bo-Cleaner D (Ecolab), 100 ppm non-alkyl terminated aliphatic alcohol alkoxy polymer (BASF (China)) and 90 ppm ethylenediamine polyoxypropylene ether (Clariant Germany Inc.). The cleaning solution was heated to a temperature of 60°C and held, then the two bottles were soaked into the cleaning solution at the same time. After 10 minutes, the bottles were emptied. Then, the bottles were cleaned with warm water, then with cool water. Next, the mud level was rated through eye observation and pictures were taken.

**[0061]** The procedure of Comparative Example B1 was repeated to respectively carry out Comparative Example B2-B4.

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**[0062]** The results of Comparative Example B1-B4 are summarized in the following Table 8.

Table 8

| Comparative Example No. | Mud level before cleaning | Mud level after cleaning | Mud removal rate |
|-------------------------|---------------------------|--------------------------|------------------|
| C.E.B1                  | 3                         | 0.5                      | 83.33%           |
| C.E.B2                  | 3.5                       | 0.5                      | 85.71%           |
| C.E.B3                  | 3                         | 1                        | 66.67%           |
| C.E.B4                  | 5                         | 2                        | 60%              |

Comparative Example B5: Precleaning with alkaline solution

**[0063]** Two glass beer bottles with relatively high mud coverage level were selected through eye observation, and pictures were taken. In Comparative Example B5, a pretreatment solution was prepared by tap water under lab environment, the solution comprises 0.2wt% Stablon BPU (Ecolab) and 3wt% sodium hydroxide. The pretreatment solution was heated to a temperature of 45°C, then 60 ml pretreatment solution was added into the two bottles, and the two bottles were left under room temperature environment. After 5 minutes, the bottles were emptied. Next, the bottles were soaked into an alkaline cleaning solution comprising 0.2wt% BPU and 3wt% sodium hydroxide. After 10 minutes, the bottles were emptied. Then, the bottles were cleaned with warm water, then with cool water. The mud level was rated through eye observation and pictures were taken.

**[0064]** The procedure of Comparative Example B5 was repeated to respectively carry out Comparative Example B5-B8.

**[0065]** The results of Comparative Example B5-B8 are summarized in the following Table 9.

Table 9

| Comparative Example No. | Mud level before cleaning | Mud level after cleaning | Mud removal rate |
|-------------------------|---------------------------|--------------------------|------------------|
| C.E.B5                  | 3                         | 2.5                      | 16.67%           |
| C.E.B6                  | 4.5                       | 3.5                      | 22.22%           |
| C.E.B7                  | 4.5                       | 1.5                      | 66.67%           |
| C.E.B8                  | 3.5                       | 3                        | 14.29%           |

Comparative Example B9: Cleaning with alkaline solution, no precleaning

**[0066]** Two glass beer bottles with relatively high mud coverage level were selected through eye observation, and pictures were taken. In Comparative Example B9, under lab environment, tap water was used for formulating the solution, which solution comprises 0.2wt% Stablon BPU (Ecolab) and 3wt% sodium hydroxide. The cleaning solution was heated to a temperature of 80°C. After 10 minutes, the bottles were emptied. Then, the bottles were cleaned with warm water, then with cool water. Next, the mud level was rated through eye observation and pictures were taken.

**[0067]** The procedure of Comparative Example B9 was repeated to respectively carry out Comparative Example B10-B12.

**[0068]** The results of Comparative Example B9-B12 are summarized in the following Table 10.

Table 10

| Comparative Example No. | Mud level before cleaning | Mud level after cleaning | Mud removal rate |
|-------------------------|---------------------------|--------------------------|------------------|
| C.E.B9                  | 3.5                       | 1.5                      | 57.14%           |
| C.E.B10                 | 3.5                       | 1.5                      | 57.14%           |
| C.E.B11                 | 5                         | 3                        | 40%              |
| C.E.B12                 | 5                         | 2                        | 60%              |

Example B1: hydrogen peroxide pretreatment solution cleaning -- "outside dosing"

**[0069]** Two glass beer bottles with relatively high mud coverage level were selected through eye observation, and

were taken pictures. In this example, under lab environment, hydrogen peroxide (50 wt%, Mitsubishi Gas Chemical Shanghai Commerce Limited) was added to tap water to prepare a pretreatment solution with a hydrogen peroxide content of 0.5wt%, The pretreatment solution was heated to 45°C for use. Thirty ml above pretreatment solution was added into the two bottles, and the two bottles were left under room temperature environment for 4 minutes and then emptied. Next the bottles were soaked in the alkaline cleaning solution as in Comparative Example 1. After 10 minutes the bottles were emptied. The bottles were then cleaned with warm water followed by cool water. The mud level was rated through eye observation and pictures were taken.

