Description

METHOD FOR CLEANING SUBJECT TO BE CLEANED

Technical Field

The present invention relates to a method for cleaning a subject to be cleaned which reduces an amount of detergent such as surfactant as little as possible, and which utilizes characteristics of electrolyzed water.

Background Art

Many of surfactants for use in cleaning floor and the like utilize environmental hormones, toxic chemical substances, organic solvents and the like in order to clean out stain at the fullest extent. For this reason, there occurs a problem associated with a treatment of exhausted liquid, sometimes leading to loading on a cleaning company. Moreover, the exhausted liquid often have an adverse effect upon organisms, and thus, the development of environmentally friendly detergent has increasingly been desired. In addition, there is a fact that the cost for detergents and the like weights heavily on a cleaning company.

At present, it has been known that the surface of a bubble is highly active, and has a property that it easily deposits stains, making it possible to remove stains in water and to clean up industrial products. Particularly, it has been known that upon utilizing a lot of smaller bubbles stains can be much more effectively cleaned up in comparison with the use of bigger

bubbles assuming that the volume of the bubbles are the same. A cleaning in the present situation is of a problem that too much surfactant must be used. This leads to the increasing of the cost which should be paid by a cleaning company. In addition, for fear of an affect upon environments of living bodies associated with a treatment of exhausted liquid, development has been made to provide a surfactant gentle for earth or such.

For example, Japanese Patent Laid-Open Publication No. 2001-303096 discloses a detergent mainly comprising a macromolecular compound having an alkylene terephtahalte unit and/or an alkylene isophtalate unit and a polyoxyalkylene unit as basic skeleton as a detergent for reducing the load to be exhausted to environments while maintaining detergent power.

Japanese Patent Laid-Open Publication No. 10-277051 discloses a detergent mainly comprising a peroxo acid salt as a main ingredient and optionally comprising a surfactant.

However, these prior arts, which concern ingredients for detergents themselves, can reduce a load upon an environment to some extent, but they do not solve a basic problem for suppressing the use of surfactant.

SUMMARY OF THE INVENTION

The present invention which solve the problem concerns as the following matters:

(1) A method for cleaning a subject to be cleaned which comprises:

a stage for generating air bubbles having a size of approximately 100 nm in water or an aqueous medium (preferably electrolyzed water); a stage for soaking a subject be cleaned into the water described above; and stage for removing stains out of the soaked subject.

(2) A method for cleaning a subject to be cleaned which comprises:

a stage for soaking a subject to be cleaned into water or an aqueous medium;

a stage for generating air bubbles having a size of approximately 100 nm in said water or said aqueous medium (preferably electrolyzed water); and

stage for removing stains out of the soaked subject.

(3) A method for cleaning a subject to be cleaned which comprises:

a stage for soaking a subject to be cleaned into water or an aqueous medium (preferably electrolyzed water);

a stage for generating air bubbles having a size of approximately 100 nm in said water or said aqueous medium;

a stage for leaving the subject soaked in said water or said aqueous medium as it while applying ultrasonic wave into said water or said aqueous medium; and

stage for removing stains out of the soaked subject.

In the method for cleaning a subject according to the present invention, the water or the aqueous medium is preferably an aqueous electrolytic solution containing an electrolyte.

Furthermore, in the method for cleaning a subject according to the present invention, the stage for soaking a subject to be cleaned is preferably performed at a warmed temperature.

Moreover, it is possible to produce air bubbles having a size of approximately 100 nm in the water and thereafter to apply ultrasonic wave into the water, whereby the produced air bubbles may be much more finely divided.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. 1 is a flowchart which explains individual stages of the method according to the present invention.

FIG. 2 is a drawing which explains an apparatus for preparing electrolyzed water used according to a preferred embodiment of the present invention.

FIG. 3 is a flowchart which explains individual stages of the another method according to the present invention.

FIG. 4 is a referential photograph showing a bubbling stage in the cleaning method according to the present invention.

FIG. 5 is a referential photograph showing the situation before and after the treatment of a subject treated according to the cleaning method of the present invention.

BEST MODE FOR CARRYING OUT THE INVENTION

The present invention will now be described by referring to attached drawings. FIG. 1 is a flowchart which explains

individual stages of the method according to the present invention; FIG. 2 is a drawing which explains an apparatus for preparing electrolyzed water used according to a preferred embodiment of the present invention; and FIG. 3 is a flowchart which explains individual stages of the another method according to the present invention.