**[0070]** The procedure of Example B1 was repeated to respectively carry out Example B1-B4.

**[0071]** The results of Example B1-B4 are summarized in the following Table 11.

Table 11

| Example No. | Mud level before cleaning | Mud level after cleaning | Mud removal rate |
|-------------|---------------------------|--------------------------|------------------|
| Ex.B1       | 3.5                       | 0.5                      | 85.71%           |
| Ex.B2       | 3.5                       | 1                        | 71.43%           |
| Ex.B3       | 3.5                       | 1                        | 71.43%           |
| Ex.B4       | 4.5                       | 1                        | 77.78%           |

**[0072]** The following table 12 summarizes the average cleaning effects of various Comparative Example and various Example. The average cleaning effects are the arithmetic averages of Mud removal rates obtained from each set of Comparative Examples and Examples.

Table 12

| No.                        | Cleaning Manner                                                            | Average cleaning effect on mud |
|----------------------------|----------------------------------------------------------------------------|--------------------------------|
| Comparative Example B1-B4  | Conventional cleaning manner, no pretreatment, cleaning temperature 60 °C  | 73.83%                         |
| Comparative Example B5-B8  | Precleaning with alkaline solution, cleaning temperature 60°C              | 29.96%                         |
| Comparative Example B9-B12 | Cleaning with alkaline solution, no precleaning, cleaning temperature 80°C | 53.57%                         |
| Example B1-B4              | Hydrogen peroxide pretreatment solution cleaning - "outside dosing"        | 76.59%                         |

#### Part C: Verification on controllable addition amount of hydrogen peroxide

**[0073]** Under lab environment, an alkaline cleaning solution provided by a beer brewery was added in a beaker, and then hydrogen peroxide. Titration was carried out with a sodium thiosulfate titration method. Titration was carried out every 5 minutes. The decomposition rate of hydrogen peroxide in the alkaline solution was tested. The additional amount of hydrogen peroxide was calculated by the volume of the alkaline wash tank of the brewery to be 25-100 kg/hour. The additional amount correlates with the contamination level in the alkaline solution. It can be seen that the amount of hydrogen peroxide cannot be controlled by directly adding hydrogen peroxide into an alkaline wash tank of a bottle washing machine due to different contamination levels in the alkaline solution.

**[0074]** However, by using the method of the present invention, hydrogen peroxide is separately added, and the addition amount per hour can be kept to 6 to 12kg. Therefore, the addition amount is controllable and significantly decreased compared with the direct addition of hydrogen peroxide into the alkaline wash tank.

#### Claims

1. A method for pretreating a container, comprising applying a pretreatment solution to a container to be cleaned comprising peroxide and then conveying the pretreated container into an alkaline wash tank for cleaning, wherein the alkaline wash tank is substantially free of peroxide and the pretreatment is carried out at a temperature range

between 35 to 45 °C.

2. The method for pretreating a container according to claim 1, wherein the peroxide is comprised of hydrogen peroxide, sodium peroxide, calcium peroxide, peroxy sulfonated oleic acid, peroacetic acid, peroctanoic acid or the mixture thereof.
3. The method for pretreating a container according to claim 1, wherein the peroxide is hydrogen peroxide.
4. The method for pretreating a container according to claim 1, the concentration of the peroxide is 0.1 to 1 wt%.
5. The method for pretreating a container according to anyone of claims 1 to 4, wherein the concentration of the peroxide is 0.3 to 0.5 wt%.
6. The method for pretreating a container according to anyone of claims 1 to 4, wherein the solution contains only peroxide as the active ingredient.
7. The method for pretreating container according to anyone of claims 1 to 4, wherein the solution comprises tap water.
8. The method for pretreating container according to anyone of claims 1 to 4, wherein the alkaline wash tank comprises an alkaline solution, the alkaline solution comprises an alkaline source selected from alkali metal hydroxide, alkali earth metal hydroxide and organic alkaline agent.
9. The method for pretreating container according to claim 8, wherein the alkaline solution further comprises an additive selected from chelating agent, and surfactant.
10. The method for pretreating a container according to claim 1, wherein the container is selected from glass bottle and plastic bottle.
11. The method for pretreating a container according to claim 10, wherein the glass bottle is a beer bottle.