(First Embodiment)

This embodiment is an embodiment where a subject or subjects is soaked in an electrolyzed water which has been subjected to a nano-bubble treatment, as a medium for use in cleaning.

As shown in FIG. 1, an electrolyzed water is first prepared in a stage S1. The preparation of electrolyzed water which can be used may be known method as shown in FIG. 1, and, for example, the electrolyzed water can be availably prepared by using an apparatus for preparing electrolyzed water shown in FIG. 2(a) to FIG. 2(c).

Electrolyzed water is prepared by electrolyzing water using such an apparatus as shown in FIG. 2(a). At this time, tap water is generally used for the electrolysis. The tap water is an electrolyte containing metals such as calcium, magnesium, sodium, and potassium in salt forms thereof.

Specifically, as shown in FIG. 2(a), an anode cathode E1 and a cathode E2 are provided on both sides of a dividing plate of a water tank T in which the interior is divided by a diaphragm D, respectively, an electrolyte such as tap water is

incorporated in the water tank, and a prescribed current is run between both electrodes E1 and E2 to thereby produce electrolyzed water.

At the side of the anode E1, the water molecule is separated into H^+ (hydrogen ions), O_2 (oxygen molecule) and e^- (electrons) to thereby increase an hydrogen ion concentration and to dissolve the oxygen molecules in the water up to the saturation concentration at that temperature. At this time, large amounts of ozone, O_2 radicals, oxidative ions having an oxidation powers are generated. Also, if there exists an electrolyte such as sodium chloride in the water, the reaction of such an electrolyte occurs to produce corresponding substances derived from the electrolyte. In this case, a strongly acidified water is produced at the anode side. As described above, at the side of the anode E1, an acidified water having an acidity is prepared.

On the other hand, at the side of the cathode E2, electron (e^-) is acted upon the water to increase OH^- (hydroxyl ion), which is dissolved in the water as H_2 (hydrogen molecule). Furthermore, as one characteristic of the water, at which large amounts of reductive ions are generated, substances taking part in the oxidation such as oxygen are significantly decreased. Since parts of metals such as calcium, magnesium, sodium, potassium, magnesium, sodium, and potassium are ionized and attracted to the cathode E2, the existence of these metal ions dissolved in the water is also one of the characteristics of

the water at side of the cathode E2.

The metal ions dissolved and existing at the side of the cathode E2 exist as a state that they are easily digested and adsorbed in comparison with the corresponding salt states such as sodium chloride (the state ordinarily existing in tap water).

The apparatus for producing the electrolyzed water as described above can be roughly divided into two types:

The first apparatus concerns an apparatus, generally called "apparatus for forming an alkaline ion water", in which tap water, purified water or mineral water is directly electrolyzed (see FIG. 2(b)). The second apparatus an apparatus, generally called "apparatus for forming strongly acidic water", in which water having an electrolyte including sodium chloride and potassium chloride added thereto is electrolyzed (see FIG. 2(c)).

Tap water is used to be passed through a device 200 for purifying water to perform the electrolysis, and the resultant electrolyzed water at the minus side is used as the alkaline ion water as is.

First, water entering from a water supply 201 is transferred to a device 202 for purifying water at which musty smell, chlorine, trihalomtahne and the like are removed (pretreatment). Subsequently, the pretreated water is transferred to an electrolysis tank 203 composed of electrodes E1 and E2, and a diaphragm D as outlined in FIG. 2 (a) (see FIG. 2(a)). The water transferred to the electrolysis tank 203 is

electrolyzed, and at the anode side E1 and at the cathode side E2 via the diaphragm D, pH levels of water are slanted, respectively to prepare two types of water containing oxidative ions and reductive ions, respectively.

After being passed through the electrolysis tank 3, these two types of water flow separate paths (main water hose 204 and drainage hose 205), respectively. Specifically, the alkali ion water exiting at the minus side is passed through the main water hose 204 and flows towards a tap specialized for alkaline ion water, and on the other hand, the acidified water from the plus side is transferred to the drainage hose 205) and then exhausted, e.g., within a kitchen sink.

It is said that the alkaline ion water produced as described above can be effectively utilized in various applications.

In the present invention, it is general to use alkali ion water, and it is also possible to use a blend of the alkali ion water and the acidic ion water. In the present invention it is important to use ionized water.

The use of electrolyzed water in the method of the present invention is not essential, but it has been found from our repeated experiments that the use of electrolyzed water in the latter nano bubbling stage (S2) has much higher deterging power in comparison with the use of tap water, which has been subjected to nano-bubbling treatment.

This may be deduced that previous ionization of water is

imparted to high deterging power (surface active power). Specifically, it can be considered that ionized water is previously prepared and then the latter nano bubbling stage is performed, whereby the generated bubbles are packed by ions to obtain cleaning water having high surface activity. To be more specific, it may be considered that similar effect would be obtained from an electrolyte solution which can be expected to contain ions similar to those of the electrolyzed water.

Typically, an prescribed amount (which is appropriately decided depending upon the shape and number of the subject) of the electrolyzed water prepared by the apparatus for preparing electrolyzed water as shown in FIG. 2, which is separately provided, (or ionized water) is introduced into a treating tank.

The present invention is not restricted to the preparation of the electrolyzed water, and the present invention is intended to encompass performing nano bubbling stage starting merely from tap water (original source water), and performing nano bubbling stage utilizing water having enzymes such as protease or such added thereto.

Subsequently, the water prepared in the stage for preparing electrolyzed water is treated in the nano bubbling stage (S2).

The term nano bubbling stage intended herein is a stage for generating air bubbles having a size of approximately 100 nm (1 nm = 10^{-9} m) (in the present invention such a stage is referred to as nano bubbling stage) in the water.

In the present invention, nano bubble generator (not shown) has means for generating bubbles in order to blow fine air bubbles into a water tank. The means for generating bubbles is not specifically restricted, as long as it has a configuration to blow fine air bubbles into the water or aqueous medium (preferably electrolyzed water) in the water tank.

In one embodiment of the present invention, for the purpose of much more finely dividing generated air bubbles, ultrasonic may be applied into the water or aqueous medium in which nano bubbles have been generated.

Although it is possible to introduce a dirty subject to be cleaned (soak the subject into water) during the generation of the nano bubbles, for the purpose of stabilizing the treated water, it is more preferable to stop the air blowing and to stop the application of supersonic wave, and to leave the subject standing from the following reasons: if the subject is soaked while bubbling, there is a possibility to have an adverse influence upon the subject. (2) As described in a second embodiment, which will be described latter on, the finally treated water (for example, sterilized water) can be utilized (effective use).

Also, the treatment period in the nano bubbles is not specifically restricted, and it is generally from several minutes to several ten minutes, for example, approximately 10 minutes. Furthermore, during the course of nano bubbling treatment, it is possible to warm up the water or aqueous medium

to a prescribed temperature, for example, from 30°C to 60°C, and preferably approximately 40°C. According to our experiments, it has been proven that if the nano bubbling treatment is performed at a relatively high temperature, nano bubbles are much more generated and a function for removing stains in the latter stage is relatively high.

Subsequently, in stage S3, the subject is soaked in the water which has been treated to generate nano bubbles in the stage S3. The subject intended herein is not specifically restricted as long as it may be soaked in the treatment tank, and its properties are never modified by nano bubbles. Examples of the subjects include household or business purpose ranges, filters for ventilation fan, tableware, food materials (such as vegetables) and others.

In the present invention, subject on which oily ingredients, such as oils, petroleum components, and resins are adhered, a subject having complicated shape with a lot of convexes and concaves, a subject having a mesh which is clogged up by oil components and dusts or the like can be suitably cleaned, which subject has hitherto been difficult to be sufficiently cleaned unless it is soaked, for example, into a strongly alkaline detergent or highly concentrated surfactant over a prolong period of time, e.g., overnight.

Although the treatment period may be suitably selected depending upon the kind of the subject to be treated and situations of staining or such, for example, in the case of the

range which has been left standing for three or more years, the treatment period is from approximately 3 minutes to approximately 10 minutes. Such a treatment period can be suitably decided by repeated experiments.

The temperature of the nano bubbled water during the course of soaking is not specifically restricted, and it is possible to treat the subject at a temperature range from a normal room temperature to a relatively high temperature (for example, approximately 60°C). Although the effect for removing the stain is higher at a higher temperature, the water temperature and treatment period may be suitably decided depending upon energy to be consumed, complication of apparatus, heat resistance of the subject, degree of staining and other factors.

In the case where the soaking is performed at a relatively high temperature, a temperature controller or a heater may be provided on the water tank to keep a temperature at a prescribed temperature or more.

By soaking the subject as described above, due to the action of nano bubbles and ions, the stain adhered on the subject can easily be separated through the surface active function to remove stain out of the subject.