#### Patentansprüche

1. Verfahren zum Vorbehandeln eines Behälters, umfassend das Aufbringen einer Vorbehandlungslösung auf einen zu reinigenden Behälter, die ein Peroxid umfasst, und dann zum Reinigen das Einbringen des vorbehandelten Behälters in einen alkalischen Waschtank, wobei der alkalische Waschtank im Wesentlichen frei von Peroxid ist und die Vorbehandlung in einem Temperaturbereich zwischen 35 und 45 °C durchgeführt wird.
2. Verfahren zum Vorbehandeln eines Behälters nach Anspruch 1, wobei das Peroxid aus Wasserstoffperoxid, Natriumperoxid, Calciumperoxid, peroxy-sulfonierter Ölsäure, Peressigsäure, Peroctansäure oder das Gemisch daraus besteht.
3. Verfahren zum Vorbehandeln eines Behälters nach Anspruch 1, wobei das Peroxid Wasserstoffperoxid ist.
4. Verfahren zum Vorbehandeln eines Behälters nach Anspruch 1, wobei die Konzentration des Peroxids 0,1 bis 1 Gew.-% beträgt.
5. Verfahren zum Vorbehandeln eines Behälters nach einem der Ansprüche 1 bis 4, wobei die Konzentration des Peroxids 0,3 bis 0,5 Gew.-% beträgt.
6. Verfahren zum Vorbehandeln eines Behälters nach einem der Ansprüche 1 bis 4, wobei die Lösung nur Peroxid als aktiven Bestandteil enthält.
7. Verfahren zum Vorbehandeln eines Behälters nach einem der Ansprüche 1 bis 4, wobei die Lösung Leitungswasser umfasst.
8. Verfahren zum Vorbehandeln eines Behälters nach einem der Ansprüche 1 bis 4, wobei der alkalische Waschtank eine alkalische Lösung umfasst, wobei die alkalische Lösung eine alkalische Quelle umfasst, die aus einem Alkali-

limetallhydroxid, einem Erdalkalimetallhydroxid und einer organischen alkalischen Substanz ausgewählt ist.

9. Verfahren zum Vorbehandeln eines Behälters nach Anspruch 8, wobei die alkalische Lösung ferner ein Additiv umfasst, das aus einem Chelatbildner, und einem Tensid ausgewählt ist.

10. Verfahren zum Vorbehandeln eines Behälters nach Anspruch 1, wobei der Behälter aus einer Glasflasche und einer Kunststoffflasche ausgewählt ist.

11. Verfahren zum Vorbehandeln eines Behälters nach Anspruch 10, wobei die Glasflasche eine Bierflasche ist.

## Revendications

1. Procédé de prétraitement d'un récipient, comprenant l'application d'une solution de prétraitement sur un récipient devant être nettoyé comprenant du peroxyde et ensuite le transport du récipient prétraité dans un réservoir de lavage alcalin destiné au nettoyage, le réservoir de lavage alcalin étant sensiblement exempt de peroxyde et le prétraitement étant réalisé dans une plage de températures comprise entre 35 et 45 °C.

2. Procédé de prétraitement d'un récipient selon la revendication 1, dans lequel le peroxyde est composé de peroxyde d'hydrogène, de peroxyde de sodium, de peroxyde de calcium, d'acide oléique peroxyde sulfuré, d'acide peroacétique, d'acide péroctanoïque et du mélange de ceux-ci.

3. Procédé de prétraitement d'un récipient selon la revendication 1, dans lequel le peroxyde est le peroxyde d'hydrogène.

4. Procédé de prétraitement d'un récipient selon la revendication 1, la concentration du peroxyde étant comprise entre 0,1 et 1 % en poids.

5. Procédé de prétraitement d'un récipient selon l'une quelconque des revendications 1 à 4, dans lequel la concentration du peroxyde est comprise entre 0,3 et 0,5 % en poids.

6. Procédé de prétraitement d'un récipient selon l'une quelconque des revendications 1 à 4, dans lequel la solution contient du peroxyde uniquement en tant que principe actif.

7. Procédé de prétraitement d'un récipient selon l'une quelconque des revendications 1 à 4, dans lequel la solution comprend de l'eau courante.

8. Procédé de prétraitement d'un récipient selon l'une quelconque des revendications 1 à 4, dans lequel le réservoir de lavage alcalin comprend une solution alcaline, la solution alcaline comprenant une source alcaline choisie parmi un hydroxyde de métal alcalin, un hydroxyde de métal alcalino-terreux et un agent alcalin organique.

9. Procédé de prétraitement d'un récipient selon la revendication 8, dans lequel la solution alcaline comprend en outre un adjuvant choisi parmi un agent de chélation et un tensioactif.

10. Procédé de prétraitement d'un récipient selon la revendication 1, dans lequel le récipient est choisi parmi une bouteille en verre et une bouteille en plastique.

11. Procédé de prétraitement d'un récipient selon la revendication 10, dans lequel la bouteille en verre est une bouteille de bière.