Subsequently, in a stage S5, stain is removed from the soaked subject. In this stage, removing means is not specifically restricted, and the removal can be performed by any of known methods. For example, brushing, wiping by means

of cloth, spraying water in an prescribed amount (at a prescribed pressure), and combination thereof can remove stain from the soaked subject.

If the stain is sufficiently removed from the subject (stage S6: YES), the subject from which the stain has been removed is subjected to post-treatment (washing with water for finish or such) to complete the cleaning (END).

If the stain is not sufficiently removed from the subject (stage S6: NO), the stage is again returned to the stage S4, and the subject is soaked in the nano bubbled water .

Since the method according to the present invention which removes the stain from the subject via such stages as described above can easily remove stain from the subject within a short period of time, dirty subject such as range, which has been conventionally required to be soaked for a prolong period of time in order to clean the stain, can be cleaned within a short period of time without taking any measure for water pollution due to chemicals.

(Second Embodiment)

Subsequently, the second embodiment of the present invention will now be described by referring to FIG. 3.

An embodiment shown in FIG. 3(a) is the first embodiment which further includes a stage S7 for finishing by the use of nano bubbled water (for example removal of microorganisms).

In the second embodiment, similar to the stage S1 and the

stage S2 of the first embodiment, the electrolyzed water is prepared (S1), and then nano bubbles are generated therein (S2). Different from the first embodiment where the subject is soaked in the prepared nano bubbled water, in the second embodiment, the prepared nano bubbled water is used as water for finishing the subject (S7).

Part or whole of the water which has been used as finishing water is used for nano bubbled water for which the subject is soaked. Specifically, since the nano bubbled water which has been used for finishing still possesses activity sufficient for removing the stain (in other words, it has an effect similar to the water just treated to generate nano bubbles), part or whole of the nano bubbled water having been used for finishing can effectively be utilized.

EXAMPLES

Examples of the present invention will now be described.

In electrolyzed water produced by an apparatus for preparing electrolyzed water at a normal room temperature (Example 1), or warmed up to 40°C (Example 2), nano bubbles were generated.

As a result it has been found that much more nano bubbles are generated in the electrolyzed water warmed up to 40°C (Example 2) within a short period of time as shown in FIG. 4.

Filters having stain strictly adhered on mesh thereof as subjects were soaked in the electrolyzed water into which nano

bubbles were generated in Example 1 and Example 2.. The situations of stain with time elapse were observed. As a result, the detachment of stain was observed after approximately one minute in Example 2, whereas the detachment of stain was observed after approximately three minutes in Example 1.

Subsequently, when the subjects were taken out from the nano bubbled water, and then rubbed with brush, the adhered stain was able to easily be removed.

Similarly, frames for ventilation fan and ventilation fan onto which oils had been strictly adhered were soaked in the nano bubbled water and then rubbed with brush. This made it possible to easily remove the stain from the subjects.

INDUSTRIAL APPLICABILITY

As described above, the present invention can easily remove stain adhered onto the subject while suppressing amounts of chemicals such as surfactants. Consequently, the present invention makes it possible to remove stain from the surface of the subject while reducing the load on the environment.

CLAIMS

1. A method for cleaning a subject to be cleaned which comprises:

a stage for generating air bubbles having a size of approximately 100 nm in water or an aqueous medium at a temperature of 30°C to 60°C;

a stage for soaking a subject to be cleaned into the water described above and having the stain adhered on the subject separated through the surface active function of air bubble; and

stage for removing stains out of the soaked subject.

2. A method for cleaning a subject to be cleaned which comprises:

a stage for soaking a subject to be cleaned into water or an aqueous medium at a temperature of 30°C to 60°C;

a stage for generating air bubbles having a size of approximately 100 nm in said water or said aqueous medium and having the stain adhered on the subject separated through the surface active function of air bubble; and

stage for removing stains out of the soaked subject.

3. A method for cleaning a subject to be cleaned which comprises:

a stage for soaking a subject to be cleaned into water

or an aqueous medium at a temperature of 30°C to 60°C;

a stage for generating air bubbles having a size of approximately 100 nm in said water or said aqueous medium and having the stain adhered on the subject separated through the surface active function of air bubble;

a stage for leaving the subject soaked in said water or said aqueous medium as it while applying ultrasonic wave into said water or said aqueous medium to make air bubbles smaller; and

stage for removing stains out of the soaked subject.

4. The method for cleaning a subject as claimed in any one of Claims 1 to 3, wherein said water or said aqueous medium is electrolyzed water.

5. The method as claimed in Claim 4, wherein said electrolyzed water is alkali ion water made by electrolysis of water.